

UNCLASSIFIED

**Department of Defense
Fiscal Year (FY) 2021 Budget Estimates**

February 2020



Air Force

Justification Book Volume 1 of 1

Research, Development, Test & Evaluation, Space Force

UNCLASSIFIED

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Air Force • Budget Estimates FY 2021 • RDT&E Program

Volume 1 Table of Contents

Introduction and Explanation of Contents.....Volume 1 - iii
Comptroller Exhibit R-1..... Volume 1 - v
Program Element Table of Contents (by Budget Activity then Line Item Number).....Volume 1 - xi
Program Element Table of Contents (Alphabetically by Program Element Title).....Volume 1 - xv
Exhibit R-2s..... Volume 1 - 1

UNCLASSIFIED

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Fiscal Year (FY) 2021 Budget Estimates RDT&E Descriptive Summaries Budget Activities February 2020

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 FY 2021 President's Budget (PB).
 - All exhibits in this document have been assembled in accordance with DoD 7000.14R, Financial Management Regulation, Volume 2B, Chapter 5.
 - Other comments on exhibit contents in this document:
 - Exhibits R-2/2a and R-3 provide narrative information for all RDT&E program elements and projects within the USAF FY 2021 RDT&E program with the exception of classified program elements. The format and contents of this document are in accordance to the guidelines and requirements of the Congressional committees in so far as possible.
 - The "Other Program Funding Summary portion of the R-2 includes, in addition to RDTE& funds, Procurement funds and quantities, Military Construction appropriation funds on specific development programs, Operations and Maintenance appropriation funds where they are essential to the development effort described, and where appropriate, Department of Energy (DOE) costs.

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.

RDT&E, Air Force Overseas Contingency Operations (OCO)

- FY2021 OCO can be separated into the following categories:
 - OCO for Direct War Costs: Direct War costs are those combat or direct combat support costs that will not continue to be expended once combat operations end at major contingency locations.
 - OCO for Enduring Requirements: OCO for Enduring Requirements are enduring in-theater and in-CONUS costs that will likely remain after combat operations cease, and have previously been funded in OCO.
 - OCO for Base Requirements: OCO for Base Requirements is OCO funding for base budget requirements in support of the National Defense Strategy. The Budget requests these funds in OCO to comply with the base budget defense caps included in the Budget Control Act of 2011.

UNCLASSIFIED

Department of the Air Force
 FY 2021 President's Budget
 Exhibit R-1 FY 2021 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

22 Jan 2020

Appropriation: 3620F RDTE, Space Force

Line No	Program Element Number	Item	Act	FY 2019 (Base + OCO)	FY 2020 Base Enacted	FY 2020 Emergency	FY 2020 OCO Enacted	FY 2020 Total Enacted S (Base+Emerg+ e OCO)	c
1	1206601SF	Space Technology	02						U
		Applied Research							
2	1203164SF	NAVSTAR Global Positioning System (User Equipment) (SPACE)	04						U
3	1203710SF	EO/IR Weather Systems	04						U
4	1206422SF	Weather System Follow-on	04						U
5	1206425SF	Space Situation Awareness Systems	04						U
6	1206427SF	Space Systems Prototype Transitions (SSPT)	04						U
7	1206438SF	Space Control Technology	04						U
8	1206760SF	Protected Tactical Enterprise Service (PTES)	04						U
9	1206761SF	Protected Tactical Service (PTS)	04						U
10	1206855SF	Evolved Strategic SATCOM (ESS)	04						U
11	1206857SF	Space Rapid Capabilities Office	04						U
		Advanced Component Development & Prototypes							
12	1203269SF	GPS III Follow-On (GPS IIIIF)	05						U
13	1203940SF	Space Situation Awareness Operations	05						U
14	1206421SF	Counterspace Systems	05						U
15	1206422SF	Weather System Follow-on	05						U
16	1206425SF	Space Situation Awareness Systems	05						U

R-121PB: FY 2021 President's Budget (Published Version), as of January 22, 2020 at 10:35:01

UNCLASSIFIED

Department of the Air Force
 FY 2021 President's Budget
 Exhibit R-1 FY 2021 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

22 Jan 2020

Appropriation: 3620F RDTE, Space Force

Line No	Program Element Number	Item	Act	FY 2021 Base	FY 2021 OCO for Base Requirements	FY 2021 OCO for Direct War and Enduring Costs	FY 2021 Total OCO	FY 2021 Total (Base + OCO)	Se
1	1206601SF	Space Technology	02	130,874				130,874	U
		Applied Research		130,874				130,874	
2	1203164SF	NAVSTAR Global Positioning System (User Equipment) (SPACE)	04	390,704				390,704	U
3	1203710SF	EO/IR Weather Systems	04	131,000				131,000	U
4	1206422SF	Weather System Follow-on	04	83,384				83,384	U
5	1206425SF	Space Situation Awareness Systems	04	33,359				33,359	U
6	1206427SF	Space Systems Prototype Transitions (SSPT)	04	142,808				142,808	U
7	1206438SF	Space Control Technology	04	35,575				35,575	U
8	1206760SF	Protected Tactical Enterprise Service (PTES)	04	114,390				114,390	U
9	1206761SF	Protected Tactical Service (PTS)	04	205,178				205,178	U
10	1206855SF	Evolved Strategic SATCOM (ESS)	04	71,395				71,395	U
11	1206857SF	Space Rapid Capabilities Office	04	103,518				103,518	U
		Advanced Component Development & Prototypes		1,311,311				1,311,311	
12	1203269SF	GPS III Follow-On (GPS IIIIF)	05	263,496				263,496	U
13	1203940SF	Space Situation Awareness Operations	05	41,897				41,897	U
14	1206421SF	Counterspace Systems	05	54,689				54,689	U
15	1206422SF	Weather System Follow-on	05	2,526				2,526	U
16	1206425SF	Space Situation Awareness Systems	05	173,074				173,074	U

R-121PB: FY 2021 President's Budget (Published Version), as of January 22, 2020 at 10:35:01

Department of the Air Force
 FY 2021 President's Budget
 Exhibit R-1 FY 2021 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

22 Jan 2020

Appropriation: 3620F RDTE, Space Force

Line No	Program Element Number	Item	Act	FY 2019 (Base + OCO)	FY 2020 Base Enacted	FY 2020 Emergency	FY 2020 OCO Enacted	FY 2020 Total Enacted S (Base+Emerg+ e OCO) c
17	1206431SF	Advanced EHF MILSATCOM (SPACE)	05					U
18	1206432SF	Polar MILSATCOM (SPACE)	05					U
19	1206442SF	Next Generation OPIR	05					U
20	1206853SF	National Security Space Launch Program (SPACE) - EMD	05					U
System Development & Demonstration								
21	1206116SF	Space Test and Training Range Development	06					U
22	1206392SF	ACQ Workforce - Space & Missile Systems	06					U
23	1206398SF	Space & Missile Systems Center - MHA	06					U
24	1206860SF	Rocket Systems Launch Program (SPACE)	06					U
25	1206864SF	Space Test Program (STP)	06					U
Management Support								
26	1201017SF	Global Sensor Integrated on Network (GSIN)	07					U
27	1203001SF	Family of Advanced BLoS Terminals (FAB-T)	07					U
28	1203110SF	Satellite Control Network (SPACE)	07					U
29	1203165SF	NAVSTAR Global Positioning System (Space and Control Segments)	07					U
30	1203173SF	Space and Missile Test and Evaluation Center	07					U

R-121PB: FY 2021 President's Budget (Published Version), as of January 22, 2020 at 10:35:01

Department of the Air Force
 FY 2021 President's Budget
 Exhibit R-1 FY 2021 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

22 Jan 2020

Appropriation: 3620F RDTE, Space Force

Line No	Program Element Number	Item	Act	FY 2021 Base	FY 2021 OCO for Base Requirements	FY 2021 OCO for Direct War and Enduring Costs	FY 2021 Total OCO	FY 2021 Total (Base + OCO)	Se
17	1206431SF	Advanced EHF MILSATCOM (SPACE)	05	138,257				138,257	U
18	1206432SF	Polar MILSATCOM (SPACE)	05	190,235				190,235	U
19	1206442SF	Next Generation OPIR	05	2,318,864				2,318,864	U
20	1206853SF	National Security Space Launch Program (SPACE) - EMD	05	560,978				560,978	U
		System Development & Demonstration		3,744,016				3,744,016	
21	1206116SF	Space Test and Training Range Development	06	20,281				20,281	U
22	1206392SF	ACQ Workforce - Space & Missile Systems	06	183,930				183,930	U
23	1206398SF	Space & Missile Systems Center - MHA	06	9,765				9,765	U
24	1206860SF	Rocket Systems Launch Program (SPACE)	06	17,993				17,993	U
25	1206864SF	Space Test Program (STP)	06	26,541				26,541	U
		Management Support		258,510				258,510	
26	1201017SF	Global Sensor Integrated on Network (GSIN)	07	3,708				3,708	U
27	1203001SF	Family of Advanced BLoS Terminals (FAB-T)	07	247,229				247,229	U
28	1203110SF	Satellite Control Network (SPACE)	07	75,480				75,480	U
29	1203165SF	NAVSTAR Global Positioning System (Space and Control Segments)	07	1,984				1,984	U
30	1203173SF	Space and Missile Test and Evaluation Center	07	4,397				4,397	U

R-121PB: FY 2021 President's Budget (Published Version), as of January 22, 2020 at 10:35:01

Department of the Air Force
 FY 2021 President's Budget
 Exhibit R-1 FY 2021 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

22 Jan 2020

Appropriation: 3620F RDTE, Space Force

Line No	Element Number	Program Item	Act	FY 2019 (Base + OCO)	FY 2020 Base Enacted	FY 2020 Emergency	FY 2020 OCO Enacted	FY 2020 Total Enacted S (Base+Emerg+ e OCO)	c
31	1203174SF	Space Innovation, Integration and Rapid Technology Development	07						U
32	1203182SF	Spacelift Range System (SPACE)	07						U
33	1203265SF	GPS III Space Segment	07						U
34	1203873SF	Ballistic Missile Defense Radars	07						U
35	1203913SF	NUDET Detection System (SPACE)	07						U
36	1203940SF	Space Situation Awareness Operations	07						U
37	1206423SF	Global Positioning System III - Operational Control Segment	07						U
41	1206770SF	Enterprise Ground Services	07						U
9999	9999999999	Classified Programs		-----	-----	-----	-----	-----	U
		Operational System Development							
42	1203614SF	JSpOC Mission System	08						U
		Software & Digital Technology Pilot Program							
		Total RDTE, Space Force		-----	-----	-----	-----	-----	

Department of the Air Force
 FY 2021 President's Budget
 Exhibit R-1 FY 2021 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

22 Jan 2020

Appropriation: 3620F RDTE, Space Force

Line No	Element Number	Program Item	Act	FY 2021 Base	FY 2021 OCO for Base Requirements	FY 2021 OCO for Direct War and Enduring Costs	FY 2021 Total OCO	FY 2021 Total (Base + OCO)	Se
31	1203174SF	Space Innovation, Integration and Rapid Technology Development	07	44,746				44,746	U
32	1203182SF	Spacelift Range System (SPACE)	07	11,020				11,020	U
33	1203265SF	GPS III Space Segment	07	10,777				10,777	U
34	1203873SF	Ballistic Missile Defense Radars	07	28,179				28,179	U
35	1203913SF	NUDET Detection System (SPACE)	07	29,157				29,157	U
36	1203940SF	Space Situation Awareness Operations	07	44,809				44,809	U
37	1206423SF	Global Positioning System III - Operational Control Segment	07	481,999				481,999	U
41	1206770SF	Enterprise Ground Services	07	116,791				116,791	U
9999	9999999999	Classified Programs		3,632,866				3,632,866	U
		Operational System Development		4,733,142				4,733,142	
42	1203614SF	JSpOC Mission System	08	149,742				149,742	U
		Software & Digital Technology Pilot Program		149,742				149,742	
Total RDTE, Space Force				10,327,595				10,327,595	

UNCLASSIFIED

Air Force • Budget Estimates FY 2021 • RDT&E Program

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

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
1	02	1206601SF	Space Technology.....	Volume 1 - 1

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
2	04	1203164SF	NAVSTAR Global Positioning System (User Equipment) (SPACE).....	Volume 1 - 15
3	04	1203710SF	EO/IR Weather Systems.....	Volume 1 - 27
4	04	1206422SF	Weather System Follow-on.....	Volume 1 - 35
5	04	1206425SF	Space Situation Awareness Systems.....	Volume 1 - 43
6	04	1206427SF	Space Systems Prototype Transitions (SSPT).....	Volume 1 - 49
7	04	1206438SF	Space Control Technology.....	Volume 1 - 59
8	04	1206760SF	Protected Tactical Enterprise Service (PTES).....	Volume 1 - 67
9	04	1206761SF	Protected Tactical Service (PTS).....	Volume 1 - 75
10	04	1206855SF	Evolved Strategic SATCOM (ESS).....	Volume 1 - 83

UNCLASSIFIED

UNCLASSIFIED

Air Force • Budget Estimates FY 2021 • RDT&E Program

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
11	04	1206857SF	Space Rapid Capabilities Office.....	Volume 1 - 91

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
12	05	1203269SF	GPS III Follow-On (GPS IIIF).....	Volume 1 - 97
13	05	1203940SF	Space Situation Awareness Operations.....	Volume 1 - 105
14	05	1206421SF	Counterspace Systems.....	Volume 1 - 111
15	05	1206422SF	Weather System Follow-on.....	Volume 1 - 129
16	05	1206425SF	Space Situation Awareness Systems.....	Volume 1 - 135
17	05	1206431SF	Advanced EHF MILSATCOM (SPACE).....	Volume 1 - 141
18	05	1206432SF	Polar MILSATCOM (SPACE).....	Volume 1 - 151
19	05	1206442SF	Next Generation OPIR.....	Volume 1 - 159
21	05	1206853SF	National Security Space Launch Program (SPACE) - EMD.....	Volume 1 - 187

UNCLASSIFIED

UNCLASSIFIED

Air Force • Budget Estimates FY 2021 • RDT&E Program

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
20	06	1206116SF	Space Test and Training Range Development.....	Volume 1 - 195
22	06	1206392SF	Space and Missile Center (SMC) Civilian Workforce.....	Volume 1 - 199
23	06	1206398SF	Space & Missile Systems Center - MHA.....	Volume 1 - 203
24	06	1206860SF	Rocket Systems Launch Program (SPACE).....	Volume 1 - 207
25	06	1206864SF	Space Test Program (STP).....	Volume 1 - 211

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
26	07	1201017SF	Global Sensor Integrated on Network (GSIN).....	Volume 1 - 215
27	07	1203001SF	Family of Advanced BLoS Terminals (FAB-T) CPT.....	Volume 1 - 223
28	07	1203110SF	Satellite Control Network (SPACE).....	Volume 1 - 243
29	07	1203165SF	NAVSTAR Global Positioning System (Space and Control Segments).....	Volume 1 - 253
30	07	1203173SF	Space and Missile Test and Evaluation Center.....	Volume 1 - 259
31	07	1203174SF	Space Innovation, Integration and Rapid Technology Development.....	Volume 1 - 267

UNCLASSIFIED

UNCLASSIFIED

Air Force • Budget Estimates FY 2021 • RDT&E Program

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
32	07	1203182SF	Spacelift Range System (SPACE).....	Volume 1 - 275
33	07	1203265SF	GPS III Space Segment.....	Volume 1 - 283
34	07	1203873SF	Ballistic Missile Defense Radars.....	Volume 1 - 291
35	07	1203913SF	NUDET Detection System (SPACE).....	Volume 1 - 299
36	07	1203940SF	Space Situation Awareness Operations.....	Volume 1 - 307
37	07	1206423SF	Global Positioning System III - Operational Control Segment.....	Volume 1 - 315
41	07	1206770SF	Enterprise Ground Services.....	Volume 1 - 333

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
42	08	1203614SF	Space C2.....	Volume 1 - 341

UNCLASSIFIED

UNCLASSIFIED

Air Force • Budget Estimates FY 2021 • RDT&E Program

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

Program Element Title	Program Element Number	Line #	BA	Page
Advanced EHF MILSATCOM (SPACE)	1206431SF	17	05.....	Volume 1 - 141
Ballistic Missile Defense Radars	1203873SF	34	07.....	Volume 1 - 291
Counterspace Systems	1206421SF	14	05.....	Volume 1 - 111
EO/IR Weather Systems	1203710SF	3	04.....	Volume 1 - 27
Enterprise Ground Services	1206770SF	41	07.....	Volume 1 - 333
Evolved Strategic SATCOM (ESS)	1206855SF	10	04.....	Volume 1 - 83
Family of Advanced BLoS Terminals (FAB-T) CPT	1203001SF	27	07.....	Volume 1 - 223
GPS III Follow-On (GPS III F)	1203269SF	12	05.....	Volume 1 - 97
GPS III Space Segment	1203265SF	33	07.....	Volume 1 - 283
Global Positioning System III - Operational Control Segment	1206423SF	37	07.....	Volume 1 - 315
Global Sensor Integrated on Network (GSIN)	1201017SF	26	07.....	Volume 1 - 215
NAVSTAR Global Positioning System (Space and Control Segments)	1203165SF	29	07.....	Volume 1 - 253
NAVSTAR Global Positioning System (User Equipment) (SPACE)	1203164SF	2	04.....	Volume 1 - 15
NUDET Detection System (SPACE)	1203913SF	35	07.....	Volume 1 - 299
National Security Space Launch Program (SPACE) - EMD	1206853SF	21	05.....	Volume 1 - 187
Next Generation OPIR	1206442SF	19	05.....	Volume 1 - 159
Polar MILSATCOM (SPACE)	1206432SF	18	05.....	Volume 1 - 151

UNCLASSIFIED

UNCLASSIFIED

Air Force • Budget Estimates FY 2021 • RDT&E Program

Program Element Title	Program Element Number	Line #	BA	Page
Protected Tactical Enterprise Service (PTES)	1206760SF	8	04.....	Volume 1 - 67
Protected Tactical Service (PTS)	1206761SF	9	04.....	Volume 1 - 75
Rocket Systems Launch Program (SPACE)	1206860SF	24	06.....	Volume 1 - 207
Satellite Control Network (SPACE)	1203110SF	28	07.....	Volume 1 - 243
Space & Missile Systems Center - MHA	1206398SF	23	06.....	Volume 1 - 203
Space C2	1203614SF	42	08.....	Volume 1 - 341
Space Control Technology	1206438SF	7	04.....	Volume 1 - 59
Space Innovation, Integration and Rapid Technology Development	1203174SF	31	07.....	Volume 1 - 267
Space Rapid Capabilities Office	1206857SF	11	04.....	Volume 1 - 91
Space Situation Awareness Operations	1203940SF	13	05.....	Volume 1 - 105
Space Situation Awareness Operations	1203940SF	36	07.....	Volume 1 - 307
Space Situation Awareness Systems	1206425SF	5	04.....	Volume 1 - 43
Space Situation Awareness Systems	1206425SF	16	05.....	Volume 1 - 135
Space Systems Prototype Transitions (SSPT)	1206427SF	6	04.....	Volume 1 - 49
Space Technology	1206601SF	1	02.....	Volume 1 - 1
Space Test Program (STP)	1206864SF	25	06.....	Volume 1 - 211
Space Test and Training Range Development	1206116SF	20	06.....	Volume 1 - 195
Space and Missile Center (SMC) Civilian Workforce	1206392SF	22	06.....	Volume 1 - 199
Space and Missile Test and Evaluation Center	1203173SF	30	07.....	Volume 1 - 259

UNCLASSIFIED

UNCLASSIFIED

Air Force • Budget Estimates FY 2021 • RDT&E Program

Program Element Title	Program Element Number	Line #	BA	Page
Spacelift Range System (SPACE)	1203182SF	32	07.....	Volume 1 - 275
Weather System Follow-on	1206422SF	4	04.....	Volume 1 - 35
Weather System Follow-on	1206422SF	15	05.....	Volume 1 - 129

UNCLASSIFIED

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force / BA 2: Applied Research</i>	R-1 Program Element (Number/Name) PE 1206601SF / <i>Space Technology</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	130.874	0.000	130.874	128.708	125.315	128.077	130.666	Continuing	Continuing
621010: <i>Space Survivability & Surveillance</i>	-	0.000	0.000	41.807	0.000	41.807	43.141	42.160	46.013	46.836	Continuing	Continuing
624846: <i>Spacecraft Payload Technologies</i>	-	0.000	0.000	29.796	0.000	29.796	31.276	30.031	31.374	31.495	Continuing	Continuing
625018: <i>Spacecraft Protection Technology</i>	-	0.000	0.000	11.639	0.000	11.639	12.421	11.957	13.406	13.765	Continuing	Continuing
628809: <i>Spacecraft Vehicle Technologies</i>	-	0.000	0.000	47.632	0.000	47.632	41.870	41.167	37.284	38.570	Continuing	Continuing

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206601F, Space Technology efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206601SF, Space Technology, from Appropriation 3600, Budget Activity (BA) 02 due to the creation of a new Appropriation for Space Force.

This program focuses on four major areas. First, the space survivability and surveillance area develops technologies to understand space weather and the geophysics environment for mitigation and exploitation of these effects to Space Force systems. Second, the spacecraft payload technologies area improves satellite payload operations by developing advanced component and subsystem capabilities. Third, the spacecraft protection area develops technologies for protecting United States space assets in potential hostile settings. The last major area, spacecraft vehicles, focuses on spacecraft platform and control technologies, and their interactions. Efforts in this program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

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, 0602298F, 0602601F, 0602602F, 0602605F, and 0602788F.

This work will still be executed by the Air Force Research Laboratory Space Vehicles (AFRL/RV) Technology Directorate located at Kirtland Air Force Base, New Mexico. This is an administrative realignment and not a New Start.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2019 Air Force penalty total is \$50.0M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 2: Applied Research</i>	R-1 Program Element (Number/Name) PE 1206601SF / <i>Space Technology</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. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	130.874	0.000	130.874
Total Adjustments	0.000	0.000	130.874	0.000	130.874
• 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	130.874	0.000	130.874

Change Summary Explanation

+\$130.874 million; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force; this total includes a \$10.000 million increase for classified space applied research activities.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3620F / 2					R-1 Program Element (Number/Name) PE 1206601SF / <i>Space Technology</i>				Project (Number/Name) 621010 / <i>Space Survivability & Surveillance</i>			
COST (\$ in Millions)	Prior Years (+)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
621010: <i>Space Survivability & Surveillance</i>	-	0.000	0.000	41.807	0.000	41.807	43.141	42.160	46.013	46.836	Continuing	Continuing

(+) The sum of all Prior Years is \$0.000 million less than the represented total due to several projects ending

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206601F, Space Technology efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206601SF, Space Technology, from Appropriation 3600, Budget Activity (BA) 02 due to the creation of a new Appropriation for Space Force.

This is an administrative realignment and not a New Start.

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

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

	FY 2019	FY 2020	FY 2021
Title: Space Environment Research	0.000	0.000	20.235
Description: Develop techniques, forecasting tools, sensors, and technologies for specifying, monitoring, predicting, and controlling space environmental conditions hazardous to Department of Defense operational space and radar systems.			
FY 2020 Plans: For 2020 and prior, this work is performed under the Space Environment Research effort in Appropriation 3600, Budget Activity (BA) 02, PE 1206601F, Space Technology, Project 621010, Space Survivability & Surveillance.			
FY 2021 Plans: Continue exploitation and data collection of radiation aged materials for electrical and optical property changes to enhance predictive models. Identify and initiate generation-beyond-next trapped and untrapped particle specification model development efforts. Continue space environment sensor and anomaly attribution tool demonstrations to identify key model development requirements and transition roadblocks. Research and develop technologies to exploit and mitigate space environment effects to the Department of Defense's advantage. Prototype and demonstrate new ground-based and space-based sensors for monitoring and specifying the state of the space environment for military applications. Continue to develop and enhance space environment modelling capabilities to better enable accurate specification and forecasting of the state of the space environment, and the resulting impacts to Department of Defense and national systems. Advance research into the physics and dynamics of the sun			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F / 2	R-1 Program Element (Number/Name) PE 1206601SF / <i>Space Technology</i>	Project (Number/Name) 621010 / <i>Space Survivability & Surveillance</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>to better specify and forecast solar events and better understand how those events impact the near-earth space environment. Explore fundamental radio frequency and chemical interactions in the near-earth space environment to inform potential utility for military applications. Continue work on hybrid supersonic solver code development and validation, expanding the solver to include accurate Global Positioning System performance.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Not applicable</p>				
<p>Title: Surveillance Technologies</p> <p>Description: Develop advanced target detection techniques, spectral signature libraries, and decision aids for space-based sensors and surveillance systems.</p> <p>FY 2020 Plans: For 2020 and prior, this work is performed under the Surveillance Technologies effort in Appropriation 3600, Budget Activity (BA) 02, PE 1206601F, Space Technology, Project 621010, Space Survivability & Surveillance.</p> <p>FY 2021 Plans: Initiate development of capability metrics for new satellite constellation architectures, advanced data analytics, and satellite demonstration concepts. Continue study of advanced surveillance and detection technologies for tracking emerging and evolving targets, including ballistic and non-ballistic targets that pose new challenges for missile warning systems. Document findings of innovative computational methods for missile warning System Program Office to significantly decrease satellite down-link bandwidth while maintaining high fidelity of missile warning data. Document findings of analysis tasks associated with on-orbit experiments that demonstrated advanced sensor and analytic methods of innovative hypertemporal imaging early missile warning concept, including the collection and analysis of missile and missile like data. Continue investigation of on-board processing capabilities and limitations for large datasets. Continue investigation of advanced surveillance and detection technologies for an expanded range of mission applications.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Not applicable</p>		0.000	0.000	5.864
<p>Title: Radiation Remediation Research</p> <p>Description: Conduct Radiation Belt Remediation research through development and validation of analytical performance models for remediation of Earth radiation belts following high altitude nuclear detonation.</p> <p>FY 2020 Plans:</p>		0.000	0.000	1.744

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F / 2	R-1 Program Element (Number/Name) PE 1206601SF / <i>Space Technology</i>	Project (Number/Name) 621010 / <i>Space Survivability & Surveillance</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>For 2020 and prior, this work is performed under the Radiation Remediation Research effort in Appropriation 3600, Budget Activity (BA) 02, PE 1206601F, Space Technology, Project 621010, Space Survivability & Surveillance.</p> <p>FY 2021 Plans: Conduct FY 2019 efforts, moved to FY 2020 due to slip in space experiment launch date: Complete space experiment operations, and reduction and exploitation of data sets to finalize end-to-end model validation. Conduct assessment of feasibility and system requirements for space-based and combined ground and space-based remediation systems.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Not applicable</p>				
<p>Title: Seismic Technologies</p> <p>Description: Develop seismic technologies to support national requirements for monitoring nuclear explosions with special focus on regional distances less than 2,000 kilometers from the sensors.</p> <p>FY 2020 Plans: For 2020 and prior, this work is performed under the Seismic Technologies effort in Appropriation 3600, Budget Activity (BA) 02, PE 1206601F, Space Technology, Project 621010, Space Survivability & Surveillance.</p> <p>FY 2021 Plans: Test new algorithms on high performance computing capabilities with special focus on improving earth structure models and the resulting automation of the discrimination of seismic events. Exercise earth models in use in high-performance computing modeling and simulation codes for operational expert analysis of difficult-to-discriminate earthquakes and explosions. Continue to test specific algorithms for application of big data heuristics to more quickly characterize seismic events. Further develop new statistical approaches to the behavior of discriminants for local (less than 200 kilometers) and regional (less than 2,000 kilometers) seismic events.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Not applicable</p>		0.000	0.000	5.660
<p>Title: Alternative Navigation Technologies</p> <p>Description: Develop new technologies based on cold atom physics that provide autonomous jam-proof precision inertial navigation to augment Global Positioning System in case of Global Positioning System-denial. Develop atomic clocks based on new technologies to replace legacy Global Positioning System atomic clocks.</p> <p>FY 2020 Plans:</p>		0.000	0.000	8.304

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force	Date: February 2020
---	----------------------------

Appropriation/Budget Activity 3620F / 2	R-1 Program Element (Number/Name) PE 1206601SF / <i>Space Technology</i>	Project (Number/Name) 621010 / <i>Space Survivability & Surveillance</i>
---	--	--

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>For 2020 and prior, this work is performed under the Alternative Navigation Technologies effort in Appropriation 3600, Budget Activity (BA) 02, PE 1206601F, Space Technology, Project 621010, Space Survivability & Surveillance.</p> <p><i>FY 2021 Plans:</i> Complete rad-hard component development for advanced compact atomic clocks with improved accuracy and stability to replace legacy atomic clocks. Deliver system for integration onto experimental satellite system. Continue transition of advanced atomic clocks to industry with potential on ramp onto future satellites. Continue testing of cold atom 3-axis accelerometers for improved Internal Navigation Systems in Global Position System denied environments.</p> <p><i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> Not applicable</p>			
Accomplishments/Planned Programs Subtotals	0.000	0.000	41.807

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3620F / 2					R-1 Program Element (Number/Name) PE 1206601SF / <i>Space Technology</i>				Project (Number/Name) 624846 / <i>Spacecraft Payload Technologies</i>			
COST (\$ in Millions)	Prior Years (+)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
624846: <i>Spacecraft Payload Technologies</i>	-	0.000	0.000	29.796	0.000	29.796	31.276	30.031	31.374	31.495	Continuing	Continuing

(+) The sum of all Prior Years is \$0.000 million less than the represented total due to several projects ending

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206601F, Space Technology efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206601SF, Space Technology, from Appropriation 3600, Budget Activity (BA) 02 due to the creation of a new Appropriation for Space Force.

This is an administrative realignment and not a New Start.

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

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

	FY 2019	FY 2020	FY 2021
Title: Space-Based Detector Technologies	0.000	0.000	6.149
Description: Develop advanced infrared device technologies that enable hardened space detector arrays with improved detection to perform acquisition, tracking, and discrimination of space objects and missile warning.			
FY 2020 Plans: For 2020 and prior, this work is performed under the Space-Based Detector Technologies effort in Appropriation 3600, Budget Activity (BA) 02, PE 1206601F, Space Technology, Project 624846, Spacecraft Payload Technologies.			
FY 2021 Plans: Begin design, development, and assessment of low-cost, high-volume infrared detectors and focal plane arrays for proliferated space architecture layers. Begin development of focal plane array optical data outputs for higher speed and data throughput and begin radiation tolerance characterization of photonic devices. Begin development of alternative infrared focal plane array materials and device architectures. Continue development of resilient scanning and staring digital focal plane arrays. Complete development of 8192 x 8192 pixels, 10 micron pixel pitch focal plane arrays hardened to the natural space environment and focused photons to enable whole-earth staring for Launch Detection and Missile Warning missions.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F / 2	R-1 Program Element (Number/Name) PE 1206601SF / <i>Space Technology</i>	Project (Number/Name) 624846 / <i>Spacecraft Payload Technologies</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
Not applicable				
<p>Title: Space Electronics Research</p> <p>Description: Develop technologies for space-based payload components such as radiation-hardened electronic devices, microelectro-mechanical system devices, and advanced electronics packaging.</p> <p>FY 2020 Plans: For 2020 and prior, this work is performed under the Space Electronics Research effort in Appropriation 3600, Budget Activity (BA) 02, PE 1206601F, Space Technology, Project 624846, Spacecraft Payload Technologies.</p> <p>FY 2021 Plans: Continue leadership role in Deputy Assistant Secretary of Defense Systems Engineering trusted and assured microelectronics strategy efforts by development of trusted manufacturing techniques that reduce risk to National Security Space systems. Improving benchmarking capabilities on state-of-the-art electronics using latest spacecraft algorithms and transitioning results to acquisition community to enable data-informed payload architecture design decisions. Initiating complete space qualification planning for next generation space processor and begin implementing plan. Continue development of alternative memory approaches for high density memory needed for next-generation space systems. Continue research and development of ultra-low power and neuromorphic/cortical processing architectures to enable game-changing capabilities in future National Security Space systems. Continue advanced transistor research and development, and transitioning techniques to mainstream manufacturing.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Not applicable</p>		0.000	0.000	6.928
<p>Title: Modeling and Simulation Tools for Space Applications</p> <p>Description: Develop modeling and simulation tools for space-based ground surveillance systems, rendezvous and proximity operations, imaging of space systems, disaggregated satellite architecture, and space control payloads.</p> <p>FY 2020 Plans: For 2020 and prior, this work is performed under the Modeling and Simulation Tools for Space Applications effort in Appropriation 3600, Budget Activity (BA) 02, PE 1206601F, Space Technology, Project 624846, Spacecraft Payload Technologies.</p> <p>FY 2021 Plans: Complete mission-level military utility analyses of architecture approaches across multi-domain mission areas. Continue refining guidelines and checkpoints for concept maturation evaluations in context of emerging space technologies. Continue development of models and mission simulations of the National Space Defense Center's new space and space enterprise capabilities.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement:</p>		0.000	0.000	8.789

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force	Date: February 2020
---	----------------------------

Appropriation/Budget Activity 3620F / 2	R-1 Program Element (Number/Name) PE 1206601SF / <i>Space Technology</i>	Project (Number/Name) 624846 / <i>Spacecraft Payload Technologies</i>
---	--	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Not applicable			
<p>Title: Alternative Positioning, Navigation, and Timing Technology</p> <p>Description: Identify and develop technologies that enable new, or enhance existing, United States positioning, navigation, and timing satellite capabilities by increasing resiliency and availability of accuracy, and/or increasing the affordability of providing current capabilities. Develop technologies to meet identified Air Force Space Command/Space and Missile Systems Center positioning, navigation, and timing space payload technology needs.</p> <p>FY 2020 Plans: For 2020 and prior, this work is performed under the Alternative Positioning, Navigation, and Timing Technology effort in Appropriation 3600, Budget Activity (BA) 02, PE 1206601F, Space Technology, Project 624846, Spacecraft Payload Technologies.</p> <p>FY 2021 Plans: Develop advanced Precision Navigation and Timing waveforms and begin to examine the interaction of signals between the space, ground, and user equipment segments. Explore new technologies for positioning, navigation, and timing payloads that will improve performance and affordability. Continue studies that explore technologies for multi-layer space-based positioning, navigation, and timing architecture in order to improve resiliency of the space architecture. Work to develop modeling and simulation results of next generation space architecture and the impact of developing technologies.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Not applicable</p>	0.000	0.000	7.930
Accomplishments/Planned Programs Subtotals	0.000	0.000	29.796

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3620F / 2					R-1 Program Element (Number/Name) PE 1206601SF / <i>Space Technology</i>				Project (Number/Name) 625018 / <i>Spacecraft Protection Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
625018: <i>Spacecraft Protection Technology</i>	-	0.000	0.000	11.639	0.000	11.639	12.421	11.957	13.406	13.765	Continuing	Continuing

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206601F, Space Technology efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206601SF, Space Technology, from Appropriation 3600, Budget Activity (BA) 02 due to the creation of a new Appropriation for Space Force.

This is an administrative realignment and not a New Start.

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

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

	FY 2019	FY 2020	FY 2021
Title: Threat Warning Research	0.000	0.000	11.639
Description: Develop satellite threat warning technologies and tools for space defense. Exploit on-board inherent satellite resources, satellite-as-a-sensor, and self-aware satellite technologies. Develop technologies to detect, assess, and respond to threats and anomalies.			
FY 2020 Plans: For 2020 and prior, this work is performed under the Threat Warning Research effort in Appropriation 3600, Budget Activity (BA) 02, PE 1206601F, Space Technology, Project 625018, Spacecraft Protection Technology.			
FY 2021 Plans: Continue to develop techniques to detect, track, identify, and characterize satellites using multi-phenomenology to address gaps in knowledge for space situational awareness and consider the tasking, collection, processing, exploitation and dissemination needs. Assess timeliness and persistence of space situational awareness capability and develop techniques to mitigate the growing population of objects that need to be monitored, from newly launched objects to debris. Conduct cooperative development utilizing commercial and international space situational awareness sources. Initiate research and development on an integrated ground and space indications and warnings experiment. Utilize space resiliency testbed to integrate technology solutions, and evaluate effectiveness against notional threats to our space architectures. Develop cyber hardening technologies, and integrate space and cyber operations capabilities. Conduct end-to-end evaluations and hardware-in-the-loop experiments for threat warning and response capabilities for protection of high value space assets. Conduct experiments, integrating commercial space C2 capabilities into Department of Defense ground architectures. These capabilities include real-time mission			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force	Date: February 2020
---	----------------------------

Appropriation/Budget Activity 3620F / 2	R-1 Program Element (Number/Name) PE 1206601SF / <i>Space Technology</i>	Project (Number/Name) 625018 / <i>Spacecraft Protection Technology</i>
---	--	--

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
planning, utilization of non-traditional Intel sources (i.e. social media), multi-path communications architectures, etc. Develop and demonstrate autonomous technologies using net-centric space command and control architectures for multi-domain command and control across the full scope of the ground and space-based enterprise. Continue development and demonstration of advanced algorithms for sensor data fusion and satellite threat detection, assessment, and response. Investigate, implement, and demonstrate integrated command and control systems at the tactical, operational, and strategic levels. Continue assessment and development of commercial capability in order to either augment or replace traditional methods for space related command and control. Continue engagements with commercial space data providers for testing new enabling technologies on commercial satellites. Continue to develop on-board autonomous satellite technologies and plan for next generation flight experiments.			
<i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> Not applicable			
Accomplishments/Planned Programs Subtotals	0.000	0.000	11.639

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3620F / 2					R-1 Program Element (Number/Name) PE 1206601SF / <i>Space Technology</i>				Project (Number/Name) 628809 / <i>Spacecraft Vehicle Technologies</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
628809: <i>Spacecraft Vehicle Technologies</i>	-	0.000	0.000	47.632	0.000	47.632	41.870	41.167	37.284	38.570	Continuing	Continuing

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206601F, Space Technology efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206601SF, Space Technology, from Appropriation 3600, Budget Activity (BA) 02 due to the creation of a new Appropriation for Space Force.

This is an administrative realignment and not a New Start.

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

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

	FY 2019	FY 2020	FY 2021
<p>Title: Space Power/Thermal Research</p> <p>Description: Develop technologies for advanced space platform subsystems such as cryocoolers, compact, high efficiency solar power cells and arrays, and innovative power generation concepts.</p> <p>FY 2020 Plans: For 2020 and prior, this work is performed under the Space Power/Thermal Research effort in Appropriation 3600, Budget Activity (BA) 02, PE 1206601F, Space Technology, Project 628809, Spacecraft Vehicle Technologies.</p> <p>FY 2021 Plans: Continue research into advanced space solar cells, solar array, and energy storage technologies. Focus on support for current heritage space systems, while also pivoting towards support of smaller space vehicles that will be utilized for the Space Warfighting Construct. Solar cells with end of life performance, which depends on the mission, above 28% power conversion efficiency. Solar array structures tailored for small to large missions with specific power greater than 100 watts per kilogram. Energy storage chemistries with cell-level specific energy greater than 300 watt-hours per kilogram. Further development of array hardening approaches to provide drop-in replacement panels.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Not applicable</p>	0.000	0.000	4.458
<p>Title: Space Structures and Controls Research</p> <p>Description: Develop revolutionary and enabling technologies, including lighter weight, lower cost, high performance structures for space platforms; guidance, navigation, and controls hardware and software for next generation of space superiority systems.</p>	0.000	0.000	11.540

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force	Date: February 2020
---	----------------------------

Appropriation/Budget Activity 3620F / 2	R-1 Program Element (Number/Name) PE 1206601SF / <i>Space Technology</i>	Project (Number/Name) 628809 / <i>Spacecraft Vehicle Technologies</i>
---	--	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p><i>FY 2020 Plans:</i> For 2020 and prior, this work is performed under the Space Structures and Controls Research effort in Appropriation 3600, Budget Activity (BA) 02, PE 1206601F, Space Technology, Project 628809, Spacecraft Vehicle Technologies.</p> <p><i>FY 2021 Plans:</i> Continue reactive maneuver strategies for spacecraft resiliency in hardware-in-the-loop testbeds. Initiate on-orbit experiment planning for reactive maneuver strategies. Apply research in verification and validation techniques for autonomous spacecraft flight software to high-fidelity simulations and brassboard laboratory experiments. Apply improved estimation algorithms for on-orbit navigation software to experimental data to assess performance and robustness. Complete laboratory and high-fidelity simulations/breadboard implementation for navigation algorithms and assess progress towards flight experiment demonstration. Continue development of integrated proof-of-concept experiments for advanced, agile manufacturing and assembly technologies for satellite production to improve performance and affordability. Continue research in functionalized structures using multi-material additive manufacturing. Transition development of research efforts in high-power small satellite technologies and affordable, high-performance phased arrays and electrically steerable antennas for tactical communication and radar concepts for agile, intelligent targets to advanced development and flight experimentation.</p> <p><i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> Not applicable</p>			
<p><i>Title:</i> Space Experiments</p> <p><i>Description:</i> Develop flight experiments to improve the capabilities of existing operational space systems and to enable new transformational space capabilities.</p> <p><i>FY 2020 Plans:</i> For 2020 and prior, this work is performed under the Space Experiments effort in Appropriation 3600, Budget Activity (BA) 02, PE 1206601F, Space Technology, Project 628809, Spacecraft Vehicle Technologies.</p> <p><i>FY 2021 Plans:</i> Conduct on-orbit small satellite demonstration of the first ever Link-16 from space to the tactical user enabling a Common Operating Picture for the Warfighter in a contested/degraded environment in support of Multi-Domain Command and Control. On-orbit small satellite demonstration capable of measuring radiation in the inner magnetosphere giving insight into the particle radiation space environment. Conduct a flight selection process and perform trade studies to determine the next flight experiment(s). Develop and mature a reference design, technical objectives, and experiment plan in coordination with Air Force Space Command, Space and Missile Systems Center and/or other mission partners. Begin working long lead items such as contracting strategy, parts, frequency allocation, and information assurance strategies.</p> <p><i>FY 2020 to FY 2021 Increase/Decrease Statement:</i></p>	0.000	0.000	24.952

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force	Date: February 2020
---	----------------------------

Appropriation/Budget Activity 3620F / 2	R-1 Program Element (Number/Name) PE 1206601SF / <i>Space Technology</i>	Project (Number/Name) 628809 / <i>Spacecraft Vehicle Technologies</i>
---	--	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Not applicable			
<p>Title: Space Communication Technologies</p> <p>Description: Develop technologies for next-generation space communications terminals and equipment and methods/techniques to enable future space system operational command and control concepts.</p> <p>FY 2020 Plans: For 2020 and prior, this work is performed under the Space Communication Technologies effort in Appropriation 3600, Budget Activity (BA) 02, PE 1206601F, Space Technology, Project 628809, Spacecraft Vehicle Technologies.</p> <p>FY 2021 Plans: Support W/V-band payload operations, telemetry analysis, and health and status monitoring. Conduct development and technology demonstrations to address future military satellite communications capability and technology needs, for example, high-gain antenna, high-power amplifiers, low-noise amplifiers, cognitive / resilient networks, reconfigurable satellite radios / transponders, and anti-jam signal processing technologies. Support development and demonstration of novel laser communications technologies such as multi-wave length optical routers. Develop network traffic models, multi-spacecraft network models, and spacecraft network simulation support, along with analysis/visualization tools to aid.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Not applicable</p>	0.000	0.000	6.682
Accomplishments/Planned Programs Subtotals	0.000	0.000	47.632

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 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1203164SF / NAVSTAR Global Positioning System (User Equipment) (SPACE)
---	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	390.704	0.000	390.704	340.178	283.663	212.735	54.066	27.578	1,308.924
643833: <i>MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP</i>	0.000	0.000	0.000	390.704	0.000	390.704	340.178	283.663	212.735	54.066	27.578	1,308.924
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

Program MDAP/MAIS Code: 447

A. Mission Description and Budget Item Justification

Note: "NAVSTAR" will be removed from the program title in this Budget Line Item in the next budget submission.

In FY 2021, PE 1203164F, NAVSTAR Global Positioning System (User Equipment) (SPACE) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203164SF, NAVSTAR Global Positioning System (User Equipment) (SPACE) from Appropriation 3600, Budget Activity 04 due to the creation of a new Appropriation for Space Force.

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

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

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1203164SF / <i>NAVSTAR Global Positioning System (User Equipment) (SPACE)</i>
---	--

Strategy to include designation of two Middle Tier Acquisition Rapid Prototype efforts: 1) Miniature Serial Interface (MSI) Receiver Cards to include next-generation Application Specific Integrated Circuit (ASIC) and 2) Joint, Modernized Handheld Receiver.

The FY 2021 funding request was reduced by \$2.381 million to account for the availability of prior year execution balances.

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

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

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

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	390.704	0.000	390.704
Total Adjustments	0.000	0.000	390.704	0.000	390.704
• 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	390.704	0.000	390.704

Change Summary Explanation

FY 2021: +\$390.704M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force; this total includes a \$232.946M increase to fully fund MGUE Inc. 2.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: MGUE Inc 1	0.000	0.000	35.933

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)		R-1 Program Element (Number/Name) PE 1203164SF I NAVSTAR Global Positioning System (User Equipment) (SPACE)		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Description: The MGUE Inc 1 program develops standard modernized receiver form factors for the Service-nominated lead platforms in accordance with the MGUE Inc 1 CDD.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Support completion of the following: Lead Platform Integration, and Card level PEO Certification for Operational Test and Evaluation (OT&E). Continue to assist each lead platform office in integrating and testing M-Code receivers in their respective platforms. Continue Verification Testing, Qualification Testing, Technical Requirements Verification for all 5 MGUE cards. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
<p>Title: Advanced Technology</p> <p>Description: Advanced Technology includes efforts to mature technology for future GPS receivers called out in the MGUE CDDs. These efforts aim to find innovative solutions to increase resiliency in GPS performance and improve on size, weight, power, and cost (SWAP/C) of military receivers.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue developing new technologies to increase the robustness and resilience of GPS receiver / PNT system solutions. Start integration of the next-generation GPS security solution into a software defined radio to verify functionality, programmability/ flexibility, and certifiability. Progress the Military Underwater Navigation System to CDR and begin the planning process M-Code implementation. Advance the integrated antenna, antenna electronics and M-Code capability to PDR. Start working with platforms for integration / test planning and potential transition opportunities. Implement and test advanced trust / integrity algorithms that might permit military use of other GNSS signals for delivering assured PNT.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>		0.000	0.000	5.000
<p>Title: System/Platform Integration and Performance Certification</p>		0.000	0.000	27.109

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 1203164SF / NAVSTAR <i>Global Positioning System (User Equipment) (SPACE)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Description: Integration of MGUE Inc 1 receiver form factors into the Service-nominated lead platforms in support of developmental and operational test events. Conduct technical and operational modernization impact analysis for MGUE Service lead platform integration.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Complete developmental test of the ground-based and aviation/maritime lead platform efforts. Continue lead platform integration efforts in support of operational test events. Assist DoD integration of M-Code GPS receivers for joint Service non-lead platforms.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
<p>Title: Information Assurance, Security/Compatibility Certification, and Test/Evaluation</p> <p>Description: Develop, implement, and maintain GPS security certification programs. Development of DoD Policy, strategy and resource requirements for MGUE security certification and compatibility certification. Security certification, compatibility certification, and security approval ensures future military GPS receivers protect critical program information and continue working in all environments and concepts of operations called for by U.S. Strategic Command.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue to conduct security certification activities for all M-Code receivers, as required. Continue modernized security evaluations/tests for Selective Availability Anti-Spoofing Module (SAASM) and other legacy GPS receiver equipment. Review, approve, and track SAASM, M-Code receivers, and legacy receiver certified platforms and integrated applications for all of DoD. Continue to conduct delta certifications, as required. For the Ground Base-GPS Receiver Application Module - Military Code (GB-GRAM-M) and the GPS Receiver Application Module-Standard Electronic Module/M-Code (GRAM-S/M) complete verification testing for all remaining MGUE Inc 1 cards. Continue requirements verification and reliability test activities as required to include approved engineering changes. Continue Lead Platform Integration Test and Operational Test (OT) activities for MGUE and Lead Platform vendors.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>		0.000	0.000	5.820
<p>Title: MGUE Inc 2 Risk Reduction</p>		0.000	0.000	100.919

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)		R-1 Program Element (Number/Name) PE 1203164SF I NAVSTAR Global Positioning System (User Equipment) (SPACE)		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Description: The MGUE Inc 2 program will develop M-Code receiver technology for additional applications (space receivers, precision guided munitions, and handheld receivers) to meet Service requirements. MGUE Inc 2 Risk Reduction activities include, but are not limited to, acquisition strategy development, early design efforts through Preliminary Design Review (PDR) for the next generation ASIC using 14nm ASIC technology node, handheld design activities and early user demonstrations, advanced concept studies, receiver component prototyping to include MGUE Inc 2 requirements.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Complete ASIC PDR on three independent contractor designs. Continue M-Code Handheld risk reduction activities, to include prototype demonstrations. Award additional Handheld risk reduction activities to address challenging Increment 2 performance requirements, improve user functionality, and reduce unit cost. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
<p>Title: MGUE Inc 2 Miniature Serial Interface (MSI) Receiver Card Rapid Prototyping</p> <p>Description: The MGUE Inc 2 program will develop M-Code receiver technology for additional applications (space receivers, precision guided munitions, and handheld receivers) to meet Service requirements. MGUE Inc 2 MSI Receiver Card Rapid prototyping builds on the ASIC post-PDR progress and will develop, integrate, produce, and test M-Code capable, low size & power GPS MSI form factor to include a Next Generation (Gen) ASIC. The MSI receiver card is to meet the needs of low size, weight and power (SWaP) ground-embedded users. However, The Next Gen ASIC must meet the needs of the MSI form factor and be backwards compatible with Inc 1 performance requirements as a potential functional replacement due to Inc 1 ASIC obsolescence. MGUE Inc 2 MSI Receiver Card Rapid Prototyping has been broken out into a separate major thrust for additional visibility.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Award up to 3 development contract(s) for new low size/power MSI receiver card to include next generation ASIC post PDR and integration activities. Continue to secure core ASIC technology, and begin early ASIC fabrication and manufacturing activities,</p>		0.000	0.000	215.923

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)	R-1 Program Element (Number/Name) PE 1203164SF I NAVSTAR Global Positioning System (User Equipment) (SPACE)
--	---

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
and Intellectual Property. Continue ASIC technology design/ manufacturing/test activities. Continue security certification and design activities; procure test equipment and articles. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	390.704

D. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• SPSF 01 GPSSPC: <i>Navstar GPS Space</i>	-	-	2.256	-	2.256	2.303	2.346	2.405	2.450	0.000	11.760

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

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

The MGUE program awarded three sole source contracts for the Inc 1 Technology Development Phase effort in September 2012, as follow-on efforts to the competitively awarded Modernized User Equipment (MUE) contracts awarded in June 2006. The effort spans the Technology Maturation and Risk Reduction Phase through design and includes integration and test of M-Code receivers into Service-nominated lead platforms. This effort also includes the security and compatibility certification of GPS receiver cards as a part of the integration effort. The Service lead platforms will select from the available vendors to integrate and perform operational testing with funding from the MGUE program. This supports compliance with PL 111-383, section 913.

The MGUE Inc 2 program developed an Acquisition Strategy to continue MGUE development by: addressing long term producibility of MGUE ASICs, identifying a U.S. owned trusted foundry for ASIC development, delivering GPS receiver cards to meet stringent Inc 2 requirements, and developing a modernized GPS handheld receiver to meet the needs of the Services. The MGUE Inc 2 program is being executed in three parts: 1) Risk Reduction Activities, 2) MSI Middle Tier Acquisition rapid prototyping, and 3) Joint Modernized GPS Handheld Receiver Middle Tier Acquisition rapid prototyping effort. The Air Force Service Acquisition Executive approved the

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity	R-1 Program Element (Number/Name)
3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	PE 1203164SF / <i>NAVSTAR Global Positioning System (User Equipment) (SPACE)</i>

MGUE Inc 2 Acquisition Strategy to include designation of two Middle Tier Acquisition Rapid Prototype efforts: 1) Miniature Serial Interface Receiver Card (includes next-generation ASIC) and 2) Joint, Modernized Handheld Receiver.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force											Date: February 2020				
Appropriation/Budget Activity 3620F / 4				R-1 Program Element (Number/Name) PE 1203164SF / NAVSTAR Global Positioning System (User Equipment) (SPACE)				Project (Number/Name) 643833 / MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP							

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
MGUE Inc 1 Technology Development (1)	C/CPIF	Collins Aerospace : Cedar Rapids, IA	-	-		-		2.889	Nov 2020	-		2.889	0.000	2.889	167.971
MGUE Inc 1 Technology Development (2)	C/CPIF	Raytheon : El Segundo, CA	-	-		-		2.616	Nov 2020	-		2.616	2.616	5.232	211.320
MGUE Inc 1 Technology Development (3)	C/CPIF	L3 Harris Tech : Anaheim, CA	-	-		-		4.145	Nov 2020	-		4.145	0.000	4.145	120.189
MGUE Inc 1 Pre-Tech Development	C/CPAF	Various : Various	-	-		-		5.000	Jan 2021	-		5.000	0.500	5.500	-
MGUE Inc 1 Platform Integration	C/CPAF	Various : Various	-	-		-		8.219	Nov 2020	-		8.219	0.000	8.219	-
MGUE Inc 1 Information Assurance	C/CPAF	Various : Various	-	-		-		2.770	Jan 2021	-		2.770	2.840	5.610	-
MGUE Inc 1 Security Certification	C/CPAF	Various : Various	-	-		-		1.830	Jan 2021	-		1.830	1.870	3.700	-
MGUE Inc 1 Technical Mission Analysis	MIPR	Various : El Segundo, CA	-	-		-		14.987	Oct 2020	-		14.987	2.470	17.457	-
MGUE Inc 1 Enterprise SE&I	C/CPAF	SAIC : El Segundo, CA	-	-		-		18.890	Nov 2020	-		18.890	0.000	18.890	132.525
MGUE Inc 2 Risk Reduction	Various	Various : Various	-	-		-		95.292	Jan 2021	-		95.292	204.261	299.553	1,013.400
MGUE Inc 2 MSI Receiver Card Rapid Prototyping	TBD	TBD : TBD	-	-		-		202.923	Dec 2020	-		202.923	584.233	787.156	992.167
MGUE Inc 2 Technical Mission Analysis	MIPR	Various : El Segundo, CA	-	-		-		4.870	Jan 2021	-		4.870	34.646	39.516	-
MGUE Inc 2 Enterprise SE&I	C/CPAF	SAIC : El Segundo, CA	-	-		-		4.357	Jan 2021	-		4.357	15.388	19.745	97.300
Subtotal			-	-		-		368.788		-		368.788	848.824	1,217.612	N/A

Remarks
L3 Technologies and Harris Corp completed their merger, new company is now L3 Harris Technologies.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1203164SF / NAVSTAR Global Positioning System (User Equipment) (SPACE)	Project (Number/Name) 643833 / MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP
---	---	---

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
MGUE Inc 1 Test and Evaluation	Various	Various : San Diego, CA	-	-		-		1.220	Jan 2021	-		1.220	0.000	1.220	-
MGUE Inc 2 Test and Evaluation	Various	Various : San Diego, CA	-	-		-		1.540	Jan 2021	-		1.540	16.769	18.309	-
Subtotal			-	-		-		2.760		-		2.760	16.769	19.529	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
MGUE Inc 1 FFRDC	Various	Aerospace/MITRE : Various	-	-		-		5.642	Dec 2020	-		5.642	0.000	5.642	-
MGUE Inc 2 FFRDC	Various	Aerospace/MITRE : Various	-	-		-		2.160	Dec 2020	-		2.160	14.848	17.008	-
MGUE Inc 1 A&AS	Various	Various : Various	-	-		-		5.414	Dec 2020	-		5.414	1.140	6.554	-
MGUE Inc 2 A&AS	Various	Various : Various	-	-		-		5.700	Dec 2020	-		5.700	35.789	41.489	-
MGUE Inc 1 and Inc 2 Other Support	Various	Various : Various	-	-		-		0.240	Dec 2020	-		0.240	0.850	1.090	-
Subtotal			-	-		-		19.156		-		19.156	52.627	71.783	N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals		-	-	0.000	390.704	-	390.704	918.220	1,308.924	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1203164SF / NAVSTAR Global Positioning System (User Equipment) (SPACE)	Project (Number/Name) 643833 / MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP

FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

MGUE Increment 1	
MGUE Inc 1 Developmental Test	
MGUE Inc 1 All Lead Platforms Operational Test	
MGUE Increment 2	
MGUE Inc 2 Next-Gen ASIC Studies up to PDR	
MGUE Inc 2 Handheld Risk Reduction Activities/Prototypes	
MGUE Inc 2 MSI Receiver Card w/ Next Gen ASIC Rapid Prototyping	
MGUE Inc 2 Modernized Handheld Receiver	

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1203164SF / NAVSTAR Global Positioning System (User Equipment) (SPACE)	Project (Number/Name) 643833 / MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
MGUE Increment 1				
MGUE Inc 1 Developmental Test	1	2021	3	2022
MGUE Inc 1 All Lead Platforms Operational Test	1	2021	2	2022
MGUE Increment 2				
MGUE Inc 2 Next-Gen ASIC Studies up to PDR	1	2021	3	2021
MGUE Inc 2 Handheld Risk Reduction Activities/Prototypes	1	2021	2	2023
MGUE Inc 2 MSI Receiver Card w/ Next Gen ASIC Rapid Prototyping	1	2021	4	2025
MGUE Inc 2 Modernized Handheld Receiver	2	2023	4	2025

Note

All 5 form factors will go through some form of Developmental Test. Per the MGUE Inc 1 Acq Strategy however, only the first card of each variant (GB-GRAM-M/GRAM-S/M) will go through formal Operational Test. OT could/would complete on the "first card" while other form factors continue to go through DT.

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)	R-1 Program Element (Number/Name) PE 1203710SF I EO/IR Weather Systems
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	131.000	0.000	131.000	174.000	132.000	94.000	77.000	Continuing	Continuing
643730: EO/IR Weather System Dev	-	0.000	0.000	131.000	0.000	131.000	174.000	132.000	94.000	77.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203710F, EO/IR Weather Systems efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203710SF, EO/IR Weather Systems from Appropriation 3600, Budget Activity 04 due to the creation of a new Appropriation for Space Force.

In compliance with 2016 National Defense Authorization Act (NDAA) and Joint Requirements Oversight Council (JROC) Memo 062-17, dated 20 Jun 2017, the Air Force has decided to pursue a materiel solution to address Space-based Environmental Monitoring (SBEM) weather Gap 1 - Cloud Characterization (CC) and Gap 2 - Theater Weather Imagery (TWI) as a follow-on to Defense Meteorological Satellite Program (DMSP) operational constellation. The Department of Defense (DoD) requires continued global collection of CC and TWI data to contribute to the space domain awareness. Without the CC and TWI data, AF production of global predictive weather data would be severely impacted, affecting daily air operations and intelligence gathering for strategic mission planning, especially around the contested environment.

Electro-Optical/Infrared (EO/IR) Weather Systems (EWS) is a component of JROC-approved SBEM materiel solutions specifically designed to address CC and TWI needs post-DMSP mission end of life.

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

- 1) Explore low-Size, Weight & Power/simplified EO/IR sensor designs in highly competitive design sprints, utilizing variety of experimental/prototyping contract vehicles
- 2) Conduct system technology end-to-end demonstrations, from prototype build, Integration & Test, Launch, ground Telemetry/Tracking & Commanding (TT&C) and on-orbit data collection to data processing and dissemination to the Weather Centrals
- 3) Explore business models for the feasibility of commercially available data.

In addition, the program may integrate sensors into a commercial & Government communication transport layer, leveraging web services to ensure delivery of data products to end users.

Secondary investments may be supported to address weather gaps identified in the SBEM Analysis of Alternatives and validated by the JROC.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1203710SF / <i>EO/IR Weather Systems</i>
---	---

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

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

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

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	131.000	0.000	131.000
Total Adjustments	0.000	0.000	131.000	0.000	131.000
• 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	131.000	0.000	131.000

Change Summary Explanation

FY 2021: \$131.000M transferred from RDT&E, Air Force to RDT&E Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: Electro-Optical/Infrared Weather System (EWS)	0.000	0.000	131.000
Description: EWS will pursue multi-phase efforts utilizing rapid experimental/prototype contract vehicles to mature industry EO/IR technologies to provide global LEO coverage to meet SBEM Gaps 1 (CC) and 2 (TWI) and eventual on-ramp to operational EO/IR system to replace DMSP constellation. Space Enterprise Consortium (SpEC) Other Transaction (OT) #1 is the prototyping effort, which will focus on maturing multi-spectral imaging capabilities to collect & disseminate terrestrial atmospheric phenomena to support DoD operations, while assessing industrial capabilities to provide CC and TWI data in a viable commercial business			

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)	R-1 Program Element (Number/Name) PE 1203710SF I EO/IR Weather Systems
---	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
model. The program will pursue simplified sensor designs and corresponding lower size, weight and power prototypes potentially hosted on a proliferated LEO mesh network. To minimize risks associated with rapid prototyping effort to replace DMSP constellation, SpEC OT #2 will focus on further developing high maturity EO/IR system designs in competitive design sprints in a parallel path to SpEC OT #1. This path will provide viable on-ramp opportunity to field operational EO/IR system, should prototype demonstrations prove unsuccessful.			
FY 2020 Plans: N/A			
FY 2021 Plans: For EWS Phase II SpEC OT #1, continue prototype system build, integration test and preparation for launch. For SpEC OT #2, continue high-maturity sensor design sprints for the space vehicle, and associated ground development activities to support Preliminary Design Review (PDR). Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.			
FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	131.000

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• SPAF 01 SPCMOD: <i>Space Mods</i>	49.526	-	-	-	-	-	-	-	-	0.000	49.526

Remarks
 Reflects PE 1203710F EO/IR Weather Systems portion of shared P-1 line SPCMOD.

E. Acquisition Strategy
 The acquisition strategy for EWS is based on validated SBEM CASR recommendations, JROC Memoranda, and subsequent architectural analysis for future weather needs. EWS will initially pursue competitive bids to field technology demonstration EO/IR prototype system capable of fulfilling CC and TWI. Once technology demonstrations of the prototype system has proven successful, the EWS program will transition to fielding operational systems capable of meeting CC and TWI requirements.

Phase I will leverage ongoing experimental EO/IR prototype development projects under AFRL's SBIR contracts to understand operational utility of available and developing EO/IR sensors.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1203710SF / <i>EO/IR Weather Systems</i>
---	---

Phase II SpEC OT #1 will involve competitive bids for multiple system designs using SpEC OT contracts for rapid prototyping effort to fulfill CC and TWI requirements, while exploring valid commercial business models for industry to provide weather data as a service.

In order to minimize risks to DMSF constellation coverage, the Space Force will also pursue SpEC OT #2 for risk mitigation, pursuing competitive bid on low- risk, high-maturity system-level solutions in a parallel effort to the prototyping effort, that can fully address CC and TWI requirements as part of the Family of Systems comprised of civil and International partnerships. This risk mitigation option will carry two vendors to PDR level design and include assessment of prototype system performance and potential for transition to operations.

Following the acquisition strategy approval and assessment of the simplified sensors' performance with the SF weather mission, the SF plans to assess costs to ramp production in future phase III to reduce revisit time to maximize warfighter utility.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1203710SF / EO/IR Weather Systems	Project (Number/Name) 643730 / EO/IR Weather System Dev
---	--	---

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Phase II Risk Mitigation System	C/CPAF	TBD : TBD	-	-	-	-		27.300	Dec 2020	-		27.300	Continuing	Continuing	-
Phase II	C/CPAF	TBD : TBD	-	-	-	-		79.400	Dec 2020	-		79.400	Continuing	Continuing	-
Phase III to IOC	C/CPAF	TBD : TBD	-	-	-	-		0.300	Mar 2021	-		0.300	Continuing	Continuing	-
Technical Mission Analysis	RO	Aerospace Corp : El Segundo, CA	-	-	-	-		11.000	Nov 2020	-		11.000	Continuing	Continuing	-
Enterprise Systems Engineering & Integration	C/CPIF	Engility Corp : Andover, MA	-	-	-	-		2.000	Nov 2020	-		2.000	Continuing	Continuing	-
Subtotal			-	-	-	-		120.000		-		120.000	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FFRDC	RO	Aerospace Corp : El Segundo, CA	-	-	-	-		4.800	Nov 2020	-		4.800	0.000	4.800	-
A&AS	Various	Various : Various	-	-	-	-		3.700	Nov 2020	-		3.700	0.000	3.700	-
Other Support	Various	Various : Various	-	-	-	-		2.500	Jun 2021	-		2.500	0.000	2.500	-
Subtotal			-	-	-	-		11.000		-		11.000	0.000	11.000	N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-	0.000	131.000	-	131.000	Continuing	Continuing	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1203710SF / <i>EO/IR Weather Systems</i>	Project (Number/Name) 643730 / <i>EO/IR Weather System Dev</i>
---	---	--

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<i>EO/IR Weather Systems (EWS)</i>																												
EWS Phase II SpEC OT #1 System Prototype Build																												
EWS Phase II SpEC OT #1 System Prototype Launch																												
EWS Phase II SpEC OT #1 System Prototype Demonstration																												
EWS Phase II SpEC OT #2 Risk Mitigation System PDR Design																												
EWS Phase III to IOC																												

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1203710SF / <i>EO/IR Weather Systems</i>	Project (Number/Name) 643730 / <i>EO/IR Weather System Dev</i>
---	---	--

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>EO/IR Weather Systems (EWS)</i>				
EWS Phase II SpEC OT #1 System Prototype Build	1	2021	3	2022
EWS Phase II SpEC OT #1 System Prototype Launch	4	2022	4	2022
EWS Phase II SpEC OT #1 System Prototype Demonstration	4	2022	4	2025
EWS Phase II SpEC OT #2 Risk Mitigation System PDR Design	1	2021	3	2021
EWS Phase III to IOC	2	2021	4	2025

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206422SF / <i>Weather System Follow-on</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	83.384	0.000	83.384	62.284	58.817	68.018	22.897	297.300	592.700
644289: <i>Weather System Follow-On</i>	0.000	0.000	0.000	83.384	0.000	83.384	62.284	58.817	68.018	22.897	297.300	592.700
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

Program MDAP/MAIS Code: 488

A. Mission Description and Budget Item Justification

Based on completion of the Space-Based Environmental Monitoring (SBEM) Joint Requirements Oversight Council (JROC) Memo 092-14, capabilities will be developed to satisfy weather gaps for which no known mitigation exists. Weather System Follow-on (WSF) is a component of SBEM efforts to develop capabilities to satisfy weather Gap 3 Ocean Surface Vector Winds (OSVW), Gap 8 Tropical Cyclone Intensity (TCI), and Gap 11 Low Earth Orbit (LEO) Energetic Charged Particles (LEO ECP). Gap 3 OSVW and Gap 8 TCI require a space-based microwave sensor to provide polarimetric ocean surface wind direction and speed required for naval sea operations, as well as fighter sortie generations and marine amphibious operations. Gap 11 LEO ECP requires in situ ECP sensor for space situational awareness. The earliest possible launch options are being integrated in the design for critical gaps.

DoD established WSF as a Pre-Major Defense Acquisition Program (MDAP) with the Space Force as the lead component. Based on the SBEM AoA results, the WSF initial thrusts will be to enable:

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

Secondary investments may be supported to address weather gaps identified in the SBEM AoA and validated by the JROC.

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

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206422SF / <i>Weather System Follow-on</i>
---	--

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

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	83.384	0.000	83.384
Total Adjustments	0.000	0.000	83.384	0.000	83.384
• 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	83.384	0.000	83.384

Change Summary Explanation

FY 2021: +\$83.384M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force; total includes a \$28.654M increase to fund WSF-M to Service Cost Position.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Title: WSF Microwave Satellite (SV1-2)</p> <p>Description: WSF Microwave Satellite (SV1-2): The Space Force awarded a contract to Ball Aerospace and Technologies Corp. to develop the WSF - Microwave (WSF-M) Space Vehicle (SV) to meet all three capability gaps. WSF-M SV-2 will be an option to exercise, should SF wish to replenish WSF constellation post-SV-1. SV-2 will be functionally equivalent to SV-1. The WSF-M SV-1 projected Initial Launch Capability (ILC) is FY 2024. Secondary investments may be supported to address weather gaps identified in the SBEM AoA and validated by the JROC.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Complete Microwave Imaging (MWI) flight payload Integration & Test (I&T). Initiate SV-1 I&T to accommodate the MWI flight payload and ECP sensor. Continue WSF-M Ground Segment Development to include, but not limited to Command and Control System Mission Unique Software (MUS) to operate the WSF-M SV. Rapidly respond to implement system resiliency and</p>	0.000	0.000	79.846

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 1206422SF / <i>Weather System Follow-on</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, technology maturation, etc.				
FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: COWVR Tech Demo		0.000	0.000	1.494
Description: The Compact Ocean Surface Wind Vector Radiometer (COWVR) launch objective supports Category A Weather Requirements, as codified in JROC Memo 092-014, providing on-orbit technology demonstration of the new COWVR technology to deliver Weather Gap #3, Ocean Surface Vector Winds (OSVW) and Gap #8, Tropical Cyclone Intensity (TCI). This will be a cooperative mission with NASA for integrating the sensor onto the International Space Station (ISS) as a weather technology demonstration project. The new mission designation for the COWVR launch will be Space Test Program Houston Mission #8 (STP-H8). Demonstrating COWVR technology in the space environment remains an important milestone for the microwave data weather mission in lieu of the ORS-6 cancellation. Unlike ORS-6, COVWR will fly on the ISS and the residual operational capability is not guaranteed as a result. Due to this restructure, the projected COWVR launch will be delayed from FY 2019 to FY 2021.				
FY 2020 Plans: N/A				
FY 2021 Plans: Complete launch preparations for STP-H8 mission; launch STP-H8 mission onto International Space Station; integrate COWVR onto International Space Station; checkout COWVR sensor and initiate sensor data calibration/validation. This funding includes but is not limited to payload interface unit, associated electronics, integration, system and environmental testing, launch, and ground operations establishment.				
FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: ECP		0.000	0.000	2.044
Description: Energetic Charged Particles (ECP) will fulfill the Space-based Environmental Monitoring (SBEM) Weather Gap 11 and address the Secretary of the Air Force (SECAF) policy which directs each USSF Satellite Office to plan for and integrate ECP sensors on all pre-Milestone B new satellite acquisitions. To accomplish this requirement, the ECP sensor will be integrated on the WSF-M satellite.				
FY 2020 Plans:				

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206422SF / <i>Weather System Follow-on</i>
---	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
N/A			
<i>FY 2021 Plans:</i> Continue support to the WSF-M prime contractor for design reviews. Complete the WSF-M ECP sensor development. Fabricate and test a CEASE 3 engineering design unit. Support integration of ECP data processing software into the WSF-M ground segment. Fabricate and test ECP flight unit, put flight unit in storage until delivery to the prime contractor for integration onto WSF-M SV-1.			
<i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	83.384

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

N/A

Remarks

E. Acquisition Strategy

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

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

The program awarded a contract for WSF satellite, capable of meeting all three weather capability gaps, in a full and open competition environment, in order to reduce overall program cost. The Space Force is procuring one WSF-M satellite with an option for a second satellite. WSF-M first satellite (SV-1) ILC is FY 2024 to mitigate any potential weather coverage gaps. WSF-M SV-2 ILC is currently projected for FY 2028. The WSF SV-2 will be functionally equivalent to SV-1. Naval Research Lab Blossom Point Tracking Facility (BPTF) will be used as a viable unclassified EGS-compatible SOC for WSF-M. BPTF consists of a satellite mission operations center, multiple ground antennas including via SFSCN, and an existing infrastructure capable of providing space system command, control, and communications (C3).

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity
3620F: *Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)*

R-1 Program Element (Number/Name)
PE 1206422SF / *Weather System Follow-on*

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

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206422SF / <i>Weather System Follow-on</i>	Project (Number/Name) 644289 / <i>Weather System Follow-On</i>
---	--	--

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
COWVR Technology Demonstration	Various	Various : Various	-	-		-		1.494	Apr 2021	-		1.494	0.000	1.494	-
WSF Microwave System (SV1-2)	C/FFP	Ball Aerospace : Boulder, CO	-	-		-		60.020	Nov 2020	-		60.020	Continuing	Continuing	-
ECP	Various	Various : Various, NM	-	-		-		2.044	Jan 2021	-		2.044	Continuing	Continuing	-
Enterprise Systems Engineering & Integration	C/CPIF	Engility Corp. : Andover, MA	-	-		-		3.282	Nov 2020	-		3.282	Continuing	Continuing	-
Technical Mission Analysis	RO	Aerospace Corp : El Segundo, CA	-	-		-		5.298	Oct 2020	-		5.298	Continuing	Continuing	-
Ground	MIPR	NRL : Welcome, MD	-	-		-		4.461	Dec 2020	-		4.461	0.000	4.461	-
Subtotal			-	-		-		76.599		-		76.599	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FFRDC	RO	Aerospace Corp : El Segundo, CA	-	-		-		3.929	Nov 2020	-		3.929	Continuing	Continuing	-
Other Support	Various	Various : Various	-	-		-		1.312	Nov 2020	-		1.312	Continuing	Continuing	-
A&AS	Various	Various : Various	-	-		-		1.544	Nov 2020	-		1.544	Continuing	Continuing	-
Subtotal			-	-		-		6.785		-		6.785	Continuing	Continuing	N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals		-	-	0.000	83.384	-	83.384	Continuing	Continuing	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206422SF / <i>Weather System Follow-on</i>	Project (Number/Name) 644289 / <i>Weather System Follow-On</i>
---	--	--

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<i>Weather System Follow-On</i>																												
COWVR Technology Demonstration I&T																												
COWVR Technology Demonstration Launch Ops																												
COWVR Technology Demonstration On-Orbit Operations																												
WSF SV-1 Production																												
WSF Microwave Imaging Integration and Test																												
WSF Microwave Ground Segment Development																												
WSF Microwave ECP Sensor Complete																												
WSF Microwave SV-1 Integration and Test																												
WSF Microwave Ground Integration and Test																												
WSF SV-2 Production																												
WSF Microwave SV-1 Initial Launch Capability																												
WSF Microwave Initial Operational Capability																												

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206422SF / <i>Weather System Follow-on</i>	Project (Number/Name) 644289 / <i>Weather System Follow-On</i>
---	--	--

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Weather System Follow-On</i>				
COWVR Technology Demonstration I&T	1	2021	2	2021
COWVR Technology Demonstration Launch Ops	2	2021	2	2021
COWVR Technology Demonstration On-Orbit Operations	2	2021	2	2024
WSF SV-1 Production	1	2021	1	2022
WSF Microwave Imaging Integration and Test	1	2021	4	2021
WSF Microwave Ground Segment Development	1	2021	3	2022
WSF Microwave ECP Sensor Complete	2	2022	2	2022
WSF Microwave SV-1 Integration and Test	3	2021	4	2022
WSF Microwave Ground Integration and Test	3	2022	3	2023
WSF SV-2 Production	1	2023	4	2024
WSF Microwave SV-1 Initial Launch Capability	2	2023	2	2024
WSF Microwave Initial Operational Capability	3	2023	4	2024

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206425SF / <i>Space Situation Awareness Systems</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	33.359	0.000	33.359	141.296	256.602	295.338	200.423	Continuing	Continuing
640290: <i>Deep Space Advanced Radar Concept</i>	-	0.000	0.000	33.359	0.000	33.359	141.296	256.602	295.338	200.423	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206425F, Space Situation Awareness Systems, Project 640290, Deep Space Advanced Radar Concept efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206425SF Space Situation Awareness Systems, Project 640290, Deep Space Advanced Radar Concept from Appropriation 3600, Budget Activity 04 due to the creation of a new Appropriation for Space Force.

Deep Space Advanced Radar Concept (DARC) will leverage ongoing defense science and technology efforts to mature radar concepts and technologies to develop and evaluate prototypes that demonstrate increased sensitivity, capacity, search rates, and scalability to detect, track and maintain custody of objects in deep space orbit. This effort will analyze and select the most promising technologies to move forward into system development and operations and a program of record (PoR). DARC will augment the Space Surveillance Network (SSN) as an additional sensor with increased capacity and capability for deep space object custody at Geosynchronous Earth Orbit (GEO).

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

This program element may include necessary civilian pay expenses required to manage, execute, and deliver the weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 120639S2F and 1206398SF.

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force / BA 4: Advanced Component Development & Prototypes (ACD&P)	R-1 Program Element (Number/Name) PE 1206425SF / Space Situation Awareness Systems
---	--

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	33.359	0.000	33.359
Total Adjustments	0.000	0.000	33.359	0.000	33.359
• 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	33.359	0.000	33.359

Change Summary Explanation

FY 2021: +\$33.359M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Title: DARC Site 1 Operational Capability</p> <p>Description: The Deep Space Advance Radar Capability Middle Tier Acquisition (MTA) activity will use knowledge gained through the Deep Space Advanced Radar Concept technology demonstration to identify system specifications and a Government Reference Architecture (GRA). The specification and GRA will then support a competition for a global Deep Space Capability system. This MTA activity will use market research and a Government Reference Architecture developed previously to provide the knowledge to determine the acquisition approach through further prototyping and/or rapid acquisition.</p> <p>The MTA activity will develop, test, and deliver three radar sites located strategically around the world to provide a global Deep Space Radar Capability to support Space Situational Awareness (SSA). The system will be responsive to regularly scheduled and un-scheduled tasks to locate, identify, characterize deep space objects and report the results to the SSN and Battle Management Command and Control locations.</p> <p>Leverage ongoing DARC Technology Maturation and Prototype Development efforts and defense science and technology efforts to initiate PoR for the DARC global radar capability. Supports standup of the DARC program office, award of contract for the DARC global radar capability, and completion of the engineering, manufacturing, and development of the first site through Critical Design Review (CDR).</p> <p>FY 2020 Plans:</p>	0.000	0.000	33.359

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 1206425SF / <i>Space Situation Awareness Systems</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
N/A				
FY 2021 Plans: Finalize and release RFP for PoR and conduct source selection. Award contract for Site 1 to design, build, and prepare for Preliminary Design Review (PDR) & CDR to support the build of an operational system. Identify and order long lead hardware items. Rapidly respond and implement system resiliency and situational awareness necessary to operate in the contested space domain. RDT&E funding is required to support this transformation and enable Space Superiority end-to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events.				
FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Accomplishments/Planned Programs Subtotals		0.000	0.000	33.359
D. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
E. Acquisition Strategy				
Project utilizes existing DoD engineering and study contracts and activities to conduct science and technology development and data analysis activities. Preliminary/critical design effort for the technology maturation and prototype commenced in FY 2017. A Broad Agency Announcement (BAA) was used to award seven Integrated System Engineering Team (ISET) contracts which allow for organizations to participate, advise the government, and gain insight into the prototype design and build. In May of 2019 DARC was designated as an Middle Tier Acquisition under Section 804 of the 2016 National Defense Authorization Act (NDAA). DARC PoR will be a full and open industry competition combining both University Affiliated Research Centers (UARC) and industry. The PoR will consist of three global, incrementally fielded, and simultaneously constructed sites during the years FY 2023 through FY 2025.				

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force												Date: February 2020				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)								
3620F / 4				PE 1206425SF / Space Situation Awareness Systems				640290 / Deep Space Advanced Radar Concept								
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
DARC Site 1 Capability	TBD	TBD : TBD	-	-		-		24.245	Jul 2021	-		24.245	Continuing	Continuing	-	
Subtotal			-	-		-		24.245		-		24.245	Continuing	Continuing	N/A	
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Prototype System and Sustainment Analyses	PO	AFRL : Albuquerque, NM	-	-		-		0.150	Mar 2021	-		0.150	Continuing	Continuing	-	
Subtotal			-	-		-		0.150		-		0.150	Continuing	Continuing	N/A	
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
A&AS	Various	Various : Various	-	-		-		5.134	Jun 2021	-		5.134	Continuing	Continuing	-	
FFRDC	SS/FP	MITRE Corp : Colorado Springs, CO	-	-		-		3.730	Nov 2020	-		3.730	Continuing	Continuing	-	
Other Support	Various	Various : Colorado Springs, CO	-	-		-		0.100	Nov 2020	-		0.100	Continuing	Continuing	-	
Subtotal			-	-		-		8.964		-		8.964	Continuing	Continuing	N/A	
Project Cost Totals			-	-		0.000		33.359		-		33.359	Continuing	Continuing	N/A	
Remarks																

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force			Date: February 2020				
Appropriation/Budget Activity 3620F / 4		R-1 Program Element (Number/Name) PE 1206425SF / <i>Space Situation Awareness Systems</i>			Project (Number/Name) 640290 / <i>Deep Space Advanced Radar Concept</i>		

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
DARC																												
Prototype Build and Test																												
Operational Demonstrations																												
Develop Documentation and Request for Proposal																												
Request for Proposal Release																												
Source Selection																												
Contract Award																												
Site 1 Development																												
Site 2 Development																												
Site 3 Development																												

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206425SF / <i>Space Situation Awareness Systems</i>	Project (Number/Name) 640290 / <i>Deep Space Advanced Radar Concept</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
DARC				
Prototype Build and Test	1	2021	2	2021
Operational Demonstrations	1	2021	2	2021
Develop Documentation and Request for Proposal	1	2021	1	2021
Request for Proposal Release	2	2021	2	2021
Source Selection	2	2021	3	2021
Contract Award	4	2021	4	2021
Site 1 Development	1	2022	3	2024
Site 2 Development	1	2024	4	2025
Site 3 Development	1	2025	4	2025

Note

DARC Site 1 estimated completion date and Initial Operating Capability (IOC) is FY 2025.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206427SF / <i>Space Systems Prototype Transitions (SSPT)</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	142.808	0.000	142.808	100.265	77.559	76.041	52.898	Continuing	Continuing
645601: <i>Space System Prototype Transition</i>	-	0.000	0.000	142.808	0.000	142.808	100.265	77.559	76.041	52.898	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note
 Per FY 2016 National Defense Authorization Act, the Evolved Expendable Launch Vehicle (EELV) program was renamed National Security Space Launch (NSSL) program. In association with the NSSL name change direction, the Space Force has renamed the Long Duration Propulsive (EELV Secondary Payload Adapter (ESPA)) (LDPE) program to be the Rapid On-Orbit Space Technology Evaluation Ring (ROOSTER) program. Pre-existing LDPE-1, LDPE-2 and LDPE-3A mission names will remain unchanged.

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206427F, Space Systems Prototype Transitions (SSPT) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206427SF, Space Systems Prototype Transitions (SSPT) from Appropriation 3600, Budget Activity 04 due to the creation of a new Appropriation for Space Force.

\$8.787M is included in FY 2021 in the request for Appropriation 3600, Research, Development, Test & Evaluation, Air Force, PE 1206427F; these funds should have been requested under Appropriation 3620 Research, Development, Test & Evaluation, Space Force, PE 1206427SF. Justification and plans for these funds are included in RDT&E, AF, PE 1206427F, Space Systems Prototype Transitions (SSPT), R-1 Line #62.

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

Specifically the SSPT project will include a cost-effective framework to identify, mature and transition demonstrations and prototypes to:

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206427SF / <i>Space Systems Prototype Transitions (SSPT)</i>	
<p>- Focus S&T Innovation and facilitate its transition to military space programs of record</p> <p>This program includes efforts for Rapid On-Orbit Space Technology Evaluation Ring (ROOSTER), Tetra, Blackjack, and Quasi-Zenith Satellite System (QZSS)-Hosted Payload (HP):</p> <p>ROOSTER is designated to provide a flexible orbit capability to host and deploy numerous prototypes and payloads utilizing excess payload margin available on US Space Force Headquarters (USSF HQ) launch missions.</p> <p>Tetra will provide a training platform for operators to develop and demonstrate tactics, techniques and procedures for prototype missions. The experiment directly supports the evolution of U.S. space situational awareness and control.</p> <p>Blackjack is a joint technology demonstration project by DARPA and the Space Force to evaluate military utility and concepts of operation for a Proliferated Low Earth Orbit (P-LEO) satellite constellation. The project leverages industry innovation in commercial P-LEO concepts by integrating military payloads onboard commercial commoditized satellite vehicles, demonstrating onboard data processing and autonomous tasking, and transmitting encrypted data through a mesh network of satellites in LEO with the goals of augmenting existing warfighter capability, increasing national security space resiliency, and decreasing per-unit satellite costs.</p> <p>QZSS-HP is a "pacesetter" hosted payload that is a high priority for the U.S. and Japan, paving the way for future Allied collaborations. It enhances Geostationary Earth Orbit (GEO) Space Situational Awareness capabilities over the Eurasian theater and facilitates resilient capabilities in the Space Surveillance Network (SSN).</p> <p>Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.</p> <p>This program element may include necessary civilian pay expenses required to manage, execute, and deliver SSPT capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.</p> <p>This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.</p>		

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)	R-1 Program Element (Number/Name) PE 1206427SF I Space Systems Prototype Transitions (SSPT)
---	---

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	142.808	0.000	142.808
Total Adjustments	0.000	0.000	142.808	0.000	142.808
• 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	142.808	0.000	142.808

Change Summary Explanation

FY 2021: +\$142.808M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Title: Technology Maturation and Prototype Development</p> <p>Description: Plan, develop, test and transition advanced technologies into space system prototypes and capabilities to meet known and emerging threats. Conduct architecture studies, modeling and simulation, technical development, integration and test activities in preparation for transition of critical technologies into prototypes or space programs of record. Develop advanced capabilities for rapid prototyping and integration into space system programs of record and, if requested, to war-fighter Urgent Operational Needs (UONs) and Joint Urgent Operational Needs (JUONs).</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue prototype/technology developments across multiple mission areas, including but not limited to: - Tetra: Continue development of Tetra-3 and Tetra-4 prototypes to support experimentation and TTP development at GEO. Award the development of Tetra-5 prototype. - Blackjack: Continue technical analysis, design, development, test, integration and delivery of prototype, cyber, ground and data processing architecture as well as develop concepts of operations to support C2 system integration. - QZSS-HP development (International Cooperation): Continue design, development, build and test of two Hosted Payload Interface Unit and two SSA sensors for integration into two payloads intended for hosting on two Japanese Quasi-Zenith Satellites.</p>	0.000	0.000	36.011

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 1206427SF / <i>Space Systems Prototype Transitions (SSPT)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>- Pursue technology investment to support the space enterprise investment strategy; commercial and allied opportunities, cross-mission proliferated payloads and buses, C2 dynamic tasking, orbital maneuver, alternative orbits, dynamic communication networks, agile signal capable terminals and fighting Position, Navigation and Timing (PNT) and Satellite Communication (SATCOM), etc.</p> <p>- Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
<p>Title: Prototype Integration, Test and On-Orbit Prototype Demonstration</p> <p>Description: Provide rideshare opportunities for prototypes and experiments, fund mission-unique payload integration to the rideshare or launch system, and conduct launch base integration, testing and launch operations. Conduct prototype integration and testing into the designated Command and Control system and provide operational support to conduct prototype testing, demonstration and operations.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans:</p> <ul style="list-style-type: none"> - Tetra: Continue payload integration and testing support for Tetra-1 and Tetra-2. Perform on-orbit demonstrations, operations and provide reach back support for Tetra-1 and Tetra-2. Provide payload integration and testing for Tetra-3 and Tetra-4. - Blackjack: Conduct technical reviews, integration and testing of prototypes with launch vehicle in support of launch and on-orbit demonstrations. Begin integration of fully assembled and tested Blackjack satellites with launch vehicles, launch the first two satellites into LEO, and conduct early orbit testing and demonstration. - QZSS-HP development (International Cooperation): Continue conducting technical reviews, integration and testing of prototypes with launch vehicle in support of two launch and on-orbit demonstrations. <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>		0.000	0.000	62.420
<p>Title: Rapid On-Orbit Space Technology Evaluation Ring (ROOSTER)</p> <p>Description: LDPE has been renamed ROOSTER. It is not a new start as it was previously included in both Technology Maturation Prototype Development and the Prototype Integration, Test and On-Orbit Prototype Demonstration major thrusts.</p>		0.000	0.000	44.377

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206427SF / <i>Space Systems Prototype Transitions (SSPT)</i>
---	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>The ROOSTER bus, core, or ring provides a standard service for a wide variety of secondary payload options. It features 6 ports and accommodates ten to twelve fixed and/or separable prototype payloads. After the forward payload separates, the ROOSTER ring separates and propels to mission orbit which so far has been in GEO approximately 22,000 miles above the earth. The ROOSTER ring moves around GEO allowing payloads to be dropped off at different locations or remain hosted to the ring based on mission requirements.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans:</p> <ul style="list-style-type: none"> - LDPE-1: Complete payload integration, launch site planning and processing and ground development. Begin on-orbit operations. - LDPE-2: Begin on-orbit operations. - LDPE-3A: Continue payload integration, launch support, CONOPS and mission planning. Begin ground development. - ROOSTER: Begin design and assembly to support on-orbit technology demonstration and prototypes beyond LDPE-3A. Begin preparation for integration and testing of payload providers and pre-launch support. <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>			
Accomplishments/Planned Programs Subtotals	0.000	0.000	142.808

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

N/A

Remarks

E. Acquisition Strategy

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

In May 2019 the first three LDPE systems were awarded competitively. The LDPE Acquisition Strategy was amended to include the addition of LDPE-3A. LDPE-3A was justified to be awarded sole source as an option to the existing contract. The acquisition strategy for the follow-on effort to LDPE, called ROOSTER is in work, but expected to be competitively awarded.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206427SF / <i>Space Systems Prototype Transitions (SSPT)</i>	Project (Number/Name) 645601 / <i>Space System Prototype Transition</i>
---	--	---

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Tetra-1,2 & 3 Integration & On-Orbit Prototype Demonstration	C/FFP	Various : Various	-	-		-		5.729	Nov 2020	-		5.729	Continuing	Continuing	-
Tetra-3 & 4 Development	C/FFP	York Space Systems : Denver, CO	-	-		-		2.916	Nov 2020	-		2.916	Continuing	Continuing	-
Tetra-5 Development	TBD	TBD : TBD	-	-		-		7.783	Apr 2021	-		7.783	Continuing	Continuing	-
LDPE-1, 2 & 3A Launch Vehicle Integration & Ops	C/CPFF	Northrop Grumman Inno Sys : Dulles, VA	-	-		-		16.270	Feb 2021	-		16.270	Continuing	Continuing	-
LDPE-3A Development	SS/FFP	Northrop Grumman Inno Sys : Dulles, VA	-	-		-		10.000	Nov 2020	-		10.000	Continuing	Continuing	-
ROOSTER Development	TBD	TBD : TBD	-	-		-		15.000	Jan 2021	-		15.000	Continuing	Continuing	-
Blackjack Development	MIPR	Various : Various	-	-		-		11.248	Nov 2020	-		11.248	Continuing	Continuing	-
Blackjack Launch/Support Activities	MIPR	Various : Various	-	-		-		47.756	Nov 2020	-		47.756	Continuing	Continuing	-
QZSS-HP Development	Various	Various : Various	-	-		-		3.055	Nov 2020	-		3.055	Continuing	Continuing	-
QZSS-HP Launch Support Activities	Various	Various : Various	-	-		-		8.935	Nov 2020	-		8.935	Continuing	Continuing	-
Subtotal			-	-		-		128.692		-		128.692	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	RO	Various : Various	-	-		-		6.800	Jan 2021	-		6.800	Continuing	Continuing	-
A&AS	Various	Various : Various	-	-		-		6.846	Feb 2021	-		6.846	Continuing	Continuing	-
Other Support	Various	Various : El Segundo, CA	-	-		-		0.470	Oct 2020	-		0.470	Continuing	Continuing	-
Subtotal			-	-		-		14.116		-		14.116	Continuing	Continuing	N/A

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force							Date: February 2020				
Appropriation/Budget Activity 3620F / 4			R-1 Program Element (Number/Name) PE 1206427SF / <i>Space Systems Prototype Transitions (SSPT)</i>				Project (Number/Name) 645601 / <i>Space System Prototype Transition</i>				
	Prior Years	FY 2019	FY 2020		FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals	-	-	0.000		142.808	-	142.808	Continuing	Continuing	N/A	

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force			Date: February 2020		
Appropriation/Budget Activity 3620F / 4		R-1 Program Element (Number/Name) PE 1206427SF / <i>Space Systems Prototype Transitions (SSPT)</i>		Project (Number/Name) 645601 / <i>Space System Prototype Transition</i>	

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<i>Technology Maturation and Prototype Development</i>																												
Tetra-3 Development																												
Tetra-4 Development																												
Tetra-5 Development																												
LDPE-3A Development																												
ROOSTER Development																												
Blackjack Development																												
QZSS-HP: HPIU Development																												
QZSS-HP: SSA Development																												
Technology Maturation and Prototype																												
<i>Prototype Integration, Test and On-Orbit Prototype Demonstration</i>																												
Tetra-2, 3 & 4 Launch and On-Orbit Prototype Demonstration																												
LDPE-1, 2, 3A & ROOSTER Launch and On-Orbit Prototype Demonstration																												
Blackjack Launch/Support Activities																												
QZSS-HP: 1 & 2 Launch/Support Activities																												
Prototype Integration, Test and On-Orbit Prototype																												

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206427SF / <i>Space Systems Prototype Transitions (SSPT)</i>	Project (Number/Name) 645601 / <i>Space System Prototype Transition</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Technology Maturation and Prototype Development</i>				
Tetra-3 Development	1	2021	2	2021
Tetra-4 Development	1	2021	2	2022
Tetra-5 Development	3	2021	1	2023
LDPE-3A Development	1	2021	3	2021
ROOSTER Development	2	2021	2	2022
Blackjack Development	1	2021	3	2021
QZSS-HP: HPIU Development	1	2021	2	2022
QZSS-HP: SSA Development	1	2021	3	2022
Technology Maturation and Prototype	1	2021	4	2025
<i>Prototype Integration, Test and On-Orbit Prototype Demonstration</i>				
Tetra-2, 3 & 4 Launch and On-Orbit Prototype Demonstration	1	2021	2	2024
LDPE-1, 2, 3A & ROOSTER Launch and On-Orbit Prototype Demonstration	1	2021	2	2024
Blackjack Launch/Support Activities	4	2021	4	2022
QZSS-HP: 1 & 2 Launch/Support Activities	1	2021	3	2025
Prototype Integration, Test and On-Orbit Prototype	1	2021	4	2025

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206438SF / <i>Space Control Technology</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	35.575	0.000	35.575	33.339	33.763	34.347	34.898	Continuing	Continuing
642611: <i>Technology Insertion Planning and Analysis</i>	-	0.000	0.000	35.575	0.000	35.575	33.339	33.763	34.347	34.898	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206438F, Space Control Technology efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206438SF, Space Control Technology from Appropriation 3600, Budget Activity 04 due to the creation of a new Appropriation for Space Force.

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

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

Specific OCS activities include disruption, denial, or degradation (and associated Electronic Support) of adversary space systems which may be used for purposes hostile to U.S. national security interests. Rapid Reaction Capabilities in response to immediate warfighter needs in the Space Control mission area are developed within this program.

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

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206438SF / <i>Space Control Technology</i>
---	--

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

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	35.575	0.000	35.575
Total Adjustments	0.000	0.000	35.575	0.000	35.575
• 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	35.575	0.000	35.575

Change Summary Explanation

FY 2021: +\$35.575M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: Rapid Reaction Branch	0.000	0.000	22.169
Description: Develops advanced capabilities for rapid prototyping and integration into space control programs of record and, if requested, to warfighter Urgent Operational Needs (UONs) and Joint Urgent Operational Needs (JUONs). Conducts prototype capability development, testing, training and rapid transition of technology and techniques to space control systems. Sustains deployed quick reaction capabilities until transition to program of record or mission completion.			
FY 2020 Plans: N/A			
FY 2021 Plans: Develop, test, train, field, transition and sustain advanced rapid reaction capabilities in response to emergent requirements from multiple Combatant Commands. Conduct initial technical development and integration activities against relevant threat systems and technologies in preparation for operational requirements. Develop and test advanced prototypes in support of activities within the Space Control Technology portfolio. Finalize development/testing of urgent/emergent operational needs using Increment 4 GRA technologies. Based on technological advances relevant to the mission area, develop, integrate and evaluate next generation capabilities into GRA Increment 5. Integrate information assurance constructs and controls into developmental			

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 1206438SF / <i>Space Control Technology</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
platforms to expedite fielding. Execute field development & test activities, at all locations, to verify system performance in the operational environment. Enhance fielded rapid reaction capabilities in response to evolving threats and operator feedback. Rapidly respond and implement system resiliency and situational awareness necessary to operate in the contested space domain. RDT&E funding is required to support this transformation and enable Space Superiority end-to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/ combat range events. FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: Space Control Technology Prototype Development Description: Foundational architecture and prototype development will enable the integration, interoperability and compatibility of new Space Control Technology into space systems. Funds architecture requirements sensors and programs across the space domain and within the Space Control mission area to increase resilience capacity, horizontal integration and technology maturation. FY 2020 Plans: N/A FY 2021 Plans: Create and mature systems engineering models for space control scenarios, to include but not limited to Defensive Cyber Operations for Space and On-orbit Experimentation, and consolidate separate program artifacts into an interconnected virtual representation of the enterprise. Exercise those models to determine critical paths and nodes, timing requirements, risks, and opportunities. Define and perform various systems engineering functions, tools, procedures, and best practices to accelerate acquisition of successful and affordable space systems. Conduct end-of-life, IRON JAR/Wolfsat and Army joint experiments. Perform maturation and transition of new technology, and technology needs identification, prioritization, and solution development. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. FY 2020 to FY 2021 Increase/Decrease Statement: N/A		0.000	0.000	13.406
Accomplishments/Planned Programs Subtotals		0.000	0.000	35.575

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206438SF / <i>Space Control Technology</i>
---	--

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

N/A

Remarks

E. Acquisition Strategy

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

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force											Date: February 2020				
Appropriation/Budget Activity 3620F / 4						R-1 Program Element (Number/Name) PE 1206438SF / <i>Space Control Technology</i>					Project (Number/Name) 642611 / <i>Technology Insertion Planning and Analysis</i>				

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
SCT Counterspace Technology Prototyping/ Rapid Reaction Development	Various	Various : Various	-	-		-		20.610	Oct 2020	-		20.610	Continuing	Continuing	-
SCT Prototype Development	C/FFP	TBD : El Segundo, CA	-	-		-		13.406	Dec 2020	-		13.406	Continuing	Continuing	-
Subtotal			-	-		-		34.016		-		34.016	Continuing	Continuing	N/A

Remarks
N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
A&AS	Various	Various : Various, CA	-	-		-		1.559	Jan 2021	-		1.559	Continuing	Continuing	-
Subtotal			-	-		-		1.559		-		1.559	Continuing	Continuing	N/A

Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
-	-	0.000	35.575	-	35.575	Continuing	Continuing	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206438SF / <i>Space Control Technology</i>	Project (Number/Name) 642611 / <i>Technology Insertion Planning and Analysis</i>

FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

RRB	
Rapid Prototyping	[REDACTED]
Signal Processing Lab GRA (dev) Increment 4	[REDACTED]
Signal Processing Lab GRA (dev) Increment 5	[REDACTED]
Signal Processing Lab GRA (dev) Increment 6	[REDACTED]
Capability Integration (Lab)	[REDACTED]
Capability tests (execute/report)	[REDACTED]
Ongoing capability DT planning/execution	[REDACTED]
Space Control Technology/Prototype Development	
Enterprise Systems Engineering	[REDACTED]
End-of-Life Experiment	[REDACTED]
IRON JAR/Wolfsat Experiment	[REDACTED]
Army Joint Experiment	[REDACTED]

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206438SF / <i>Space Control Technology</i>	Project (Number/Name) 642611 / <i>Technology Insertion Planning and Analysis</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
RRB				
Rapid Prototyping	1	2021	4	2025
Signal Processing Lab GRA (dev) Increment 4	1	2021	4	2021
Signal Processing Lab GRA (dev) Increment 5	3	2021	2	2024
Signal Processing Lab GRA (dev) Increment 6	1	2024	4	2025
Capability Integration (Lab)	1	2021	4	2025
Capability tests (execute/report)	1	2021	4	2025
Ongoing capability DT planning/execution	1	2021	4	2025
Space Control Technology/Prototype Development				
Enterprise Systems Engineering	1	2021	4	2025
End-of-Life Experiment	1	2021	1	2021
IRON JAR/Wolfsat Experiment	3	2021	3	2021
Army Joint Experiment	4	2021	4	2021

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206760SF / <i>Protected Tactical Enterprise Service (PTES)</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	114.390	0.000	114.390	103.250	56.788	50.710	35.092	Continuing	Continuing
643726: <i>PTES</i>	-	0.000	0.000	114.390	0.000	114.390	103.250	56.788	50.710	35.092	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206760F, Protected Tactical Enterprise Service (PTES) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206760SF, Protected Tactical Enterprise Service (PTES) from Appropriation 3600, Budget Activity 04 due to the creation of a new Appropriation for Space Force.

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

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

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

The PTES rapid prototype addresses an urgent operational need in the Pacific region by achieving Initial Operational Capability (IOC) in 2023. IOC provides ground elements for PTW over WGS and consists of PTES installation at two WGS Gateway sites utilizing one WGS satellite. The Navy Wideband Anti-Jam Modem System (WAMS) relies on PTES to provide PTW ground infrastructure. The Space Force is utilizing FY 2016 National Defense Authorization Act, Section 804, Middle Tier of Acquisition for Rapid Prototyping authority to deliver a PTES Operational Demonstration meeting the Navy's Minimum Viable Product in 2022. At Full Operational Capability (FOC) PTES will provide worldwide PTW operations using up to all WGS satellites.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships,

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206760SF / <i>Protected Tactical Enterprise Service (PTES)</i>
---	--

and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

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

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

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	114.390	0.000	114.390
Total Adjustments	0.000	0.000	114.390	0.000	114.390
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	114.390	0.000	114.390

Change Summary Explanation

FY 2021: \$114.390M transferred from RDT&E, Air Force to RDT&E Space Force. This total includes a reduction of \$9.451M for higher Department priorities.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: PTES Prototype Development	0.000	0.000	114.390
Description: After competitive contract award, the PTES team will develop a prototype consisting of three segments: a MMS, a KMS, and joint hubs integrated into existing SATCOM gateways. PTES will enable an anti-jam communications capability via PTW over WGS for tactical users in all Services and International Partners. The PTES team will be responsible for developing all PTES segments and performing all system integration, including end-to-end tests of the complete PTES prototype.			
FY 2020 Plans:			

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206760SF / <i>Protected Tactical Enterprise Service (PTES)</i>
---	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
N/A			
FY 2021 Plans: Complete Agile Build 2 of the PTES Prototype Development. Continue to test and deliver MMS, KMS, and Key Loading Initialization Facility (KLIF) functionality on multiple system level integration and testing events on the Government approved Data Center environment. Conduct the Build 2 Risk Reduction Demonstration and the Risk Reduction Test on the PTES Integration, Test and Development Environment. Conduct required cybersecurity assessments and multiple requirements management framework assessments including security, adversarial, and cyber vulnerability assessments, and End Cryptographic Unit (ECU) NSA certification. Begin Build 3, which includes operational demonstration capability, and execute the Interim Program Review for Operational Demonstration Readiness on the Government approved Data Center environment. Seek to participate in various Navy operational exercise to test for interoperability of PTES system with external organization's terminal modems over WGS. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.			
FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	114.390

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

Remarks
Associated WAMS funding is contained within Navy Multiband Terminal (NMT) program.

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

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force												Date: February 2020				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)					Project (Number/Name)							
3620F / 4				PE 1206760SF / Protected Tactical Enterprise Service (PTES)					643726 / PTES							
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Protected Tactical Enterprise Service Prototype Development	C/CPIF	Boeing : El Segundo, CA	-	-		-		86.104	Oct 2020	-		86.104	Continuing	Continuing	-	
Data Center	Various	Various : Various	-	-		-		2.482	Dec 2020	-		2.482	Continuing	Continuing	-	
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	-		-		4.795	Nov 2020	-		4.795	Continuing	Continuing	-	
Enterprise SE&I	Various	Various : Various	-	-		-		8.081	Oct 2020	-		8.081	Continuing	Continuing	-	
Subtotal			-	-		-		101.462		-		101.462	Continuing	Continuing	N/A	
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
Test Planning & Execution DT/OT	Various	Various : Various	-	-		-		3.185	Dec 2020	-		3.185	Continuing	Continuing	-	
Subtotal			-	-		-		3.185		-		3.185	Continuing	Continuing	N/A	
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
FFRDC	MIPR	Aerospace : El Segundo, CA	-	-		-		0.131	Nov 2020	-		0.131	Continuing	Continuing	-	
A&AS	Various	Various : Various	-	-		-		9.506	Nov 2020	-		9.506	Continuing	Continuing	-	
Other Support	Various	Various : Various	-	-		-		0.106	Oct 2020	-		0.106	Continuing	Continuing	-	
Subtotal			-	-		-		9.743		-		9.743	Continuing	Continuing	N/A	
Project Cost Totals			-	-		0.000		114.390		-		114.390	Continuing	Continuing	N/A	

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force							Date: February 2020			
Appropriation/Budget Activity 3620F / 4			R-1 Program Element (Number/Name) PE 1206760SF / <i>Protected Tactical Enterprise Service (PTES)</i>			Project (Number/Name) 643726 / <i>PTES</i>				
	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206760SF / <i>Protected Tactical Enterprise Service (PTES)</i>	Project (Number/Name) 643726 / <i>PTES</i>

FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

PTES	
PTES Prototype Development	[Redacted]
Software Build 2	[Redacted]
Software Build 3	[Redacted]
Critical Design Review (CDR)	[Redacted]
Operational Demonstration (Navy Minimum Viable Product)	[Redacted]
Software Build 4	[Redacted]
Software Build 5	[Redacted]
IOC	[Redacted]
Software Build 6	[Redacted]
Software Build 7	[Redacted]
Developmental/Operational Testing (to include Planning)	[Redacted]
Software Build 8	[Redacted]

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206760SF / <i>Protected Tactical Enterprise Service (PTES)</i>	Project (Number/Name) 643726 / <i>PTES</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
PTES				
PTES Prototype Development	1	2021	4	2025
Software Build 2	1	2021	2	2021
Software Build 3	2	2021	1	2022
Critical Design Review (CDR)	2	2021	2	2021
Operational Demonstration (Navy Minimum Viable Product)	1	2022	1	2022
Software Build 4	1	2022	4	2022
Software Build 5	4	2022	3	2023
IOC	1	2024	1	2024
Software Build 6	3	2023	2	2024
Software Build 7	2	2024	1	2025
Developmental/Operational Testing (to include Planning)	1	2021	4	2025
Software Build 8	1	2025	4	2025

Note

FOC occurs outside FYDP

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206761SF / <i>Protected Tactical Service (PTS)</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	205.178	0.000	205.178	225.186	460.910	842.239	670.175	Continuing	Continuing
643728: <i>Protected Tactical SATCOM</i>	-	0.000	0.000	205.178	0.000	205.178	225.186	460.910	842.239	670.175	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206761F, Protected Tactical Service (PTS) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206761SF, Protected Tactical Service (PTS) from Appropriation 3600, Budget Activity 04 due to the creation of a new Appropriation for Space Force.

The global threat of electronic warfare attacks against space systems will expand in the coming years in both number and types of weapons. Threat development will very likely focus on jamming capabilities against dedicated military satellite communications. To address this critical need, the Air Force is developing the Protected Anti-jam Tactical Satellite Communications (PATs) family-of-systems, of which the Protected Tactical Satellite Communications (PTS) program was a New Start in FY 2018 to fulfill the highest level of anti-jam capabilities to mitigate adversarial jamming effects. PTS provides worldwide and polar, beyond-line-of-sight, Anti-Jam (AJ), low-probability-of intercept communications in benign and highly-contested environments utilizing the Protected Tactical Waveform (PTW). PTS, with its on-board payload processing and antenna design, enables reliable tactical satellite communications within close proximities to adversarial jammers. The system also employs interfaces consistent with United States Space Force's on-going resilience initiatives and Enterprise Ground Services (EGS); thereby enhancing mission assurance, resiliency, and interoperability.

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

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206761SF / <i>Protected Tactical Service (PTS)</i>
---	--

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

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

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

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	205.178	0.000	205.178
Total Adjustments	0.000	0.000	205.178	0.000	205.178
• 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	205.178	0.000	205.178

Change Summary Explanation

FY 2021: \$205.178M transferred from RDT&E, Air Force to RDT&E Space Force. This total includes a \$48.214M reduction for higher Department priorities.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: Technical Baseline Management and System Integration	0.000	0.000	43.878
Description: Perform as Government system integrator function through acquiring, designing, testing and integrating key prototype system segments and interfaces. Mature technical baseline and interface requirements for the prototype system. Conduct architectural engineering and system level integration planning for the PTS space, ground, and gateway segments. Support, configure, and conduct integrated testing of the major PTS subsystems, segments, and end-to-end prototype system.			

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 1206761SF / <i>Protected Tactical Service (PTS)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
Manage the PTS open system architecture, refine interface requirements, and validate concept of operations through integrated system performance demonstrations. FY 2020 Plans: N/A FY 2021 Plans: Support prototype capability and interface maturity demonstrations of up to four contractors. Incorporate critical lessons from demonstrations into ongoing maturation and refinement of the technical baseline and system architecture, and into systems engineering trades. Continue acquiring developing and managing key system components including the prototype Ground and Gateway Segments along with their interfaces. Support PATS level integration and reduce risks to integrating with PTES and other partner programs. Conduct key interface tests between the PTS prototype and emulators/simulators to reduce risk prior to entering Build and Test phase of the payload. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: Space Hub End Cryptographic Unit (ECU) Description: Develop a single, National Security Agency (NSA) certified, space-flight qualified, production-ready Space Hub ECU for integration with the PTS payloads. Initiate execution of engineering and design work in advance of rapid prototype design and development to alleviate critical path risks to the launch of PTS payloads. Conduct requirements reviews, functional and design reviews, PTS interface development, and Interface Control Document (ICD) coordination with PTS vendors. FY 2020 Plans: N/A FY 2021 Plans: Continue Space Hub End Cryptographic Unit development. Conduct Security Verification Test (SVT) and obtain an Interim Authority to Test (IATT). Provide programmatic and integration support to facilitate ECU non-flight deliveries to support payload build and test activities. FY 2020 to FY 2021 Increase/Decrease Statement: N/A		0.000	0.000	5.397
Title: PTS Rapid Prototype Design and Development		0.000	0.000	155.903

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206761SF / <i>Protected Tactical Service (PTS)</i>
---	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Description: Rapid prototyping of PTS space, ground, and gateway segments and key system components. Develop, demonstrate, test, and evaluate PTS hardware and software systems. Design and develop modular, scalable payloads to support hosted or free-flyer configurations. Demonstrate prototype payload performance on-orbit. Evaluate PTS concept of operations with user participation and enable potential residual operational capability. Mature and validate user requirements. Continue prototyping and risk reduction efforts.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Conduct two major design reviews and mature key technologies to evaluate progress and performance for the two remaining prototype system design contractors. Prototype systems include payloads and buses, as well as payload and bus ground control elements. Continue software development and mature engineering design models. Develop and purchase hardware to support ongoing demonstrations of early prototype technology. Mature test and integration plans. Continue design and development of Space Segment interfaces between the Ground and Gateway Segments of the PTS System. Initiate the build and test phase for two flight prototype payloads. Finalize acquisition planning for payload host/bus and transition into integration of payload and bus to support capability demonstrations. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>			
Accomplishments/Planned Programs Subtotals	0.000	0.000	205.178

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

Remarks

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

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206761SF / Protected Tactical Service (PTS)	Project (Number/Name) 643728 / Protected Tactical SATCOM
---	---	--

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Protected Tactical SATCOM Rapid Prototyping (up to four contractors)	C/TBD	TBD : TBD	-	-		-		154.131	Jan 2021	-		154.131	Continuing	Continuing	-
Space Hub End Cryptographic Unit (ECU)	C/CPIF	L3Harris East : Camden, NJ	-	-		-		4.820	Jan 2021	-		4.820	Continuing	Continuing	-
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	-		-		9.953	Nov 2020	-		9.953	Continuing	Continuing	-
Enterprise SE&I	Various	Various : Various	-	-		-		18.440	Jan 2021	-		18.440	Continuing	Continuing	-
Subtotal			-	-		-		187.344		-		187.344	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FFRDC	MIPR	Aerospace : El Segundo, CA	-	-		-		1.250	Nov 2020	-		1.250	Continuing	Continuing	-
Other Support	Various	Various : Various	-	-		-		0.300	Nov 2020	-		0.300	Continuing	Continuing	-
A&AS	Various	Various : Various	-	-		-		16.284	Nov 2020	-		16.284	Continuing	Continuing	-
Subtotal			-	-		-		17.834		-		17.834	Continuing	Continuing	N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals		-	-	0.000	205.178	-	205.178	Continuing	Continuing	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206761SF / <i>Protected Tactical Service (PTS)</i>	Project (Number/Name) 643728 / <i>Protected Tactical SATCOM</i>

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Hostable Protected Tactical PL																												
Technical Baseline Management and Integration																												
Space Hub End Cryptographic Unit (ECU)																												
Rapid Prototyping Spiral PTS System Prototype Design & Development																												
Ground and Gateway Segments																												
Rapid Prototyping Spiral Major Design Review #1 (2 Contractors)																												
Space Hub ECU Security Verification Testing																												
Rapid Prototyping Spiral Major Design Review #2 (2 Contractors)																												
Development Spiral Decision (Air Force Review Board)																												
Development Spiral ATP																												
Development Spiral PTS System Prototype Design & Development																												
PTS Prototype Payload Available for Launch																												
PTS Prototype Spiral Launch and Operations																												

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206761SF / <i>Protected Tactical Service (PTS)</i>	Project (Number/Name) 643728 / <i>Protected Tactical SATCOM</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Hostable Protected Tactical PL</i>				
Technical Baseline Management and Integration	1	2021	4	2025
Space Hub End Cryptographic Unit (ECU)	1	2021	3	2022
Rapid Prototyping Spiral PTS System Prototype Design & Development	1	2021	3	2024
Ground and Gateway Segments	1	2021	4	2024
Rapid Prototyping Spiral Major Design Review #1 (2 Contractors)	1	2021	1	2021
Space Hub ECU Security Verification Testing	2	2021	2	2021
Rapid Prototyping Spiral Major Design Review #2 (2 Contractors)	4	2021	4	2021
Development Spiral Decision (Air Force Review Board)	1	2023	1	2023
Development Spiral ATP	2	2023	2	2023
Development Spiral PTS System Prototype Design & Development	2	2023	2	2025
PTS Prototype Payload Available for Launch	4	2024	4	2024
PTS Prototype Spiral Launch and Operations	4	2024	4	2025

Note

SpEC OT: Space Enterprise Consortium Other Transaction

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206855SF / <i>Evolved Strategic SATCOM (ESS)</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	71.395	0.000	71.395	172.018	536.952	915.616	816.215	Continuing	Continuing
643725: <i>Evolved Strategic SATCOM (ESS)</i>	-	0.000	0.000	71.395	0.000	71.395	172.018	536.952	915.616	816.215	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206855F, Evolved Strategic SATCOM (ESS) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206855SF, Evolved Strategic SATCOM (ESS) from Appropriation 3600, Budget Activity 04 due to the creation of a new Appropriation for Space Force.

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

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

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

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

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206855SF / <i>Evolved Strategic SATCOM (ESS)</i>
---	--

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

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

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	71.395	0.000	71.395
Total Adjustments	0.000	0.000	71.395	0.000	71.395
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	71.395	0.000	71.395

Change Summary Explanation

FY 2021: \$71.395M transferred from RDT&E, Air Force to RDT&E, Space Force; total includes a reduction of \$134.852M for higher Department priorities.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: Space Segment Prototyping	0.000	0.000	46.540
Description: Award up to three competitive rapid-prototyping contracts. Invest in technology and demonstrations that enables continued development of modernized, strategic payload and other key technology prototypes, risk reduction, and space segment design. Enables long-term return on investment and energizes industrial base for Strategic SATCOM, increased competition, promotion of innovation, and increased resiliency. Actively manage contractors through prototyping, demonstration and requirements/criteria needed for contractors to competitively bid on the ESS space segment Build, Integration and Test (I&T) and Delivery follow-on.			
FY 2020 Plans: N/A			
FY 2021 Plans:			

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 1206855SF / <i>Evolved Strategic SATCOM (ESS)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
Execute for up to three contractors, for the continuation of rapid prototyping and demonstrations of the payload and other key technologies, risk reduction, space segment design, delivery of contract items, and completion of planned milestone reviews and/or demonstrations. Each of the three contracts, awarded in FY 2020, will have varying prototyping and demonstration plans and schedules, depending on the specific contractor. Includes all necessary program office, cyber, resiliency, and security support and equipment, Government contractor support for oversight and integration. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc. FFRDC and UARC studies and technical support will assist with requirements trades, technical approaches, threat assessment and mitigation approaches, and ESS testing assets. FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: ESS Ground Segment and Space-to-Ground Integration Description: Develop and field the ESS ground segment, to include Mission Planning, Command and Control and other architecture and activities required to support the ESS space segment. Includes interoperability with the existing architectures and interfaces for EGS compatibility. Provide for space-to-ground (system) and mission integration for the ESS system. FY 2020 Plans: N/A FY 2021 Plans: Complete acquisition planning for ground segment Phase 2 Mission Planning architectural design. Continue ground segment Phase 1 of up to five Broad Agency Announcement contracts for Mission Planning technology readiness. Continue ground segment In-Band and Out-of-Band Command and Control studies with design and development to best evolve these systems that are currently under sustainment. Procure and provide any government-furnished equipment or resources in support of design, integration and testing of the ESS system. Includes all required cryptography, cyber, resiliency, and security activities required and Government contractor support for management and oversight. FFRDC and UARC studies and technical support will assist with requirements trades, technical approaches, threat assessment and mitigation approaches, prototyping strategy, and ESS testing assets. Continue development activities in support of the ground segment and system/mission integration schedules. FY 2020 to FY 2021 Increase/Decrease Statement: N/A		0.000	0.000	16.903
Title: Space Segment Payload End-Cryptographic Unit (ECU) Description: Develop and deliver the National Security Agency (NSA)-certified ECUs required for secure strategic communications encryption in the ESS payloads and payload test terminals in accordance with the approved ECU acquisition		0.000	0.000	7.952

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206855SF / <i>Evolved Strategic SATCOM (ESS)</i>
---	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>strategy and schedule. Upon development completion, production ECU units will be delivered as government-furnished equipment for integration and testing with the ESS payloads and payload test terminals.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Execute the approved space segment payload and payload test terminals ECU acquisition strategy, to include early definition and development that supports future delivery of the ECUs that meet the ESS control documents. Provide for NSA support on encrypted ECU requirements and standards. Plan and provide program office support, government-furnished equipment, studies or technical analyses, information or resources in support of prototyping activities. Includes all required cyber, resiliency, and security activities required and Government contractor support for management and oversight. FFRDC and UARC studies and technical support will assist with requirements trades, technical approaches, threat assessment and mitigation approaches, and ESS testing assets.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>			
Accomplishments/Planned Programs Subtotals	0.000	0.000	71.395

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

Remarks

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

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206855SF / <i>Evolved Strategic SATCOM (ESS)</i>
---	--

The initial Ground Segment Acquisition Strategy was approved by the Program Executive Officer (PEO) in 4th Quarter FY 2019 to begin early technology readiness studies for ESS Phase 1 Mission Planning in FY 2020. Final approval for Mission Planning to begin architectural design and development/production may require additional approval and authority designation by the MDA. In-Band and Out-of-Band Command and Control studies are underway to best evolve these systems that are currently under sustainment.

A Space Segment Payload ECU acquisition strategy will be delivered to the PEO for approval in FY 2020.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206855SF / Evolved Strategic SATCOM (ESS)	Project (Number/Name) 643725 / Evolved Strategic SATCOM (ESS)
---	---	---

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Space Segment Prototyping	C/TBD	TBD : TBD	-	-		-		22.013	Oct 2020	-		22.013	Continuing	Continuing	-
Ground Segment and Space-to-Ground Integration	TBD	TBD : TBD	-	-		-		5.630	Nov 2020	-		5.630	Continuing	Continuing	-
Space Segment Payload End Cryptographic Unit (ECU)	TBD	TBD : TBD	-	-		-		4.630	Dec 2020	-		4.630	Continuing	Continuing	-
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	-		-		12.068	Nov 2020	-		12.068	Continuing	Continuing	-
Enterprise SE&I	C/CPAF	Linquest : Los Angeles, CA	-	-		-		15.246	Nov 2020	-		15.246	Continuing	Continuing	-
Subtotal			-	-		-		59.587		-		59.587	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	Various	Various : Various	-	-		-		5.596	Nov 2020	-		5.596	Continuing	Continuing	-
Other Support	Various	Various : Various	-	-		-		0.500	Oct 2020	-		0.500	Continuing	Continuing	-
A&AS	Various	Various : Various	-	-		-		5.712	Nov 2020	-		5.712	Continuing	Continuing	-
Subtotal			-	-		-		11.808		-		11.808	Continuing	Continuing	N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-	0.000	71.395	-	71.395	Continuing	Continuing	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206855SF / Evolved Strategic SATCOM (ESS)	Project (Number/Name) 643725 / Evolved Strategic SATCOM (ESS)

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

ESS Development	
System and Mission Integration	
Space Segment Prototyping - Execution (up to 3 contractors)	
Ground Segment - In and Out-of-Band Command and Control efforts	
Ground Segment - Phase 1 Mission Planning Technology Readiness	
Space Segment Payload ECU - Early Definition, Development & Delivery	

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206855SF / <i>Evolved Strategic SATCOM (ESS)</i>	Project (Number/Name) 643725 / <i>Evolved Strategic SATCOM (ESS)</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>ESS Development</i>				
System and Mission Integration	1	2021	4	2025
Space Segment Prototyping - Execution (up to 3 contractors)	1	2021	4	2025
Ground Segment - In and Out-of-Band Command and Control efforts	1	2021	4	2025
Ground Segment - Phase 1 Mission Planning Technology Readiness	1	2021	1	2022
Space Segment Payload ECU - Early Definition, Development & Delivery	4	2021	4	2024

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206857SF / <i>Space Rapid Capabilities Office</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	103.518	-	103.518	9.356	13.984	9.146	9.314	Continuing	Continuing
64A020: <i>AF Funded ORSSats</i>	-	0.000	0.000	103.518	0.000	103.518	9.356	13.984	9.146	9.314	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206857F, Space Rapid Capabilities Office efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206857SF, Space Rapid Capabilities Office from Appropriation 3600, Budget Activity 04 due to the creation of a new Appropriation for Space Force.

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

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

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

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

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

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)	R-1 Program Element (Number/Name) PE 1206857SF I Space Rapid Capabilities Office
---	--

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	103.518	-	103.518
Total Adjustments	0.000	0.000	103.518	-	103.518
• 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	103.518	0.000	103.518

Change Summary Explanation

FY 2021: +\$103.518M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force; total includes increase of \$85.474M for Space RCO Solar Power.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
---	----------------	----------------	----------------

Title: Space RCO Solar Power	0.000	0.000	85.880
Description: Space RCO is developing the Solar Power project to collect solar energy and provide uninterrupted, assured, and logistically agile power to expeditionary forces operating in unimproved areas such as forward operating bases.			
FY 2020 Plans: N/A			
FY 2021 Plans: Continue developing space-based solar power collection and transmission technology via a series of integrated demos and technology development/maturation efforts: 1) demonstration of a solar-to-Radio Frequency (RF) tile and rectenna, 2) space flight demonstration of solar-to-RF panel payload, and 3) demonstration of scaled array payloads; operational prototype concept designs/analysis; and functional demonstrations for critical technologies in energy generation, deployable structures, thermal technology, and RF transmission.			
FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Title: Space RCO Board of Directors (BoD) Projects, Studies, and Analysis	0.000	0.000	17.638

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206857SF / <i>Space Rapid Capabilities Office</i>
---	---

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Description: Execute projects, studies, and analysis under rapid acquisition authorities inherent to the Space RCO, that address emergent capabilities and respond to validated requirements and other BoD approved efforts to meet needs in year of execution. In addition, provide systems engineering, program management support and civilian pay across all the Space RCO activities as well as perform modeling, simulation, analysis, and assess alternative concepts and requirements.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue to initiate rapid acquisition projects, studies, and analysis that address emergent capabilities requirements and other Space RCO BoD approved efforts. These activities may include, but are not limited to studies, technical analysis, experimentation, prototyping, modeling, etc. Continue ongoing systems engineering support of future mission development as well as Program Office support and potentially including Civilian pay. Activities may include, but are not limited to program office support, facilities, and studies. This Major Thrust includes items formerly under Operational Capabilities, Development, Enablers, Integration and Rapid Assembly, Integration & Test as well as Space RCO Development for FY 2020.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>			
Accomplishments/Planned Programs Subtotals	0.000	0.000	103.518

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

N/A

Remarks

E. Acquisition Strategy

Expediently award contracts through Space RCO or partner organizations.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force												Date: February 2020			
Appropriation/Budget Activity 3620F / 4						R-1 Program Element (Number/Name) PE 1206857SF / <i>Space Rapid Capabilities Office</i>				Project (Number/Name) 64A020 / <i>AF Funded ORSSats</i>					
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Space RCO Solar Power	SS/CPFF	Northrop Grumman : Linthicum, MD	-	-		-		85.880	Nov 2020	-		85.880	Continuing	Continuing	-
Space RCO Board of Directors (BoD) Projects, Studies, and Analysis	C/CPAF	Various : Various, NM	-	-		-		7.238	Mar 2021	-		7.238	Continuing	Continuing	-
Subtotal			-	-		-		93.118		-		93.118	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS	Various	Various : Various	-	-		-		1.000	Dec 2020	-		1.000	Continuing	Continuing	-
FFRDC	Various	Various : Various	-	-		-		9.400	Dec 2020	-		9.400	Continuing	Continuing	-
Subtotal			-	-		-		10.400		-		10.400	Continuing	Continuing	N/A
Project Cost Totals			-	-		0.000		103.518		-		103.518	Continuing	Continuing	N/A
Remarks															

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206857SF / <i>Space Rapid Capabilities Office</i>	Project (Number/Name) 64A020 / <i>AF Funded ORSSats</i>

FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

Space Rapid Capabilities Office	
Space RCO Solar Power	
Space RCO Board of Directors (BoD) Projects, Studies, and Analysis	

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206857SF / <i>Space Rapid Capabilities Office</i>	Project (Number/Name) 64A020 / <i>AF Funded ORSSats</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Space Rapid Capabilities Office				
Space RCO Solar Power	1	2021	4	2023
Space RCO Board of Directors (BoD) Projects, Studies, and Analysis	1	2021	4	2025

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1203269SF / <i>GPS III Follow-On (GPS IIIIF)</i>
--	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	263.496	0.000	263.496	267.542	294.706	286.279	177.074	1,182.166	2,471.263
653170: <i>GPS IIIIF</i>	0.000	0.000	0.000	263.496	0.000	263.496	267.542	294.706	286.279	177.074	1,182.166	2,471.263
Quantity of RDT&E Articles	-	2	-	-	-	-	-	-	-	-	-	-

Program MDAP/MAIS Code: 590

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203269F, GPS III Follow-On (GPS IIIIF) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203269SF, GPS III Follow-On (GPS IIIIF) from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

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

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

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1203269SF / <i>GPS III Follow-On (GPS IIIIF)</i>
--	---

agreements for Search and Rescue. LRA, built by the Naval Research Lab (NRL), is a passive reflector that improves accuracy and provides better ephemeris data. National Geospatial-Intelligence Agency (NGA) funds the integration costs of the LRA.

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

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

The FY 2021 funding request was reduced by \$15.835 million to account for the availability of prior year execution balances

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

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

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	263.496	0.000	263.496
Total Adjustments	0.000	0.000	263.496	0.000	263.496
• 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	263.496	0.000	263.496

Change Summary Explanation

FY 2021: +\$263.496M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)	R-1 Program Element (Number/Name) PE 1203269SF I GPS III Follow-On (GPS IIIIF)
--	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: GPS III Follow-On (GPS IIIIF) Development Description: The program utilizes RDT&E funds to develop and deliver SVs 11-12, conduct the NRE of developing risk-reducing simulators, developing support test equipment, and conducting the systems engineering associated with delivering the new capabilities required of GPS IIIIF including backward compatibility, dual band Telemetry, Tracking, and Control (TT&C), integration of Government Furnished Equipment (GFE) hosted payloads, and RMP, which delivers high power regional M-Code signals in specific areas of intended effect. FY 2020 Plans: N/A FY 2021 Plans: Continue development and NRE efforts to simultaneously support three satellites (SV11, SV12, & GNST+) in preparation for the start of system integration and the final build and checkout of two software simulators (GSS). Efforts include hardware purchases of long lead items. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to, continued program office support, studies, technical analysis, experimentation, prototyping, etc. FY 2020 to FY 2021 Increase/Decrease Statement: N/A	0.000	0.000	263.496
Accomplishments/Planned Programs Subtotals	0.000	0.000	263.496

D. Other Program Funding Summary (\$ in Millions)	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• SPAF 01 GPS03C: <i>GPS III Follow On</i>	-	394.625	-	-	-	-	-	-	-	0.000	394.625
• SPSF 01 GPS03C: <i>GPS III Follow On</i>	-	-	627.796	-	627.796	634.821	640.782	920.657	750.853	3,230.317	6,805.226
• RDTE 07 1203265F: <i>GPS III Space Segment</i>	72.096	42.440	-	-	-	-	-	-	-	0.000	114.536
• RDTE 07 1203265SF: <i>GPS III Space Segment</i>	-	-	10.777	-	10.777	7.296	1.598	3.382	7.722	0.000	65.493
• SPAF 01 GPSIII: <i>GPS III Space Segment</i>	69.386	31.466	-	-	-	-	-	-	-	0.000	100.852

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1203269SF / <i>GPS III Follow-On (GPS IIIIF)</i>
--	---

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• SPSF 01 GPSIII: <i>GPS III Space Segment</i>	-	-	20.122	-	20.122	21.302	19.312	7.868	1.883	15.196	85.683

Remarks

E. Acquisition Strategy

In December 2017, Principal Deputy Office of the Assistant Secretary of the Air Force (Acquisition & Logistics) declared the GPS IIIIF program a new start beginning in FY 2019 and, consistent with the Fiscal Year 2016 National Defense Authorization Act (NDAA), the program was categorized as an Acquisition Category (ACAT) (1B) Major Defense Acquisition Program (MDAP) with the Service Acquisition Executive (SAE) serving as the Milestone Decision Authority (MDA). During this time, the MDA approved the second phase of the two-phased GPS III Follow-On acquisition strategy. Executed using funds in PE 1203265F, GPS III Space Segment, the Phase 1 Production Readiness Feasibility Assessments conducted during FY 2016-2017 provided data and insight into contractors' GPS satellite production designs with emphasis on a mature navigation payload and production-ready designs. Phase 1 results affirmed the viability of a competitive approach for Phase 2. The Phase 2 strategy directed the Air Force to conduct a full-and-open competition for GPS IIIIF space vehicles and specified the use of RDT&E funds to deliver SVs 11-12 and conduct associated NRE. In addition to SVs 11-12, the RDT&E effort will be comprised of developing risk-reducing simulators, support test equipment, and conducting the systems engineering associated with delivering the new capabilities required of GPS IIIIF. The Air Force awarded the contract to Lockheed Martin in September 2018 and began the 1-year CDR campaign in March 2019. Completion of CDR is scheduled for March 2020 followed by Milestone C in Q3FY20. Upon Milestone C approval, the Space Force will procure SV 13+ via annual contract options exercised Space Procurement, Air Force (SPAF) and Space Procurement, Space Force (SPSF) funds consistent with full-funding policy under an annual buy approach.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force												Date: February 2020				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)								
3620F / 5				PE 1203269SF / GPS III Follow-On (GPS IIIIF)				653170 / GPS IIIIF								
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
GPS IIIIF Development	C/FPIF	Lockheed Martin : Littleton, CO	-	-		-		222.799	Dec 2020	-		222.799	1,533.756	1,756.555	-	
GPS IIIIF Technical Mission Analysis	MIPR	Various : Various	-	-		-		12.071	Dec 2020	-		12.071	136.679	148.750	-	
GPS IIIIF Enterprise SE&I	C/CPAF	SAIC : El Segundo, CA	-	-		-		8.882	Dec 2020	-		8.882	157.248	166.130	-	
Subtotal			-	-		-		243.752		-		243.752	1,827.683	2,071.435	N/A	
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
GPS IIIIF Test and Evaluation	Various	Various : Various	0.000	-		-		2.235	Mar 2021	-		2.235	22.932	25.167	-	
Subtotal			0.000	-		-		2.235		-		2.235	22.932	25.167	N/A	
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total				
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract	
GPS IIIIF FFRDC	MIPR	Aerospace Corp : El Segundo, CA	-	-		-		4.024	Dec 2020	-		4.024	65.272	69.296	-	
GPS IIIIF A&AS	Various	Various : El Segundo, CA	-	-		-		13.085	Dec 2020	-		13.085	286.680	299.765	-	
GPS IIIIF Other Support	Various	Various : El Segundo, CA	-	-		-		0.400	Oct 2020	-		0.400	5.200	5.600	-	
Subtotal			-	-		-		17.509		-		17.509	357.152	374.661	N/A	
Project Cost Totals			0.000	-		0.000		263.496		-		263.496	2,207.767	2,471.263	N/A	

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force							Date: February 2020			
Appropriation/Budget Activity 3620F / 5			R-1 Program Element (Number/Name) PE 1203269SF / GPS III Follow-On (GPS IIIIF)			Project (Number/Name) 653170 / GPS IIIIF				
	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	

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

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1203269SF / <i>GPS III Follow-On (GPS IIIIF)</i>	Project (Number/Name) 653170 / <i>GPS IIIIF</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
GPS IIIIF				
GSS 1 & 2 Subsystem Procurement & Build	1	2021	3	2021
GSS 1 & 2 Hardware Available	2	2021	3	2021
GSS 1&2 Integration	3	2021	1	2024
GSS 1&2 Delivered	2	2024	2	2024
GNST+ Subsystem Procurement & Build	1	2021	2	2022
GNST+ Integration	3	2022	4	2023
SV11 Subsystem Procurement & Build	1	2021	3	2022
SV11 System Integration & Test	4	2022	4	2025
SV12 Subsystem Procurement & Build	1	2021	2	2023
SV12 System Integration & Test	3	2023	4	2025

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1203940SF / <i>Space Situation Awareness Operations</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	41.897	0.000	41.897	51.977	16.061	19.637	0.000	Continuing	Continuing
65A037: <i>Ground Based Optical Sensor System (GBOSS)</i>	-	0.000	0.000	41.897	0.000	41.897	51.977	16.061	19.637	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203940F, Space Situation Awareness Operations, Project 65A037, Ground Based Optical Sensor System (GBOSS) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203940SF, Space Situation Awareness Operations, Project 65A037, Ground Based Optical Sensor System (GBOSS) from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

Space Situational Awareness (SSA) is knowledge of all aspects of space related to operations. As the foundation for space control, SSA encompasses surveillance of all space objects and activities; detailed surveillance of specific space assets; monitoring space environmental conditions; monitoring cooperative space assets; gathering indications and warning on adversary space operations; and conducting integrated command, control, communications, processing, analysis, dissemination, and archiving activities. This program element fields, upgrades, operationalizes, operates and maintains Space Force sensors and information integration capabilities within the SSA network while companion program element 1206425SF, Space Situational Awareness Systems, develops new network sensors and improved information integration capabilities across the network. Funds also support efforts such as engineering studies and analyses, architectural engineering studies, trade studies, technology needs forecasting, modernization initiatives, systems engineering, system development, and test & evaluation, and may include prototyping and technology demonstration. Activities funded in this program element (1203940SF) focus on surveillance of objects in earth orbit to aid tasks including satellite tracking; space object identification; tracking and cataloging; satellite attack warning; notification of satellite flyovers to U.S. forces; space treaty monitoring; and technical intelligence gathering.

The FY 2021 funding request was reduced by \$13.784 million to account for the availability of prior year execution balances.

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

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1203940SF / <i>Space Situation Awareness Operations</i>
--	--

This program is in Budget Activity 05, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	41.897	0.000	41.897
Total Adjustments	0.000	0.000	41.897	0.000	41.897
• 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	41.897	0.000	41.897

Change Summary Explanation

FY 2021: +\$41.897M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Title: Ground Based Optical Sensor System (GBOSS)</p> <p>Description: GBOSS provides global ground based optical sensor capability for Space Situational Awareness (SSA). GBOSS improves sensitivity, search rate, tracking of non-cooperative launches, precise tagging of clustered objects, and detection of closely spaced dim objects. This effort includes fielding GBOSS capabilities in optimal global locations, upgrading existing Ground-based Electro-Optical Deep Space Surveillance (GEODSS) sensors to improve sensitivity and search rates, and may acquire new advanced technology sensor(s) to improve global electro-optical sensor resilience and persistence. The effort will coordinate with Combined Space Operations Center (CSpOC), National Space Defense Center (NSDC), and National Air and Space Intelligence Center (NASIC) efforts to ensure enterprise data fusion and dissemination supporting Enterprise Space Battle Management Command, and Control (ESBMC2).</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Complete GBOSS Technology Maturation and Risk Reduction (TMRR) and initiate Engineering Manufacturing Development (EMD). Complete design through Critical Design Review (CDR) (including System Requirements Review (SRR) and Preliminary</p>	0.000	0.000	41.897

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1203940SF / <i>Space Situation Awareness Operations</i>
--	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Design Review (PDR). Initiate facility preparation for two overseas sites and for modifications to one US site. Post CDR, initiate software and hardware development. Rapidly respond and implement system resiliency and situational awareness necessary to operate in the contested space domain. RDT&E funding is required to support this transformation and enable Space Superiority end-to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events. FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	41.897

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

Remarks

E. Acquisition Strategy
Program established as an FY 2018 new start to address ground-based optical SSA gaps and shortfalls in supporting the Space Warfighting Construct (SWC). The acquisition strategy approved by AFPEO/SP in March 2018 accelerates the development and fielding of the solution, minimizing the time to address the requirements in light of current and emerging threats. Initial technology maturation and risk reduction will be executed using existing DoD, IC, and lab contracts. TMRR and EMD effort will be executed on a new contract awarded through full and open competition. The approved acquisition strategy supports fielding Initial Operational Capability (IOC) in the European theater in 2023 and Final Operational Capability (FOC) of the global capability in 2024.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1203940SF / <i>Space Situation Awareness Operations</i>	Project (Number/Name) 65A037 / <i>Ground Based Optical Sensor System (GBOSS)</i>
---	--	--

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
GBOSS design, development and life extension	Various	Multiple : Colorado Springs, CO	-	-		-		30.565	Mar 2021	-		30.565	Continuing	Continuing	-
GBOSS Technical Mission Analysis	C/CPIF	NASA/JPL : Pasadena, CA	-	-		-		6.019	Nov 2020	-		6.019	Continuing	Continuing	-
Subtotal			-	-		-		36.584		-		36.584	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS	Various	Multiple: Various : Various	-	-		-		2.567	May 2021	-		2.567	Continuing	Continuing	-
FFRDC	Various	Multiple: Various : Various	-	-		-		2.696	Apr 2021	-		2.696	Continuing	Continuing	-
Other Support	C/CPAF	Various: Various : Various	-	-		-		0.050	Nov 2020	-		0.050	Continuing	Continuing	-
Subtotal			-	-		-		5.313		-		5.313	Continuing	Continuing	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-	0.000	-	41.897	-	41.897	Continuing	Continuing	N/A	

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1203940SF / <i>Space Situation Awareness Operations</i>	Project (Number/Name) 65A037 / <i>Ground Based Optical Sensor System (GBOSS)</i>

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<i>GBOSS Phase I Development</i>																												
GBOSS TMRR																												
GBOSS EMD																												
CDR																												
IOC																												
FOC																												
Optical Product Improvement																												

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1203940SF / <i>Space Situation Awareness Operations</i>	Project (Number/Name) 65A037 / <i>Ground Based Optical Sensor System (GBOSS)</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>GBOSS Phase I Development</i>				
GBOSS TMRR	1	2021	1	2021
GBOSS EMD	1	2021	3	2024
CDR	3	2021	3	2021
IOC	2	2023	2	2023
FOC	4	2024	4	2024
Optical Product Improvement	4	2024	4	2025

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	54.689	0.000	54.689	44.709	29.432	42.036	42.813	Continuing	Continuing
65A001: <i>Counter Satellite Communications System</i>	-	0.000	0.000	50.453	0.000	50.453	36.057	20.627	33.066	33.679	Continuing	Continuing
65A005: <i>Offensive Counterspace (OCS) C2</i>	-	0.000	0.000	2.252	0.000	2.252	6.621	6.738	6.866	6.991	Continuing	Continuing
65A013: <i>BOUNTY HUNTER</i>	-	0.000	0.000	1.984	0.000	1.984	2.031	2.067	2.104	2.143	Continuing	Continuing

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206421F, Counterspace Systems efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206421SF, Counterspace Systems from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

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

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

The FY 2021 funding request was reduced by \$4.156 million to account for the availability of prior year execution balances.

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

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>
--	--

Bounty Hunter (BH) supports the Defensive Space Control of US systems in a specific AOR and provides the capacity to prevent effective adversary use of Command, Control, Communications, Computers, and Intelligence (C4I). Continuing annual agile development is needed to meet new user needs in an ever changing threat environment.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Bounty Hunter weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F.

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

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	54.689	0.000	54.689
Total Adjustments	0.000	0.000	54.689	0.000	54.689
• 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	54.689	0.000	54.689

Change Summary Explanation

FY 2021: +\$54.689M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force. This total includes a \$31.266M increase to CCS to accelerate CCS B10.3 Meadowlands and technique development to counter advancing threats and develop advanced training environment for next generation threats.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3620F / 5					R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>				Project (Number/Name) 65A001 / <i>Counter Satellite Communications System</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
65A001: <i>Counter Satellite Communications System</i>	-	0.000	0.000	50.453	0.000	50.453	36.057	20.627	33.066	33.679	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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

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

The FY 2021 funding request was increased by \$31.266 million for the Fix CCS for C4I and increased by \$0.966 million for the JETSS Architecture Realignment.

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

	FY 2019	FY 2020	FY 2021
Title: Counter Communications System (CCS) Pre-planned Product Improvement (P3I) Program	0.000	0.000	50.453
Description: Develop, integrate, test and field the CCS P3I program. This is an incremental approach to deliver Block 20 CCS capabilities.			
FY 2020 Plans: N/A			
FY 2021 Plans: Continue P3I development, integration and testing of the Block 10 P3I Meadowlands program. Include additional CCS Block 20 capabilities in CCS Block 10.3 Meadowlands, design forward garrison systems, mission specific emulators, training environment and multi-range integration. Accelerate development of new mission techniques to meet advancing threat and integrates techniques into the CCS program of record. Begin implementation of Agile development approach for development of weapon system software. Rapidly respond and implement system resiliency and situational awareness necessary to operate in the contested space domain. RDT&E funding is required to support this transformation and enable Space Superiority end-to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping,			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>	Project (Number/Name) 65A001 / <i>Counter Satellite Communications System</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events.			
FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	50.453

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• SPAF 01 1206421SF: <i>Counterspace Systems</i>	-	-	65.540	0.000	65.540	65.623	66.819	62.756	1.999	0.000	262.737

Remarks

D. Acquisition Strategy

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

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>	Project (Number/Name) 65A001 / <i>Counter Satellite Communications System</i>
---	--	---

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Block 10 P3I Development	Various	Various : El Segundo, CA	-	-		-		40.015	Feb 2021	-		40.015	Continuing	Continuing	-
Technical Mission Analysis	RO	Aerospace Corp : El Segundo, CA	-	-		-		0.737	Oct 2020	-		0.737	Continuing	Continuing	11.144
Enterprise Systems Engineering and Integration	C/FFP	AT&T : El Segundo, CA	-	-		-		0.202	May 2021	-		0.202	Continuing	Continuing	-
Counterspace Architecture Development	C/CPFF	NGMS : Redondo Beach, CA	-	-		-		0.966	Jan 2021	-		0.966	Continuing	Continuing	-
Subtotal			-	-		-		41.920		-		41.920	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Security	C/CPAF	Mantech : El Segundo, CA	-	-		-		2.254	Nov 2020	-		2.254	Continuing	Continuing	-
Miscellaneous Support Services	Various	Various : TBD	-	-		-		0.009	Nov 2020	-		0.009	Continuing	Continuing	-
Subtotal			-	-		-		2.263		-		2.263	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FFRDC	RO	Aerospace Corp : El Segundo, CA	-	-		-		0.772	Oct 2020	-		0.772	Continuing	Continuing	-
A&AS	Various	Various : El Segundo, CA	-	-		-		5.421	May 2021	-		5.421	Continuing	Continuing	-
Other Support	Various	Various : El Segundo, CA	-	-		-		0.077	Oct 2020	-		0.077	Continuing	Continuing	-

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force											Date: February 2020				
Appropriation/Budget Activity 3620F / 5				R-1 Program Element (Number/Name) PE 1206421SF / Counterspace Systems				Project (Number/Name) 65A001 / Counter Satellite Communications System							
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Subtotal			-	-		-		6.270		-		6.270	Continuing	Continuing	N/A
			Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-		0.000		50.453		-		50.453	Continuing	Continuing	N/A
<u>Remarks</u>															

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>	Project (Number/Name) 65A001 / <i>Counter Satellite Communications System</i>

FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

CCS B10.3	
10.3. Development	
Technique development (2x per year)	
10.3 System Deliveries #1-4	
10.3 Development Test/Operational Test	
10.3 Sustainment	

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>	Project (Number/Name) 65A001 / <i>Counter Satellite Communications System</i>

Schedule Details

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

Note
For CCS B10.2, 14 systems delivered plus 2 trainers.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>	Project (Number/Name) 65A005 / <i>Offensive Counterspace (OCS) C2</i>
---	--	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
65A005: <i>Offensive Counterspace (OCS) C2</i>	-	0.000	0.000	2.252	0.000	2.252	6.621	6.738	6.866	6.991	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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

The FY 2021 funding request was reduced by \$4.156 million to account for the availability of prior year execution balances.

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

	FY 2019	FY 2020	FY 2021
Title: Joint Execution and Tasking System for Space (JETSS)	0.000	0.000	2.252
Description: Evolve with upgrades the counterspace mission planning and C2 capability to support counterspace systems space control warfighter activities.			
FY 2020 Plans: N/A			
FY 2021 Plans: Develop product line for higher protection level to support multiple classification levels, risk reduction efforts, and provide upgraded capabilities to support evolutionary C2 initiatives, Counterspace Operations for Combined Space Operations Center (CSpOC) and National Space Defense Center (NSDC), and integration into Battle Management Command and Control (BMC2). Rapidly respond and implement system resiliency and situational awareness necessary to operate in the contested space domain. RDT&E funding is required to support this transformation and enable end-to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events.			
FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	2.252

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force Date: February 2020

Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)
3620F / 5	PE 1206421SF / <i>Counterspace Systems</i>	65A005 / <i>Offensive Counterspace (OCS) C2</i>

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

N/A

Remarks

-

D. Acquisition Strategy

All contracts will be awarded using competitive procedures to the maximum extent possible to acquire next generation capabilities through incremental acquisitions.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5 **R-1 Program Element (Number/Name)** PE 1206421SF / *Counterspace Systems* **Project (Number/Name)** 65A005 / *Offensive Counterspace (OCS) C2*

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Develop Counterspace Planning and C2 System (JETSS)	C/CPIF	L3 Harris : Colorado Springs, CO	-	-		-		1.217	Dec 2020	-		1.217	Continuing	Continuing	-
Subtotal			-	-		-		1.217		-		1.217	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
A&AS	C/FFP	Various : Various	-	-		-		1.001	May 2021	-		1.001	Continuing	Continuing	-
Other Support	C/Various	Various : Various	-	-		-		0.034	Oct 2020	-		0.034	Continuing	Continuing	-
Subtotal			-	-		-		1.035		-		1.035	Continuing	Continuing	N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-	0.000	2.252	-	2.252	Continuing	Continuing	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>	Project (Number/Name) 65A005 / <i>Offensive Counterspace (OCS) C2</i>
---	--	---

FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

JETSS	
C2 Product Line Development	[REDACTED]

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>	Project (Number/Name) 65A005 / <i>Offensive Counterspace (OCS) C2</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
JETSS				
C2 Product Line Development	1	2021	1	2025

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3620F / 5					R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>				Project (Number/Name) 65A013 / <i>BOUNTY HUNTER</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
65A013: <i>BOUNTY HUNTER</i>	-	0.000	0.000	1.984	0.000	1.984	2.031	2.067	2.104	2.143	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Bounty Hunter (BH) supports the Defensive Space Control of US systems in a specific AOR and provides the capacity to prevent effective adversary use of Command, Control, Communications, Computers, and Intelligence (C4I). Continuing annual agile development is needed to meet new user needs in an ever changing threat environment.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Bounty Hunter weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F.

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

	FY 2019	FY 2020	FY 2021
Title: Bounty Hunter	0.000	0.000	1.984
Description: Develop new capabilities for the Bounty Hunter program to maintain operational capability. Specific accomplishments are classified.			
FY 2020 Plans: N/A			
FY 2021 Plans: Resolve any new tech obsolescence HW and SW challenges with new system component purchases for additional new system delivery to a new AOR. Prepare R&D plan for new total system upgrade to BH 3.0 to allow for system component consolidation and consideration for remote operation. Rapidly respond to reach and maintain pace with the threat environment and implement system resiliency and situational awareness necessary to operate in the contested space domain. Continue transition of some R&D activities from MITRE to a commercial vendor. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.			
FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	1.984

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force	Date: February 2020
---	----------------------------

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>	Project (Number/Name) 65A013 / <i>BOUNTY HUNTER</i>
---	--	---

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• SPAF 01 CTRSPC: <i>Counterspace Systems</i>	1.121	-	-	-	-	-	-	-	-	0.000	1.121

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

D. Acquisition Strategy
Contracts funded for this program shall be awarded to MITRE, a Federally Funded Research and Development Center (FFRDC). The establishment of a commercial vendor has yet to be determined.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>	Project (Number/Name) 65A013 / <i>BOUNTY HUNTER</i>
---	--	---

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Bounty Hunter Agile Development	SS/CPAF	MITRE : Colorado Springs, CO	-	-		-		1.984	Oct 2020	-		1.984	Continuing	Continuing	-
Subtotal			-	-		-		1.984		-		1.984	Continuing	Continuing	N/A
			Prior Years	FY 2019	FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals			-	-	0.000		1.984		-		1.984	Continuing	Continuing	N/A	

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>	Project (Number/Name) 65A013 / <i>BOUNTY HUNTER</i>
---	--	---

FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
BOUNTY HUNTER																												
Bounty Hunter Agile Development 2021																												
2021 Continuous Delivery																												
Bounty Hunter Agile Development 2022																												
2022 Continuous Delivery																												
Bounty Hunter Agile Development 2023																												
2023 Continuous Delivery																												

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / <i>Counterspace Systems</i>	Project (Number/Name) 65A013 / <i>BOUNTY HUNTER</i>
---	--	---

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>BOUNTY HUNTER</i>				
Bounty Hunter Agile Development 2021	1	2021	4	2021
2021 Continuous Delivery	2	2021	1	2022
Bounty Hunter Agile Development 2022	1	2022	4	2022
2022 Continuous Delivery	2	2022	1	2023
Bounty Hunter Agile Development 2023	1	2023	4	2023
2023 Continuous Delivery	2	2023	1	2024

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force / BA 5: System Development & Demonstration (SDD)	R-1 Program Element (Number/Name) PE 1206422SF / Weather System Follow-on
--	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	2.526	0.000	2.526	2.583	1.413	0.000	0.000	0.000	6.522
65A038: SSA Environmental Monitoring	-	0.000	0.000	2.526	0.000	2.526	2.583	1.413	0.000	0.000	0.000	6.522
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206422F, Weather System Follow-on, Project 65A038, SSA Environmental Monitoring efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206422SF, Weather System Follow-on, Project 65A038, SSA Environmental Monitoring from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

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

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

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

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206422SF / <i>Weather System Follow-on</i>
--	--

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	2.526	0.000	2.526
Total Adjustments	0.000	0.000	2.526	0.000	2.526
• 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	0.000	0.000			
• Other Adjustments	0.000	0.000	2.526	0.000	2.526

Change Summary Explanation

FY 2021: +\$2.256M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
---	----------------	----------------	----------------

Title: Space Situational Awareness Environmental Monitoring (SSAEM)	0.000	0.000	2.526
Description: The SSAEM program is a non-ACAT, Class D technology demonstration project to support international Constellation Observing System for Meteorology, Ionosphere and Climate 2 (COSMIC-2) mission. The SSAEM program provides the acquisition, development and launch/on-orbit support of 18 space/terrestrial weather sensors to COSMIC-2 partnership in coordination with National Oceanic and Atmospheric Administration (NOAA) and Taiwan's National Space Organization (NSPO). On June 25th, 2019 COSMIC-2 successfully launched six satellites in an equatorial, Low Earth Orbit (LEO) with 3 SSAEM sensors in each spacecraft. The sensor types are; Tri-GNSS Radio occultation System (TGRS), Ion Velocity Meter (IVM) and Radio Frequency Beacon (RFB). The SSAEM sensors will address three distinct Joint Requirement Oversight Committee (JROC)-approved Category A weather gaps, specifically Gap 4 (Ionospheric Density), 7 (Equatorial Ionospheric Scintillation) and 12 (Electric Field), to provide additional space meteorological data to improve forecast capabilities and improve warfighter navigation/communication capabilities.			
FY 2020 Plans: N/A			
FY 2021 Plans: Complete sensor data cal/val effort for all three sensor types. Complete RF Beacon ground receiver cyber hardening for connecting with Ionospheric Scintillation Total Electron Count (TEC) observer (ISTO) sites. Field RF Beacon ground receiver units for connection into ISTO network. Provide continuous on-orbit sensors health check and anomaly resolution support until the			

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206422SF / <i>Weather System Follow-on</i>
--	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
satellites reach their designed mission EoL. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc. FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	2.526

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

N/A

Remarks

E. Acquisition Strategy

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

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5 **R-1 Program Element (Number/Name)**
PE 1206422SF / *Weather System Follow-on* **Project (Number/Name)**
65A038 / *SSA Environmental Monitoring*

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total		Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete			
UCAR Sensor R&D	SS/CPFF	UCAR : TBD	-	-		-		0.711	Nov 2020	-		0.711	Continuing	Continuing	-	
On-Orbit Support (UCAR/JPL)	MIPR	UCAR/JPL : Boulder, CO	-	-		-		0.538	Nov 2020	-		0.538	Continuing	Continuing	-	
Ground Support (Resiliency)	Various	Various : TBD	-	-		-		0.171	Nov 2020	-		0.171	Continuing	Continuing	-	
Technical Mission Analysis	RO	Aerospace Corp : El Segundo, CA	-	-		-		0.394	Oct 2020	-		0.394	Continuing	Continuing	-	
Subtotal			-	-		-		1.814		-		1.814	Continuing	Continuing	N/A	

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total		Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete			
FFRDC	RO	Aerospace Corp : El Segundo, CA	-	-		-		0.640	Nov 2020	-		0.640	Continuing	Continuing	-	
Other Support	Various	Various : Various	-	-		-		0.072	Nov 2020	-		0.072	Continuing	Continuing	-	
Subtotal			-	-		-		0.712		-		0.712	Continuing	Continuing	N/A	

Project Cost Totals	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals		-	-	0.000	2.526	-	2.526	Continuing	Continuing	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206422SF / <i>Weather System Follow-on</i>	Project (Number/Name) 65A038 / <i>SSA Environmental Monitoring</i>
---	--	--

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

Space Situational Awareness	
Environmental Monitoring	
SSAEM Sensors Cal/Val	██████████
On Orbit Activities	██

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206422SF / <i>Weather System Follow-on</i>	Project (Number/Name) 65A038 / <i>SSA Environmental Monitoring</i>
---	--	--

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Space Situational Awareness Environmental Monitoring</i>				
SSAEM Sensors Cal/Val	1	2021	2	2021
On Orbit Activities	2	2021	2	2024

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206425SF / <i>Space Situation Awareness Systems</i>
--	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	173.074	0.000	173.074	310.602	75.509	57.280	329.317	244.006	1,189.788
65A006: <i>Space Based Space Surveillance</i>	0.000	0.000	0.000	173.074	0.000	173.074	310.602	75.509	57.280	329.317	244.006	1,189.788
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

Program MDAP/MAIS Code: 328

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206425F, Space Situation Awareness Systems, Project 65A006, Space Based Space Surveillance efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206425SF, Space Situation Awareness Systems, Project 65A006, Space Based Space Surveillance from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

The Space-Based Space Surveillance (SBSS) Block 10 satellite was launched September 2010 with a design life through 2018 and an extended operational capability through 2020. The SBSS Follow-On (SBSS FO) program will develop and deliver a system to continue providing space object surveillance from space post SBSS Block 10 End-of-Life. AFSPC and NRO have signed a Memorandum of Agreement partnering SBSS FO with an NRO program based on overlapping requirements. The new partner program is called SILENTBARKER. SILENTBARKER requirements are based on a Statement of Capabilities and upon the current Space Situational Awareness (SSA) Initial Capabilities Document architectural requirements focused on protecting High Value Assets. SILENTBARKER will provide the capability to search, detect, and track objects from a space-based sensor for timely custody and event detection. Surveillance from space augments and overcomes existing ground sensor limitations with timely 24-hour above-the-weather collection of satellite metric data only possible with a space-based sensor and then communicates its findings to the Combined Space Operations Center (CSpOC), National Space Defense Center (NSDC), and other classified users. This program element includes efforts related to SILENTBARKER, its integration into the broader space superiority architecture, and analysis and experimentation to ensure space-based space surveillance capabilities against the evolving threat.

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

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206425SF / <i>Space Situation Awareness Systems</i>
--	---

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

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	173.074	0.000	173.074
Total Adjustments	0.000	0.000	173.074	0.000	173.074
• 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	173.074	0.000	173.074

Change Summary Explanation

FY 2021: +\$173.074M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: SBSS Follow-On (SBSS FO) Design & Development	0.000	0.000	173.074
Description: Performs space based SSA analysis, research, and development for the SILENTBARKER system in partnership with SILENTBARKER.			
FY 2020 Plans: N/A			
FY 2021 Plans: Continue to support SILENTBARKER partner integration and test phase. Prepare for and conduct Test Readiness Review (TRR) prior to deployment. Enhances space environmental monitoring solutions. Continue SILENTBARKER constellation assets to expand coverage for deep space Space Situational Awareness (SSA). Continue implementation of ground mission data processing and data dissemination efforts in support of SILENTBARKER ground requirements. Conduct CDR for expansion effort. Identify requirements and technology enhancements to ensure space-based space surveillance capabilities against the evolving threat for future upgrades, extensions and augmentations.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206425SF / <i>Space Situation Awareness Systems</i>
--	---

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	173.074

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

N/A

Remarks

E. Acquisition Strategy

The Acquisition Strategy was approved to minimize the space-based SSA gap post-SBSS Block 10. SILENTBARKER anticipates Initial Launch Capability in FY 2022. The SBSS FO Materiel Development Decision was approved by the Milestone Decision Authority (MDA) on April 5, 2016. The Acquisition Strategy Panel was completed with the MDA on August 29, 2016. To satisfy the SSA architecture needs, the SBSS FO program requirements combined with an NRO program and were updated in the December 2017 SILENTBARKER Statement of Capabilities. The SBSS FO program remains a Space Force program, but will leverage NRO processes to fulfill SBSS FO space segment and telemetry, tracking, and commanding (TT&C) program segments in order to further National Security Space objectives. Mutual investment for the non-recurring engineering (NRE) cost enables the potential for a larger initial constellation buy and lower unit costs. The Space Force and NRO are implementing the approach to meet mission processing requirements, develop the ground architecture, and extend capabilities in 2020 and beyond.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force Date: February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206425SF / <i>Space Situation Awareness Systems</i>	Project (Number/Name) 65A006 / <i>Space Based Space Surveillance</i>
---	---	--

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
SBSS Follow On Prime Development	MIPR	Various : Various	-	-		-		147.812	Nov 2020	-		147.812	236.476	384.288	-
Technical Mission Analysis	Various	Various : Various, CA	-	-		-		1.965	Jan 2021	-		1.965	3.465	5.430	-
Enterprise SE&I	Various	Various : Various	-	-		-		1.699	Dec 2020	-		1.699	0.000	1.699	-
Subtotal			-	-		-		151.476		-		151.476	239.941	391.417	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FFRDC	RO	Aerospace Corp. : Los Angeles, CA	-	-		-		0.887	Dec 2021	-		0.887	3.465	4.352	-
A&AS	Various	Various : CA	-	-		-		20.587	Jan 2021	-		20.587	39.687	60.274	-
Other Support	Various	Various : Various	-	-		-		0.124	Mar 2021	-		0.124	0.400	0.524	-
Subtotal			-	-		-		21.598		-		21.598	43.552	65.150	N/A

	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
		Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Project Cost Totals	-	-		0.000		173.074		-		173.074	283.493	456.567	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force			Date: February 2020				
Appropriation/Budget Activity 3620F / 5		R-1 Program Element (Number/Name) PE 1206425SF / <i>Space Situation Awareness Systems</i>			Project (Number/Name) 65A006 / <i>Space Based Space Surveillance</i>		

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025							
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
SBSS Follow On																																
Technology Development, Engineering and Manufacturing Development, Production									██																							
Test Readiness Review (TRR)																	████															
Available for Launch																	████															
On-orbit Support																	██															
SBSS Follow On Expanded Coverage																																
Technology Development, Engineering and Manufacturing Development, Production									██								██															
Critical Design Review																	████															
Available for Launch																									████							
On-orbit Support																									██							

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206425SF / <i>Space Situation Awareness Systems</i>	Project (Number/Name) 65A006 / <i>Space Based Space Surveillance</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>SBSS Follow On</i>				
Technology Development, Engineering and Manufacturing Development, Production	1	2021	3	2022
Test Readiness Review (TRR)	4	2021	4	2021
Available for Launch	4	2022	4	2022
On-orbit Support	4	2022	4	2025
<i>SBSS Follow On Expanded Coverage</i>				
Technology Development, Engineering and Manufacturing Development, Production	1	2021	4	2024
Critical Design Review	4	2021	4	2021
Available for Launch	4	2024	4	2024
On-orbit Support	4	2024	4	2025

Note

Event dates are aligned with SILENTBARKER program threshold schedule.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206431SF / <i>Advanced EHF MILSATCOM (SPACE)</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	138.257	-	138.257	95.856	15.010	15.280	0.000	0.000	264.403
657104: <i>MILSATCOM Space Modernization Initiative (SMI)</i>	0.000	0.000	0.000	138.257	-	138.257	95.856	15.010	15.280	0.000	0.000	264.403
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

Program MDAP/MAIS Code: 261

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206431F, Advanced EHF MILSATCOM (SPACE) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206431SF, Advanced EHF MILSATCOM (SPACE) from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

The Space Force ability to deliver global satellite communications (SATCOM) is unprecedented, and the joint warfighter relies on this capability at all levels and across the range of military operations. SATCOM provides survivable communications for Presidential support and nuclear command and control, and affords national and military leaders a means to maintain strategic situational awareness and convey their intent to the Joint Force Commander (JFC). In order for the United States to maintain its asymmetric advantage of global space-based communications, the SATCOM enterprise must be prepared to "fight SATCOM" as a single enterprise through a Contested, Degraded and Operationally-limited (CDO) environment, prevent or withstand loss, and continue to deliver effects to warfighters.

The Space Modernization Initiative (SMI) strategy is to evolve current and future SATCOM systems to meet the needs of an integrated "Fighting SATCOM" Enterprise, sustain the existing AEHF system capability, develop a more affordable and resilient SATCOM enterprise capable of meeting near term and emerging requirements, demonstrate technologies and Concepts of Operations (CONOPS) that lead to a future Protected Anti-Jam Tactical SATCOM (PATS) capability that provides tactical level Military SATCOM (MILSATCOM) users protected, anti-jam satellite communications while operating in a contested environment, and develop an integrated (Commercial SATCOM (COMSATCOM and MILSATCOM) "Fighting SATCOM" Enterprise. PATS will provide tactical users significantly higher data rates than AEHF and a security architecture that enables forward deployed users to have protected satellite communications in scenarios where AEHF terminals cannot be deployed.

Under this construct the SMI will: 1) Continue the Capabilities Insertion Program (CIP) to enhance the current AEHF constellation and Protected Communications performance, and improve system operational resiliency, 2) Invest in technologies and demonstrations (e.g. Protected Tactical Service Field Demonstration (PTSFD)) that enable the future Protected Tactical Enterprise Service (PTES) and SATCOM programs by continued development of the Protected Tactical Testbed, and demonstrating resilient and affordable wideband protected technologies and CONOPS, 3) Demonstrate and develop a roadmap to evolve the current stove piped MILSATCOM Command and Control (C2) management system into an integrated "Fighting SATCOM" Enterprise, 4) Develop and demonstrate flexible terminal interface technologies with Services and SATCOM Terminal providers, and 5) Develop and demonstrate an improved integration of ground gateways and data networking with the space segment with the goal of providing seamless end to end SATCOM service for the warfighters in a CDO environment.

The FY 2021 funding request was reduced by \$7.224 million to account for the availability of prior year execution balances.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206431SF / <i>Advanced EHF MILSATCOM (SPACE)</i>
--	--

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

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

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

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	138.257	-	138.257
Total Adjustments	0.000	0.000	138.257	-	138.257
• 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	138.257	-	138.257

Change Summary Explanation

FY 2021: +\$138.257M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: Capabilities Insertion Program (CIP)	0.000	0.000	69.614
Description: Develop software that will increase the current AEHF constellation and Protected Communications capabilities, broaden overall user base, and accommodate a larger user population through improved resource utilization efficiencies. Develop modifications that will improve the Protected mission operational resiliency. Develop software to increase current AEHF terminal data rates with adaptive coding algorithms. Invest in technology demonstrations that improve the operational mission resiliency			

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>		R-1 Program Element (Number/Name) PE 1206431SF / <i>Advanced EHF MILSATCOM (SPACE)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
and effectiveness for all protected capabilities, which include, but are not limited to; Rapid Adaptive Planning and Situational Awareness for the Warfighter (RAPSAW), Mission Planning Element (MPE) 8.4, Cyber Defense-in-depth, etc.				
FY 2020 Plans: N/A				
FY 2021 Plans: Continue OR2/2B Phase 2, which adds capability to constellation and ground software updates. Other continuing projects include the RAPSAW resiliency effort that decreases the mission planning timelines, de-conflicts communication planning for the operators, and provides enhanced situational awareness of payload and terminal resources; MPE 8.4 - a capability improvement to the AEHF system that improves the Wideband EHF Beyond-Line-of-Sight Terminal (WEB-T) functionality and crypto redesign; and Cyber Defense-in-depth - that will deliver new system enhancements and upgrades to fortify AEHF against cyber security threats. This will provide new capabilities and functionality for defensive cyber operation and hardening against cyber-attacks on-orbit and on the ground. Invest in technology demonstrations that improve operational mission resiliency and effectiveness for all protected capabilities. These activities include, but are not limited to W/V Frequency utility, etc. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.				
FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: Protected Tactical Testbed		0.000	0.000	6.952
Description: Protected Tactical Testbed provides a government gold standard of reference for risk reduction and experimentation on critical technology elements for the space payload, terminals and networking segments of the PATS system. Supports the hardware development of the hub component for the PTES ground system and any necessary test capabilities to support either the over-the-air (OTA) or laboratory demonstrations for the PTSFD. It enables system integration capabilities with industry and FFRDC partners for interoperability testing and conducting experiments to mature the PATS operations, with a focus on the Protected Tactical Waveform (PTW). This effort is planned to move to PE 1206761SF, Protected Tactical Service (PTS) in FY 2022.				
FY 2020 Plans: N/A				
FY 2021 Plans: During PTES Phase I, testbed assets will continue to be developed and procured to support the PATS mission. Continue Testbed support to PTES Operational Demonstration and PTES extensibility to PTS. PTES, PTS and Army-Air Force Anti-Jam Modem				

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>		R-1 Program Element (Number/Name) PE 1206431SF / <i>Advanced EHF MILSATCOM (SPACE)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>(A3M) will utilize the test assets to develop Key Management Systems (KMS), Mission Management Systems (MMS), Joint Hub, Space Hub, and Terminal Modem Line Replacement Unit (TM LRU), and Terminal / Hub capability in support of risk reduction events and testing of numerous over-the-air, interoperability demonstrations, is planned to include: a) demonstration of PTW of Kirameki Satellites (in cooperation with Japan) which will mature International Partner user CONOPS within PATS; b) maturation and demonstration of Enterprise Management and Control functions while roaming between MILSATCOM and COMSATCOM systems; and c) participation in Navy Trident Warrior exercise which helps mature PTW COCOM CONOPS. Protected Tactical Testbed is planned to move to PE 1206761SF, PTS in FY 2022.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
<p>Title: Army-Air Force Anti-Jam Modem (A3M)</p> <p>Description: The A3M will develop PTW modems that meet all environmental, integration, and mission requirements for Satellite Transportable Terminal (STT) and Ground Multi-band Terminal (GMT) tactical users. A3M development includes fabrication of pre-production modems, development of operator training materials, fielding, and sustainment planning.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue modem development, conduct Critical Design Reviews (CDR), fabrication of pre-production modems and developmental testing including National Cyber Range (NCR), blue and red team testing. Continue GMT modification preparation, cable design and non-recurring engineering.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>		0.000	0.000	18.479
<p>Title: Fighting SATCOM Enterprise</p> <p>Description: Warfighters require SATCOM capabilities that can effectively operate in a CDO environment. Some key areas that are the focus of this effort: 1) Provide situational awareness and synchronization of operations across the SATCOM enterprise; 2) Provide Full-spectrum Defensive Space Control (DSC) allowing warfighters to communicate through any operational environment; 3) Manage and direct COMSATCOM resources employed by DoD users; 4) Develop flexible terminal interface standards for adoption by Service terminal program offices to operate on a variety of waveforms over varying frequencies and providers with quick transition or, when possible, simultaneously; 5) Enable users to maintain their networks when transitioning to different beams, antennas, satellite, or systems; 6) Improve the cyber resiliency for warfighters, protecting their operational information as</p>		0.000	0.000	43.212

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206431SF / <i>Advanced EHF MILSATCOM (SPACE)</i>
--	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
well as their communications data and control systems in the face of a determined and sophisticated attacker; and 7) Enable data interoperability with joint command and control systems.			
FY 2020 Plans: N/A.			
FY 2021 Plans: This is not a New Start, as it transitions the effort started under Program Element 1206445F, COMSATCOM Integration. This effort will focus on a Fighting SATCOM Enterprise and the award of Block 0 effort necessary to: 1) integrate the tools to provide SATCOM capability to global warfighters and restore services in tactically-relevant timelines, and 2) improve resilience and operational agility in CDO environments, by leveraging DoD and commercial systems, capabilities, and products to deliver connectivity to users in all operational conditions. Achieve Block 0 Initial Operational Capability (IOC). Begin Block I, utilizing a development operations approach.			
FY 2020 to FY 2021 Increase/Decrease Statement: N/A.			
Accomplishments/Planned Programs Subtotals	0.000	0.000	138.257

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2021</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u>	<u>Total Cost</u>
			<u>Base</u>	<u>OCO</u>	<u>Total</u>					<u>Complete</u>	
• SPAF 01 ADV555:: <i>Advanced EHF</i>	28.329	21.894	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	50.223
• SPSF 01 ADV555:: <i>Advanced EHF</i>	0.000	0.000	14.823	-	14.823	0.000	0.000	0.000	0.000	0.000	14.823
• SPSF 01 MILSAT: <i>MILSATCOM</i>	0.000	0.000	4.518	-	4.518	17.001	8.993	0.000	0.000	0.000	30.512

Remarks
The FY21-23 MILSAT SPSF above funds the production of the A3M. A3M is a joint effort between the MILSATCOM Directorate (SMC) and the Program Manager (PM) Tactical Networks (TM), Aberdeen Proving Ground (APG) to develop a common modem for the AF GMT and Army STT. Leveraging similar mission and environmental requirements enables selection of the high water mark requirements to meet both mission parameters with greater efficiency while reducing risk and lifecycle cost.

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206431SF / <i>Advanced EHF MILSATCOM (SPACE)</i>
--	--

"Fighting SATCOM" Enterprise intends to utilize the Middle Tier Acquisition Section 804 authorities to develop rapid operational prototype capabilities in blocks starting in FY 2021. This work leverages the Wideband Communication Analysis (WCS) Analysis of Alternatives (AoA) Final Report (2019) and the Protected Satellite Communication Services (PSCS) AoA Final Report (2016). Findings in both AoA reports identified the need for an enterprise approach to managing SATCOM in an aggregated architecture for both cost savings and the necessary responsiveness to counter evolving threats. Market research has identified high Technology Readiness Level products; and prototyping demonstrated mature interfaces and architectures to enable rapid capabilities that are "Fighting SATCOM" Enterprise-aligned.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206431SF / <i>Advanced EHF MILSATCOM (SPACE)</i>	Project (Number/Name) 657104 / <i>MILSATCOM Space Modernization Initiative (SMI)</i>
---	--	--

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Capabilities Insertion Program (CIP)	SS/CPIF	Lockheed Martin : Sunnyvale, CA	-	-		-		61.185	Oct 2020	-		61.185	Continuing	Continuing	-
W/V Frequency utilization demonstration	MIPR	AFRL : Various	-	-		-		8.554	Nov 2020	-		8.554	Continuing	Continuing	-
Protected Tactical Testbed	Various	Various : Various	-	-		-		6.123	Dec 2020	-		6.123	Continuing	Continuing	-
A3M PTW Modem Development	C/TBD	TBD : TBD	-	-		-		16.100	Nov 2020	-		16.100	Continuing	Continuing	-
Fighting SATCOM Enterprise	TBD	Not specified. : TBD	-	-		-		35.063	Jan 2021	-		35.063	Continuing	Continuing	-
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	-		-		2.300	Oct 2020	-		2.300	Continuing	Continuing	-
Enterprise SE&I	C/CPAF	Linquest : Los Angeles, CA	-	-		-		3.497	Oct 2020	-		3.497	Continuing	Continuing	-
Subtotal			-	-		-		132.822		-		132.822	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FFRDC	MIPR	Aerospace : El Segundo, CA	-	-		-		2.000	Oct 2020	-		2.000	Continuing	Continuing	-
Other Support	Various	Various : Various	-	-		-		0.300	Nov 2020	-		0.300	Continuing	Continuing	-
A&AS	Various	Various : Various	-	-		-		3.135	Oct 2020	-		3.135	Continuing	Continuing	-
Subtotal			-	-		-		5.435		-		5.435	Continuing	Continuing	N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract		
Project Cost Totals		-	-	0.000	-	138.257	-	138.257	Continuing	Continuing	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206431SF / <i>Advanced EHF MILSATCOM (SPACE)</i>	Project (Number/Name) 657104 / <i>MILSATCOM Space Modernization Initiative (SMI)</i>

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<i>MILSATCOM Space Modernization Initiative</i>																												
CIP: MPE 8.4 Design Release									██████████																			
CIP: Operational Resiliency - Phase 2									██████████																			
W/V Frequency Utilization demonstration									██████████																			
Protected Tactical Testbed: Support End to End OTA Demonstration (TM LRU, MMS, PHEC)									██████████				██████████				██████████				██████████				██████████			
A3M PTW Modem SFRR, PDR, CDR									██████████																			
A3M PTW Modem Block I Production / Block II Development													██████████															
Fighting SATCOM Enterprise RFP, Source Selection/Contract Award													██████															
Fighting SATCOM Enterprise Block 0 IOC													██████															
Fighting SATCOM Development Ops Approach Block 1																	██████████											

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206431SF / <i>Advanced EHF MILSATCOM (SPACE)</i>	Project (Number/Name) 657104 / <i>MILSATCOM Space Modernization Initiative (SMI)</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>MILSATCOM Space Modernization Initiative</i>				
CIP: MPE 8.4 Design Release	1	2021	4	2022
CIP: Operational Resiliency - Phase 2	1	2021	3	2022
W/V Frequency Utilization demonstration	1	2021	4	2022
Protected Tactical Testbed: Support End to End OTA Demonstration (TM LRU, MMS, PHEC)	1	2021	4	2025
A3M PTW Modem SFRR, PDR, CDR	1	2021	2	2022
A3M PTW Modem Block I Production / Block II Development	4	2021	4	2022
Fighting SATCOM Enterprise RFP, Source Selection/Contract Award	1	2021	2	2021
Fighting SATCOM Enterprise Block 0 IOC	3	2021	4	2021
Fighting SATCOM Development Ops Approach Block 1	1	2022	4	2022

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206432SF / <i>Polar MILSATCOM (SPACE)</i>
--	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	190.235	0.000	190.235	129.455	35.539	10.069	0.000	10.342	375.640
654215: <i>EPS Recap</i>	0.000	0.000	0.000	190.235	0.000	190.235	129.455	35.539	10.069	0.000	10.342	375.640
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

Program MDAP/MAIS Code: 121

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206432F, Polar MILSATCOM (SPACE) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206432SF, Polar MILSATCOM (SPACE) from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

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

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

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

The FY 2021 funding request was reduced by \$1.702 million to account for the availability of prior year execution balances.

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206432SF / <i>Polar MILSATCOM (SPACE)</i>
--	---

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

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

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

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	190.235	0.000	190.235
Total Adjustments	0.000	0.000	190.235	0.000	190.235
• 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	190.235	0.000	190.235

Change Summary Explanation

FY 2021: +\$190.235M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: Space Segment	0.000	0.000	103.837
Description: Develop and acquire two EHF payloads, using AEHF's XDR waveform, for integration on host spacecraft.			
FY 2020 Plans: N/A			
FY 2021 Plans: Continue development, fabrication, and testing of the two EPS-R payloads that were initiated in FY 2018. Ship one of two payloads to space vehicle (SV) vendor for integration onto the SV. Continue developing interface documentation and integration plans with international partner. Fund FY 2021 USAF share of Arctic Memorandum of Agreement (MOA) collaboration costs for hosting of the EPS-R payloads. Facilitate coordination between Space Norway, space vehicle vendor, and payload contractor.			

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>		R-1 Program Element (Number/Name) PE 1206432SF / <i>Polar MILSATCOM (SPACE)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Provide representation, technical expertise, and assistance as necessary at Space Norway and/or space vehicle vendor facilities to support activities including payload integration and testing. Continue cyber certification efforts to include crypto procurement activities. Support development and integration for the EPS-R system strategic requirements. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
<p>Title: Ground Updates</p> <p>Description: Modify and upgrade the existing EPS CAPS to provide command and control and XDR mission planning capability for the two new payloads.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue risk reduction efforts on and upgrade CAPS. Conduct Software Item Qualification Test (SIQT) for EPS-R CAPS Software (SW) items. Deliver Factory Acceptance Test (FAT) SW build. Conduct integration testing demonstrating interoperability of EPS-R CAPS with space vehicle, Host ground, and EPS-R payload. Accomplish link functionality testing between EPS-R CAPS and Space Norway Space Operations Center (SOC) location. Support development and integration for the EPS-R system strategic requirements. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>		0.000	0.000	51.618
<p>Title: Gateway Updates</p> <p>Description: Modify and upgrade the existing EPS Gateway to support the two new payloads.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans:</p>		0.000	0.000	34.780

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206432SF / <i>Polar MILSATCOM (SPACE)</i>
--	---

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Execute risk reduction efforts, EPS Gateway upgrades, and system integration testing. Continue installation efforts for a second telemetry and control terminal. Upgrade additional telemetry and control terminals as necessary to support EPS-R. Support development and integration for the EPS-R system strategic requirements.			
<i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	190.235

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• RDTE 04 1206434F: <i>Midterm Polar MILSATCOM System</i>	370.353	-	-	-	-	-	-	-	-	0.000	370.353

Remarks

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

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206432SF / Polar MILSATCOM (SPACE)	Project (Number/Name) 654215 / EPS Recap
---	---	--

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
EPS-R Tactical Payloads 1-2	SS/CPIF	NGAS : Redondo Beach, CA	-	-		-		84.933	Nov 2020	-		84.933	77.379	162.312	409.958
Control and Planning Segment Upgrades	SS/CPIF	NGMS : Redondo Beach, CA	-	-		-		42.221	Nov 2020	-		42.221	24.092	66.313	82.320
Gateway Upgrades	Various	Various : Various, CA	-	-		-		28.448	Nov 2020	-		28.448	26.191	54.639	68.895
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	-		-		9.264	Nov 2020	-		9.264	12.088	21.352	-
Enterprise SE&I	C/CPAF	LinQuest : Los Angeles, CA	-	-		-		19.063	Nov 2020	-		19.063	17.357	36.420	-
Subtotal			-	-		-		183.929		-		183.929	157.107	341.036	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FFRDC	MIPR	Aerospace : El Segundo, CA	-	-		-		2.316	Oct 2020	-		2.316	3.697	6.013	-
A&AS	Various	Various : Various	-	-		-		3.840	Oct 2020	-		3.840	14.009	17.849	-
Other Support	Various	Various : Various	-	-		-		0.150	Oct 2020	-		0.150	0.250	0.400	-
Subtotal			-	-		-		6.306		-		6.306	17.956	24.262	N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals		-	-	0.000	190.235	-	190.235	175.063	365.298	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206432SF / <i>Polar MILSATCOM</i> (SPACE)	Project (Number/Name) 654215 / <i>EPS Recap</i>

FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

Space Segment	
Payload Design/Build	████████████████████
International Collaboration w/ Norway	██
Space Vehicle Integration/Test	████████████████████████████
Payloads Ready to Ship	████████
Ground and Gateway Upgrades/ Modifications	
Risk Reduction Activities/Studies	██
Acquire Telemetry and Control Terminals	████████████████████████████
Upgrades/Modifications	██
System Level Integration and Test	██

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206432SF / <i>Polar MILSATCOM</i> (SPACE)	Project (Number/Name) 654215 / <i>EPS Recap</i>

Schedule Details

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

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	2,318.864	0.000	2,318.864	2,319.702	2,668.900	3,074.872	2,646.907	Continuing	Continuing
657009: <i>Space Mod Initiative</i>	-	0.000	0.000	209.662	0.000	209.662	200.731	221.338	225.324	229.451	Continuing	Continuing
657106: <i>Next-Gen OPIR Ground</i>	-	0.000	0.000	498.289	0.000	498.289	539.678	340.381	357.839	364.393	Continuing	Continuing
657120: <i>Next-Gen OPIR Space, Block 0 GEO</i>	-	0.000	0.000	1,128.900	0.000	1,128.900	1,157.467	1,330.876	1,316.512	728.974	Continuing	Continuing
657121: <i>Next-Gen OPIR Space, Block 0 Polar</i>	-	0.000	0.000	482.013	0.000	482.013	421.826	581.657	579.027	717.000	Continuing	Continuing
657122: <i>Next-Gen OPIR Space, Block 1*</i>	-	0.000	0.000	0.000	0.000	0.000	0.000	194.648	596.170	607.089	Continuing	Continuing

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2021

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206442F, Next Generation Overhead Persistent Infrared (Next-Gen OPIR) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation (RDT&E), Space Force, PE 1206442SF, Next-Gen OPIR from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

1. Next-Generation Overhead Persistent Infrared (OPIR) Space Modernization Initiative (SMI) (Project 657009): SMI supports Next-Gen OPIR by assessing and demonstrating new technologies to better enable detection of emerging global missile threats and awareness of material obsolescence. Additionally, SMI supports space and ground design efforts focused on delivering affordable capabilities, maximizing the effectiveness of existing system data products. SMI funds engineering activities to reduce both production and future system costs through manufacturing improvements, producibility enhancements, and technology insertion. SMI will also mature potential technology upgrades at the component and system level for space and ground architecture enhancements. SMI includes studies and risk reduction activities to evolve the current SBIRS Program of Record (PoR) constellation, reduce production timelines, and reduce recurring production costs. SMI activities are balanced and phased to enable an expanded trade space and improve the competitive environment. The three major thrust areas under SMI are Demonstrations, Technology Maturation and Data Exploitation. The Demonstrations mature and demonstrate technologies with ground and on-orbit prototypes. Demonstrations advance system performance and algorithms for tactical and strategic applications to enhance PoR capabilities. Finally, demonstrations reduce program risks for future OPIR systems, whether new systems or evolutions of the current PoR. Technology Maturation assesses and addresses needs to support resiliency of PoR assets and future architectures that must respond to an evolving threat environment. Data Exploitation enables access to OPIR data sources to expand technical intelligence products, battlespace awareness processing, and data dissemination tools to support warfighters and other data users.

2. Next-Gen OPIR Ground (Project 657106): Next-Gen OPIR Ground, also known as Future Operationally Resilient Ground Evolution (FORGE), consists of Command and Control (C2) migration to the Space Force's Enterprise Ground Services (EGS), modernization of Mission Data Processing (MDP) to implement an open framework, and required development and/or upgrades to Relay Ground Stations (RGS) to meet United States Space Command guidance on the current and future space domain

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>
--	--

demands. FORGE and EGS efforts combined will provide the flexibility and scalability to integrate new satellites, sensors, and capabilities more rapidly and efficiently in order to meet evolving threats and warfighter needs. The Next-Gen OPIR ground efforts enable cyber enhancements for both space and ground systems. EGS will introduce common ground services such as Telemetry, Tracking, and Command (TT&C); mission management; and automation. To support initial Next-Gen OPIR Space satellite launches without driving risks into the FORGE development schedule, the program will establish a risk reduction ground Next-Gen OPIR Interim Operations (NIO) capability based on a limited Space Based Infrared System (SBIRS) Block 20 solution that can be utilized if FORGE is delayed.

3. Next-Gen OPIR Space: Next-Gen OPIR implements the direction of the Joint Requirements Oversight Council Memorandum (JROCM) 130-17, dated 21 December 2017, by developing the next generation of strategically survivable space-based missile warning OPIR platforms in both GEO and Polar orbits. This program is a transition from the legacy SBIRS to a program that will deliver improved core missile warning capabilities that are more survivable against emerging threats. The full Next-Gen OPIR constellation will consist of a minimum of Geosynchronous Earth Orbit (GEO) and Polar satellites in sufficient number to meet global warning coverage with no exploitable holes (5 GEO + 2 Polar) plus required backup for attrition or reconstitution reserves. The Space Force intends to acquire Next-Gen systems in block procurements. The Block 0 acquisition strategy consists of three GEO and two Polar satellites. The first GEO satellite is required no later than FY 2025 and the first Polar satellite is required in FY 2027. All five Block 0 satellites need to be on orbit by FY 2029. Follow-on blocks will be addressed in future acquisition strategies.

Next-Gen OPIR Space, Block 0 GEO (GEO) (NGG) (Project 657120): The Program Office intends to acquire the NGG capability in two contract actions. Phase 1, awarded in August 2018, encompasses requirements analysis, design/development, critical path flight hardware procurement, and risk reduction efforts leading to a System CDR. Phase 2 will be awarded in FY 2021 for the manufacturing, assembly, system integration and test, launch, and early on-orbit test, through operational acceptance of NGG satellites 1-3.

Next-Gen OPIR Space, Block 0 Polar (NGP) (Project 657121): The Program Office intends to acquire the NGP capability in three contract actions. Phase 0, awarded in June 2018, encompasses system and payload requirements analysis and risk reduction efforts leading to a System Requirements Review. Phase 1 will include design and development, critical path flight hardware procurement, and risk reduction efforts leading to a System CDR. Phase 2 will be awarded for the manufacturing, assembly, integration and test, and early on-orbit test, through operational acceptance of NGP satellites 1 and 2.

Next-Gen OPIR Space, Block 1 (Project 657122): The Space Force plans to acquire subsequent blocks in a competitive environment. The Block 1 satellites will be based on the Missile Warning and Missile Defense OPIR Capability Development Document (CDD), validated by the Joint Requirements Oversight Council (JROC) in May 2019. The Next Gen OPIR Block 1 program acquisition will begin in FY 2023 in time to deliver its first satellite by FY 2030.

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>
--	--

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

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

B. Program Change Summary (\$ in Millions)	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	2,318.864	0.000	2,318.864
Total Adjustments	0.000	0.000	2,318.864	0.000	2,318.864
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	2,318.864	0.000	2,318.864

Change Summary Explanation

FY 2021: +\$2318.864M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force; total includes a \$329.344M increase to cover unfunded FY 2020 scope for work on GEO Block 0.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3620F / 5					R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>				Project (Number/Name) 657009 / <i>Space Mod Initiative</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
657009: <i>Space Mod Initiative</i>	-	0.000	0.000	209.662	0.000	209.662	200.731	221.338	225.324	229.451	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206442F, Next Generation OPIR efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206442SF, Next Generation OPIR from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

Next-Generation Overhead Persistent Infrared (OPIR) Space Modernization Initiative (SMI) (Project 657009): SMI supports Next-Gen OPIR by assessing and demonstrating new technologies to better enable detection of emerging global missile threats and awareness of material obsolescence. Additionally, SMI supports space and ground design efforts focused on delivering affordable capabilities, maximizing the effectiveness of existing system data products. SMI funds engineering activities to reduce both production and future system costs through manufacturing improvements, producibility enhancements, and technology insertion. SMI will also mature potential technology upgrades at the component and system level for space and ground architecture enhancements. SMI includes studies and risk reduction activities to evolve the current SBIRS Program of Record (PoR) constellation, reduce production timelines, and reduce recurring production costs. SMI activities are balanced and phased to enable an expanded trade space and improve the competitive environment. The three major thrust areas under SMI are Demonstrations, Technology Maturation and Data Exploitation. The Demonstrations mature and demonstrate technologies with ground and on-orbit prototypes. Demonstrations advance system performance and algorithms for tactical and strategic applications to enhance PoR capabilities. Finally, demonstrations reduce program risks for future OPIR systems, whether new systems or evolutions of the current PoR. Technology Maturation assesses and addresses needs to support resiliency of PoR assets and future architectures that must respond to an evolving threat environment. Data Exploitation enables access to OPIR data sources to expand technical intelligence products, battlespace awareness processing, and data dissemination tools to support warfighters and other data users.

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

	FY 2019	FY 2020	FY 2021
Title: Demonstrations	0.000	0.000	95.520
<p>Description: Demonstrations mature and demonstrate OPIR technologies with ground and on-orbit prototypes advance system performance, algorithms, and resiliency for future OPIR systems. The demonstrations explore technology maturation, qualification of new components, and subsystem/component prototyping to evolve the OPIR architecture. The demonstrations support maturation of Mission Data Processing (MDP) algorithms for tactical and strategic applications which are critical efforts to enhance PoR capabilities and to reduce program risks for future OPIR systems.</p> <p>The Wide Field Of View (WFOV) demonstration matures WFOV technology and validates multi-mission capabilities including the potential for a single sensor to simultaneously perform strategic and tactical missions. WFOV is ready for launch in FY 2021. Collection of on-orbit WFOV data is critical to develop algorithms to process large data sets generated by emerging large format focal planes and reduce risk for future architectures. The WFOV payload and bus are separate development efforts. The WFOV testbed program provides a bus capable of demonstrating on-orbit mission performance and mitigating the development risks for</p>			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657009 / <i>Space Mod Initiative</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>employing WFOV sensors. The testbed program will integrate, test, and launch a prototype WFOV payload with a government-owned free-flyer spacecraft. The WFOV testbed will host the WFOV payload. As an integrated Space Vehicle, the WFOV system will prove on-orbit mission performance of WFOV sensors. The WFOV payload will provide the critical on-orbit data required to develop and validate WFOV algorithms, as well as on-board MDP throughput requirements for strategic missile warning.</p> <p>The Block 1 Prototype (space vehicle) is under development and will be responsive to emerging missile types and threats to the current missile warning architecture as well as evolving threats to the enterprise. The Block 1 Prototype will inform future OPIR architecture to include those achieved by the Space Force, Missile Defense Agency (MDA), and other mission partners. The Block 1 Prototype has a Class-C mission assurance with a 3-5 year designed mission life. The Block 1 Prototype is targeting an initial launch capability beginning in 2025. The technology demonstrations will incorporate resiliency capabilities while advancing the state of the art performance technology. The demonstrations will focus on the rapid advancement, technology insertion, and launch of future generations of missile warning technologies. These assets will incorporate threat mitigation technologies and other resiliency features with the goal of demonstrating these technologies in ground and on-orbit. These demonstrations will facilitate tech insertion, validate technical performance, inform future OPIR requirements, and reduce technical risk to the enterprise.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: WFOV Demonstration: Finalize launch service integration campaign. Demo ready for launch in FY 2021. Complete WFOV OCONUS ground infrastructure bed-down. Complete Blossom Point Tracking Facility integration to support Command and Control (C2) and data dissemination. Finalize on-orbit mission calibration planning and execution. Continue support of WFOV Space Vehicle maintenance and storage. Complete any remaining integrated WFOV Space Vehicle end-to-end test and maintenance. Continue Systems Engineering, Integration and Test (SEIT) activities including pre-launch preparations, mission operations planning, and training. Conduct on-orbit checkout operations and initiate execution of the experimentation plan.</p> <p>Block 1 Prototype: Execute option for up to two contractors that culminates in a tailored delta Preliminary Design Review (PDR) progressing to a Space Vehicle PDR in FY 2022. Continue to mature ground integration plan. Begin development of engineering model for a resiliency ground demonstration sensor test bed. Continue procuring long lead items. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
Title: Technology Maturation		0.000	0.000	44.719

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657009 / <i>Space Mod Initiative</i>
---	--	--

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
---	----------------	----------------	----------------

Description: Assess technology needs to support resiliency of PoR assets and future architectures that are responsive to the evolving threat environment. Perform trade and design studies to assess obsolescence, affordability, capability design modifications, and CONOPS for the OPIR mission. Mature technologies and manufacturability to reduce cost, schedule, and technical risk for new component and subsystem designs that may be used in the future systems. Mature technologies including algorithms, Focal Plane Arrays (FPA), optical filters, on-board processors, auxiliary resiliency payloads, and other payload components for future missile warning satellites, and reconstitution capabilities. Develop modeling and simulation (M&S) capabilities, and engineering model prototypes for hardware/software integration and testing. These efforts will reduce risk and mature technologies applicable to future systems and architectures. Additionally, develop a sensor ground test bed incorporating M&S software, breadboards/brassboards, test equipment, and data reduction software to provide an evaluation capability for prototype systems and hardware. The test bed will validate/verify requirements and ensure technical maturity for next-gen payload technologies as well as threat mitigation components and techniques.

FY 2020 Plans:

N/A

FY 2021 Plans:

Initiate development of critical technologies that directly impact the performance of current technology efforts (Back-end electronics, cryocoolers, etc). Continue prototyping resilient hardware and maturing critical technologies that include large format FPAs, resilient FPAs, resilient processing algorithms, pointing mirrors, threat sensors, and processors for earliest integration into Next Gen OPIR or similar programs. Continue to develop technology options to address emerging threats and stressing targets to current and future OPIR systems. Continue to develop and space qualify emerging technologies to reduce risk for Next Gen OPIR satellites. Continue to develop system resiliency and advanced technology concepts via Hardware-in-the-Loop (HWIL) modeling and simulations in order to demonstrate performance, develop CONOPS, and prove enhanced system capabilities. Continue the integration of sensor test bed components and conduct resiliency characterization tests in the sensor ground test bed. Continue to develop on-board algorithms that support processing of large format arrays. Continue to enhance system response to emerging threats and stressing targets. Begin maturation of sensor and bus modularity concepts.

FY 2020 to FY 2021 Increase/Decrease Statement:

N/A

Title: Data Exploitation

0.000	0.000	69.423
-------	-------	--------

Description: Data exploitation efforts will exploit existing OPIR data sources including Defense Support Program (DSP), SBIRS Highly Elliptical Orbit (HEO), SBIRS GEO Scanner, SBIRS GEO Starer, prototypes, and other sources. Efforts will exploit data through collection, processing, fusion, data dissemination, algorithm development and testing, network connectivity, and sensor performance assessments. SBIRS and other sensors provide a rich data set for exploitation. SMI data exploitation enables access to raw and processed data for data analysts and application developers to expand capabilities for battlespace awareness and

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force	Date: February 2020
---	----------------------------

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657009 / <i>Space Mod Initiative</i>
---	--	--

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>other applications. SMI data exploitation efforts are complementary to, and enhance, the exploitation capabilities delivered by the PoR and prototypes. SMI will develop tools and algorithms to enable users to apply OPIR data to support their mission needs. Data exploitation efforts also evaluate tools for C2, mission management, and MDP to reduce risk. Data exploitation efforts evolve the PoR ground system to an open architecture that could support PoR and other future satellite alternatives. SMI ground system development activities seek to demonstrate the performance of an evolved ground system architecture capable of supporting multiple satellites, payloads, and missions through management and data processing. These efforts seek to lower operating costs with enhanced net-centric and service oriented features with a new flexible expansion capability. Data exploitation efforts support demonstration and prototype architecture planning and experimentation.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Begin operations of data exploitation lab capability. Support experimentation, technology maturity, and evolution of exploitation algorithms. Continue to provide enhanced ground segment capability and tools for C2, data collection, mission processing, and data dissemination. Enhance mission resiliency and data exploitation of SBIRS and other OPIR data. Continue to collaborate with Intelligence Community (IC) and MDA to enhance Joint OPIR Ground (JOG) study initiatives. Continue development of applications for data exploitation of Infrared (IR) data within the data exploitation lab. Continue development and expansion of a Battlespace Awareness real-time capability in the OPIR Battlespace Awareness Center (OBAC) that will integrate applications and services matured in the data exploitation government lab. Continue to develop, expand, and manage the common open framework architecture of the data exploitation lab and real-time OBAC capability. Support development of experimental operations and additional uses of the program of record data in the OBAC. Develop prototype processes for managing an open framework architecture. Develop applications for the OBAC that transition to the Future Operationally Resilient Ground Evolution (FORGE). Develop and demonstrate the performance of a Government owned open and extensible evolved ground system architecture to support multiple satellites, payloads, and missions. Demonstrate data processing for any infrared payload with enhanced net-centric and service oriented features with a flexible expansion capability. Incorporate results from WFOV payload calibration into WFOV MDP software. Develop and test WFOV calibration algorithm and execute the WFOV on-orbit calibration. Support demonstration and prototype architecture planning and experimentation.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>			
Accomplishments/Planned Programs Subtotals	0.000	0.000	209.662

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657009 / <i>Space Mod Initiative</i>
---	--	--

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• SPAF 01 Line 13: <i>MSSBIR: SBIR High (Space)</i>	108.397	233.952	176.007	-	176.007	55.188	8.337	8.487	0.000	Continuing	Continuing
• RDTE 05 1206441F: <i>Space Based Infrared System (SBIRS) High EMD</i>	60.565	-	-	-	-	-	-	-	-	0.000	60.565

Remarks

D. Acquisition Strategy

The program office will use a variety of acquisition approaches to execute various concept studies, technology maturation efforts, testbed/prototype demonstrations, and data exploitation initiatives and projects. The program office will collaborate with appropriate contracting agencies to support each individual effort. Data exploitation efforts in the laboratory and the Battlespace Awareness center will leverage existing external contracts, as well as new internal competitive contracts. Activities, such as SBIRS obsolescence and affordability enhancements to the existing satellite design, will leverage existing Program of Record contracts. Technology maturation and component prototyping and/or qualification could leverage existing contracts. Broad Agency Announcements (BAAs) and Other Transaction Authorities are planned in collaboration with Air Force Research Lab (AFRL) and other government agencies. Where practical, other efforts are competed. An SMC BAA will be used to acquire and mature high priority technology items. Federally Funded Research and Development Center (FFRDC), University Affiliated Research Centers (UARCs), and Systems Engineering and Technical Assistance (SETA) contractors will also be used to conduct and support studies. New technology, replacement components, and system designs will be acquired with government data rights to the maximum extent, allowing incorporation into future OPIR satellite production or system development. Contracting partnerships with other agencies will also be used to study, develop, demonstrate, and prove emerging capabilities. Funding in execution years will be realigned within the Next-Gen OPIR program element to respond to execution requirements. To accelerate contracting actions and program execution, a local SMC contract vehicle will be utilized for the OPIR Battlespace Awareness Center (OBAC) and government lab services.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657009 / <i>Space Mod Initiative</i>
---	--	--

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Demonstrations	Various	Various : Various	-	-		-		86.201	Dec 2020	-		86.201	Continuing	Continuing	-
Technology Maturation	Various	Various : Various	-	-		-		40.356	Jan 2021	-		40.356	Continuing	Continuing	-
Data Exploitation	Various	Various : Various	-	-		-		62.651	Jan 2021	-		62.651	Continuing	Continuing	-
Technical Mission Analysis	RO	Aerospace : El Segundo, CA	-	-		-		7.781	Oct 2020	-		7.781	Continuing	Continuing	-
Subtotal			-	-		-		196.989		-		196.989	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	Various	Various : Various	-	-		-		4.986	Dec 2020	-		4.986	Continuing	Continuing	-
A&AS	Various	Various : Various	-	-		-		1.387	Oct 2020	-		1.387	Continuing	Continuing	-
Other Support	Various	Various : Various	-	-		-		6.300	Jan 2021	-		6.300	Continuing	Continuing	-
Subtotal			-	-		-		12.673		-		12.673	Continuing	Continuing	N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-	0.000	209.662	-	209.662	Continuing	Continuing	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force Date: February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / Next Generation OPIR	Project (Number/Name) 657009 / Space Mod Initiative
--	--	--

FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				

<i>Demonstrations - WFOV Testbed</i>																							
Ready for Launch & on-orbit calibration								██████████															
WFOV On-Orbit Demo												██											
<i>Demonstrations - Block 1 Prototype</i>																							
Development								████████████████████████████															
Preliminary Design Review												██████████											
Build												██											
Integration and Test																				████████████████████			
<i>Technology Maturation</i>																							
BAA Awards (annual calls)								██															
Component design & test								██															
<i>Data Exploitation</i>																							
BAA Follow-on								██															
Government Lab & OBAC Support Services								██															

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657009 / <i>Space Mod Initiative</i>
---	--	--

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Demonstrations - WFOV Testbed</i>				
Ready for Launch & on-orbit calibration	2	2021	4	2021
WFOV On-Orbit Demo	4	2021	4	2025
<i>Demonstrations - Block 1 Prototype</i>				
Development	1	2021	2	2022
Preliminary Design Review	1	2022	1	2022
Build	2	2022	4	2025
Integration and Test	4	2024	4	2025
<i>Technology Maturation</i>				
BAA Awards (annual calls)	1	2021	4	2025
Component design & test	1	2021	4	2025
<i>Data Exploitation</i>				
BAA Follow-on	1	2021	4	2025
Government Lab & OBAC Support Services	1	2021	4	2025

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3620F / 5					R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>				Project (Number/Name) 657106 / <i>Next-Gen OPIR Ground</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
657106: <i>Next-Gen OPIR Ground</i>	-	0.000	0.000	498.289	0.000	498.289	539.678	340.381	357.839	364.393	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206442F, Next Generation OPIR efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206442SF, Next Generation OPIR from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

Next-Gen OPIR Ground (Project 657106): Next-Gen OPIR Ground, also known as Future Operationally Resilient Ground Evolution (FORGE), will consist of Command and Control (C2) migration to US Space Force (USSF) HQ Enterprise Ground Services (EGS), modernization of Mission Data Processing (MDP) to implement an open framework, and required development and/or upgrades to Relay Ground Stations (RGS) to meet USSF HQ guidance on the current and future space domain demands. FORGE and EGS efforts combined will provide the flexibility and scalability to integrate new satellites, sensors and capabilities more rapidly and efficiently in order to meet evolving threats and warfighter needs. The Next-Gen OPIR ground efforts enable cyber enhancements for both space and ground systems. EGS will introduce common ground services such as Telemetry, Tracking, and Command (TT&C); mission management; and automation. To support initial Next-Gen OPIR Space satellite launches without driving risks into the FORGE development schedule, the program will establish a risk reduction ground Next-Gen OPIR Interim Operations (NIO) capability based on a limited Space Based Infrared System (SBIRS) Block 20 solution.

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

	FY 2019	FY 2020	FY 2021
Title: Future Operationally Resilient Ground Evolution (FORGE)- Enterprise Ground Services (EGS)/Command and Control (C2) Thrust	0.000	0.000	64.540
Description: This is not a New Start. This thrust was previously justified under the effort titled Next-Gen OPIR Ground, but has been broken out for transparency. The Space Force is transitioning to a Government owned ground architecture (Enterprise Ground Services (EGS)) that focuses on Mission Management (MM), Telemetry, Tracking, and Commanding (TT&C), and Ground Control (GC) utilizing common services. FORGE C2 creates Mission Unique Software (MUS) and provides sensor/spacecraft-specific C2 capabilities to plug into the EGS suite of services. In the future, the legacy Space Based Infrared System (SBIRS) constellation assets C2 will be transitioned to using the FORGE C2 portion of EGS.			
FY 2020 Plans: N/A			
FY 2021 Plans: Continue proof of concept development for shadow operations of legacy SBIRS GEO space vehicles. Begin to develop mission-unique C2 capability for remaining GEO assets. Use lessons learned from HEO Operations Migrations to EGS (HOME) to begin C2 migration of remaining HEO payload assets to EGS.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657106 / <i>Next-Gen OPIR Ground</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
N/A				
<p>Title: FORGE - Mission Data Processing (MDP) Thrust</p> <p>Description: This is not a New Start. This thrust was previously justified under the effort titled Next Gen OPIR Ground, but has been broken out for transparency. The FORGE MDP effort creates a replacement for the existing legacy SBIRS Ground mission processing applications which has cyber security and scalability limitations. MDP is creating a cyber-resilient, flexible, and scalable open framework capable of meeting tomorrow's threats. MDP will plan Overhead Persistent Infra-Red (OPIR) and other mission data resource utilization to meet warfighter requirements in the future. MDP provides the ability to: ingest and publish varying levels of processed data for enhanced processing; perform efficient and systematic upgrades; and orchestrate real-time wideband processing for Integrated Threat Warning/Attack Assessment (ITW/AA) and non-ITW/AA mission areas. The MDP system provides modular mission applications to meet the future challenges of Missile Warning (MW), Missile Defense (MD), Battlespace Awareness (BA), Technical Intelligence (TI), and Civil/Environmental (C/E). MDP is critical to making cyber-secure, effective use of the increased amounts of data that will be collected by Next-Gen OPIR.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue development of MDP system framework and initial applications. Establish MDP capability in contractor facilities and Government laboratory environment. Award follow-on MDPAP effort. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. These activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>		0.000	0.000	337.549
<p>Title: Next Gen Interim Operations (NIO)</p> <p>Description: This is not a New Start. This thrust was previously justified under the effort titled Next Gen OPIR Ground, but has been broken out for transparency. The NIO effort is a risk reduction effort for FORGE. It is being developed simultaneously with the full Next-Gen OPIR Ground efforts in order to ensure the most critical ground processing is ready in time for the first Next-Gen OPIR satellite launch. It will provide the ability to perform limited processing of the data from the NGG asset using the FORGE solutions. The NIO solution will create mono tracks and publish those mono tracks to the existing SBIRS Block 20 ground system for fusion and dissemination to the warfighter. NIO follows a similar paradigm utilized for processing the initial HEO and GEO assets where HEO Mono Tracks (HMTs) and GEO Mono Tracks (GMTs) were fused outside of the operational baseline.</p> <p>FY 2020 Plans:</p>		0.000	0.000	50.200

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force	Date: February 2020
---	----------------------------

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657106 / <i>Next-Gen OPIR Ground</i>
---	--	--

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
N/A			
<p><i>FY 2021 Plans:</i> Complete the Critical Design Review and begin to develop the risk reduction system. Scale the scope of the risk reduction development based on evolving technology maturity level of the FORGE C2/MDP solutions.</p> <p><i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> N/A</p>			
<p><i>Title:</i> Relay Ground Stations (RGSs)</p> <p><i>Description:</i> This is not a New Start. This thrust was previously justified under the effort titled Next Gen OPIR Ground, but has been broken out for transparency. OPIR data collected in space must be relayed to ground entry points and routed to provide warfighters with timely information. The legacy SBIRS ground architecture requires RGS upgrades and new RGSs to receive OPIR data from legacy and future Next-Gen OPIR assets. This effort expands the set of RGSs to include up to three RGSs that will use common hardware capable of supporting both GEO and Polar assets. This effort will and provide data to the Mission Control Station for processing and dissemination to warfighters and National Command Authorities. The RGS modernization effort will include the ability to operate antennas, process data, and integrate to support older Defense Support Program (DSP) assets.</p> <p><i>FY 2020 Plans:</i> N/A</p> <p><i>FY 2021 Plans:</i> Continue build-out of the RGS facility which is an integral part of RGS development and prepare for installation/checkout of modernized capabilities. Perform site surveys and planning for the next RGS site.</p> <p><i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> N/A</p>	0.000	0.000	46.000
Accomplishments/Planned Programs Subtotals	0.000	0.000	498.289

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

N/A

Remarks

D. Acquisition Strategy

The Next Gen OPIR Ground program has been declared a Section 804 Rapid Prototype effort under the 2016 National Defense Authorization Act (NDAA), effective December 2019. Up to this point, FORGE has utilized existing Space and Missile Systems Center (SMC) contracts to transition SBIRS C2 satellite operations to EGS.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)
3620F / 5	PE 1206442SF / <i>Next Generation OPIR</i>	657106 / <i>Next-Gen OPIR Ground</i>

SMC intends to compete a MDP framework provider and MDP applications provider via Other Transaction Authority (OTA). EGS infrastructure modernization and FORGE MDP will introduce competition into OPIR ground systems with an emphasis to on ramp to EGS as soon as practical. NIO is being acquired as part of the Next-Gen GEO Block 0 contract. RGS(s) will be developed utilizing a combination of existing and future contracts using competitive processes whenever possible.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657106 / <i>Next-Gen OPIR Ground</i>
---	--	--

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FORGE-EGS/C2	TBD	TBD : TBD	-	-		-		64.540	Nov 2020	-		64.540	Continuing	Continuing	-
FORGE - MDP	TBD	TBD : TBD	-	-		-		288.835	Nov 2020	-		288.835	Continuing	Continuing	-
Next Gen Interim Operations (NIO) (Risk Reduction Option)	TBD	TBD : TBD	-	-		-		50.200	Nov 2020	-		50.200	Continuing	Continuing	-
Relay Ground Stations (RGS)	TBD	TBD : TBD	-	-		-		46.000	Nov 2020	-		46.000	Continuing	Continuing	-
Enterprise SE&I	C/CPAF	Engility Corp. : Andover, MA	-	-		-		7.027	Nov 2020	-		7.027	Continuing	Continuing	-
Technical Mission Analysis	RO	Aerospace Corporation : El Segundo, CA	-	-		-		7.928	Nov 2020	-		7.928	Continuing	Continuing	-
Subtotal			-	-		-		464.530		-		464.530	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FFRDC	RO	Aerospace Corporation : El Segundo, CA	-	-		-		5.438	Jan 2021	-		5.438	Continuing	Continuing	-
A&AS	Various	Various : Various	-	-		-		18.352	Feb 2021	-		18.352	Continuing	Continuing	-
Other Support	Various	Various : Various	-	-		-		9.969	Nov 2020	-		9.969	Continuing	Continuing	-
Subtotal			-	-		-		33.759		-		33.759	Continuing	Continuing	N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals		-	-	0.000	-	498.289	-	498.289	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657106 / <i>Next-Gen OPIR Ground</i>
---	--	--

FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

FORGE - EGS/C2	
1 SBIRS GEO on EGS	██████████
Next-Gen OPIR GEO	██
SBIRS Constellation C2 Transition	██
Next Gen Polar Development	██
FORGE - MDP	
Next-Gen OPIR GEO MDP Development Sensor Specific Processing (SSP) and Verification & Validation (V&V)	██
Competitive Prototype Applications Provider	████████████████████
Follow-on Prototype Framework Development	██
Follow-on Prototype Applications Provider Development	██
Next Gen Polar MDP Development	██
Next-Gen Interim Operations (NIO) (Risk Reduction Option)	
NIO Development	██
Relay Ground Stations (RGS)	
RGS Development	██

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657106 / <i>Next-Gen OPIR Ground</i>
---	--	--

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>FORGE - EGS/C2</i>				
1 SBIRS GEO on EGS	1	2021	2	2021
Next-Gen OPIR GEO	1	2021	4	2023
SBIRS Constellation C2 Transition	1	2021	4	2023
Next Gen Polar Development	3	2023	4	2025
<i>FORGE - MDP</i>				
Next-Gen OPIR GEO MDP Development Sensor Specific Processing (SSP) and Verification & Validation (V&V)	1	2021	3	2022
Competitive Prototype Applications Provider	1	2021	4	2021
Follow-on Prototype Framework Development	1	2021	4	2024
Follow-on Prototype Applications Provider Development	4	2021	4	2024
Next Gen Polar MDP Development	3	2023	4	2025
<i>Next-Gen Interim Operations (NIO) (Risk Reduction Option)</i>				
NIO Development	1	2021	2	2025
<i>Relay Ground Stations (RGS)</i>				
RGS Development	1	2021	4	2025

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3620F / 5					R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>				Project (Number/Name) 657120 / <i>Next-Gen OPIR Space, Block 0 GEO</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
657120: <i>Next-Gen OPIR Space, Block 0 GEO</i>	-	0.000	0.000	1,128.900	0.000	1,128.900	1,157.467	1,330.876	1,316.512	728.974	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

FY 2021: \$160M added to fund FY20 scope of work for Next-Gen GEO, providing the requisite backstop in the event a FY 2020 Above Threshold Reprogramming is unattainable.

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206442F, Next Generation OPIR efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206442SF, Next Generation OPIR from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

Next-Generation Overhead Persistent Infrared (Next-Gen OPIR) Space Block 0 Geosynchronous Earth Orbit (GEO) (Project 657120): The primary mission is to provide initial missile warning of a ballistic missile attack on the US, deployed forces and allies. The Next-Gen OPIR GEO (NGG) missile warning satellites enhance detection and improve reporting of intercontinental ballistic missile launches, submarine ballistic missile launches, and tactical ballistic missile launches. Development consists of new payloads in a highly resilient bus, providing real-time persistent global infrared coverage to meet validated Joint Requirements Oversight Council (JROC) requirements on current and future space domain demands.

The Program Office intends to acquire the NGG capability in two contract actions. Phase 1 awarded in August 2018 encompasses requirements analysis, design/development, critical path flight hardware procurement, and risk reduction efforts leading to a System Critical Design Review (CDR). Phase 2 will be awarded in FY 2021 for the manufacturing, assembly, system integration and test, launch, and early on-orbit test through operational acceptance of NGG satellites 1-3.

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

	FY 2019	FY 2020	FY 2021
Title: Next-Gen OPIR Space, Block 0 GEO	0.000	0.000	1,128.900
Description: Development of the Next-Gen OPIR GEO missile warning satellites with a proven bus, new hardened sensors, and auxiliary payloads for increased resilience. The space segment for GEO missile warning satellites consist of a resilient architecture providing real time persistent global equatorial infrared coverage. The first GEO satellite is required in FY 2025.			
FY 2020 Plans: N/A			
FY 2021 Plans:			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657120 / <i>Next-Gen OPIR Space, Block 0 GEO</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Continue to perform requirements analysis, design/development, critical path flight hardware procurement, and risk reduction efforts leading to a System Critical Design Review (CDR) for GEO satellites in FY 2021. Conduct CDR for the payload to evaluate progress and performance of the payload design. Complete detailed design, ramp-up procurement and integration of the functional test bed. Award the Phase 2 contract modification to begin the manufacture, build, integration, test, and launch of the GEO SVs. Purchase critical path flight hardware for SVs #2 & 3 under Phase 2 contract award. Continue to purchase required flight hardware for SV #1 and begin build of SV #1 subsystem components following each subsystem CDR. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. These activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
Accomplishments/Planned Programs Subtotals		0.000	0.000	1,128.900
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
<p>The Space Force intends to acquire Next-Gen systems in block developments to deliver the required constellation. The first block, Block 0, consists of 3 Next-Gen GEO and 2 Next-Gen Polar satellites. The Next-Gen OPIR Space program has been declared a Section 804 Rapid Prototype effort under the 2016 National Defense Authorization Act (NDAA). The first GEO satellite is required by FY 2025 and the first Polar satellite is required in FY 2027. All five Block 0 satellites need to be on orbit by FY 2029. The program office awarded two sole source contracts (one to a GEO prime and one to a Polar prime) under the authority of two Justification & Authorization documents. Next-Gen GEO Phase 1 was awarded in FY 2018, encompassing requirements analysis, design/development, critical path flight hardware procurement, and risk reduction efforts leading to a System Critical Design Review for SV #1. Next-Gen GEO Phase 2 will be awarded in FY 2021 as a modification to the Phase 1 contract. This will include material buys for SV #2 and #3, as well as complete the manufacturing, assembly, system integration and test, launch, and early on-orbit test through the delivery of GEOs 1-3 for operational acceptance of each space vehicle. The Block 1 satellites will be based on the Missile Warning and Missile Defense OPIR Capability Development Document (CDD), validated by the Joint Requirements Oversight Council (JROC) in May 2019. Funding in execution years will be realigned within the Next-Gen OPIR program element to respond to execution requirements.</p>				

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / Next Generation OPIR	Project (Number/Name) 657120 / Next-Gen OPIR Space, Block 0 GEO
---	---	---

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Next-Gen OPIR Space, Block 0 GEO	SS/CPIF	Lockheed Marin : Sunnyvale, CA	-	-		-		1,069.066	Oct 2020	-		1,069.066	Continuing	Continuing	-
Enterprise SE&I	C/CPAF	Engility Corp. : El Segundo, CA	-	-		-		13.870	Nov 2020	-		13.870	Continuing	Continuing	-
Technical Mission Analysis	RO	Aerospace Corp. : El Segundo, CA	-	-		-		11.003	Oct 2020	-		11.003	Continuing	Continuing	-
Subtotal			-	-		-		1,093.939		-		1,093.939	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FFRDC	RO	Aerospace Corp. : El Segundo, CA	-	-		-		3.624	Oct 2020	-		3.624	Continuing	Continuing	-
A&AS	Various	Various : Various	-	-		-		11.352	Feb 2021	-		11.352	Continuing	Continuing	-
Other Support	Various	Various : Various	-	-		-		19.985	Oct 2020	-		19.985	Continuing	Continuing	-
Subtotal			-	-		-		34.961		-		34.961	Continuing	Continuing	N/A

Project Cost Totals	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
	-	-	0.000	1,128.900	-	1,128.900	Continuing	Continuing	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657120 / <i>Next-Gen OPIR Space, Block 0 GEO</i>

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Phase 1																												
Bus Development									████████████████████																			
SV CDR													████															
SV 1 Critical Path Flight Hardware									████████████████████																			
Payload Development									████████████████████																			
Payload CDR													████															
Phase 2																												
SV 1 Build Integration & Testing																	████████████████████											
SV 1 Mission Payload Integration & Testing																	████████████████████											
SV 1 Ready for Launch																									████			
SV 2/3 Critical Path Flight Hardware									████████████████████																			

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657120 / <i>Next-Gen OPIR Space, Block 0 GEO</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Phase 1				
Bus Development	1	2021	2	2022
SV CDR	4	2021	4	2021
SV 1 Critical Path Flight Hardware	1	2021	3	2022
Payload Development	1	2021	2	2022
Payload CDR	3	2021	3	2021
Phase 2				
SV 1 Build Integration & Testing	4	2021	3	2025
SV 1 Mission Payload Integration & Testing	4	2021	4	2023
SV 1 Ready for Launch	4	2025	4	2025
SV 2/3 Critical Path Flight Hardware	2	2021	2	2024

Note

Next-Gen OPIR Space, Block 0 GEO efforts continue past 2025.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3620F / 5					R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>				Project (Number/Name) 657121 / <i>Next-Gen OPIR Space, Block 0 Polar</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
657121: <i>Next-Gen OPIR Space, Block 0 Polar</i>	-	0.000	0.000	482.013	0.000	482.013	421.826	581.657	579.027	717.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206442F, Next Generation OPIR efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206442SF, Next Generation OPIR from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

Next-Generation Overhead Persistent Infrared (OPIR) Space, Block 0 Polar (NGP) (Project 657121): The primary mission is to provide initial missile warning of a ballistic missile attack on the US, its deployed forces, and its allies. Next-Gen OPIR Space enhances detection and improves reporting of intercontinental ballistic missile launches, submarine launched ballistic missile launches, and tactical ballistic missile launches. Development consists of the Next-Gen OPIR Polar missile warning satellites with new payloads in a highly resilient bus, providing real-time persistent global infrared coverage to meet validated Joint Requirements Oversight Council (JROC) requirements on current and future space domain demands.

The Program Office intends to acquire the NGP capability in three contract actions. Phase 0 awarded in June 2018, encompasses system requirements analysis and risk reduction efforts leading to a System Requirements Review (SRR). Phase 1 will be awarded for design and development, critical path flight hardware procurement, and risk reduction efforts leading to a System Critical Design Review (CDR). Phase 2 will be awarded for the manufacturing, assembly, integration and test, and early on-orbit test, through operational acceptance of NGP satellites 1 and 2.

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

	FY 2019	FY 2020	FY 2021
Title: Next-Gen OPIR Space, Block 0 Polar	0.000	0.000	482.013
Description: Development of the NGP missile warning satellites using a proven bus with modifications, auxiliary payloads for improved resiliency, and new hardened sensors. The Polar space segment will consist of two NGP satellites in a resilient architecture, providing real time persistent infrared coverage of the northern hemisphere.			
FY 2020 Plans: N/A			
FY 2021 Plans: Ramp up Phase 1 activities including systems engineering and software design to ensure a successful Polar System Preliminary Design Review (PDR) in FY 2021. Perform analysis for requirements unique to Polar bus and payload. Meet new missile warning requirements by balancing affordability, capability, and resiliency. Continue Phase 1 activities to include design/development, risk reduction efforts, and initial procurement of mission critical flight hardware. Continue efforts leading to a System Critical			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657121 / <i>Next-Gen OPIR Space, Block 0 Polar</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Design Review (CDR) for Polar Satellites in FY 2022. Rapidly respond to incorporate system resiliency and situational awareness requirements necessary to operate in the contested space domain. These activities may include, but are not limited to program office support, studies, technical analysis, prototyping, critical hardware, etc.			
<i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	482.013

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

N/A

Remarks

D. Acquisition Strategy

The Space Force intends to acquire Next-Gen systems in block developments to deliver the required constellation. The first block, Block 0, consists of three Next-Gen Geosynchronous Earth Orbit (GEO) and two Next-Gen Polar satellites. The Next-Gen OPIR Space program has been declared a Section 804 Rapid Prototype effort under the 2016 National Defense Authorization Act (NDAA). The first GEO satellite is required by FY2025, and the first Polar satellite is required in FY2027. All five Block 0 satellites need to be on orbit by FY2029. The program office awarded two sole source contracts (one to a GEO prime and one to a Polar prime) under the authority of two Justification & Authorization documents. The Next-Gen Polar Phase 0 was awarded in FY 2018, consisting of requirements development and culminates in a FY 2020 SRR. Phase 1 will be awarded in FY 2020, encompassing requirements review, design, development, critical path flight hardware procurement, and risk reduction efforts leading to a System CDR for Next-Gen Polar Satellite Vehicles (SV) 1 and 2. Phase 2 will be awarded in FY 2022, encompassing build, integration, test, launch, and transition to operations for Next-Gen Polar SVs 1 and 2. The Space Force plans to acquire subsequent blocks in a competitive environment. The Block 1 satellites will be based on the Missile Warning and Missile Defense OPIR Capability Development Document (CDD), validated by the Joint Requirements Oversight Council (JROC) in May 2019. Funding in execution years will be realigned within the Next-Gen OPIR program element to respond to execution requirements.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / Next Generation OPIR	Project (Number/Name) 657121 / Next-Gen OPIR Space, Block 0 Polar
---	---	---

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Next-Gen OPIR Space, Block 0 Polar	SS/CPAF	Northrop Grumman : Redondo Beach, CA	-	-		-		453.859	Oct 2020	-		453.859	Continuing	Continuing	-
Enterprise SE&I	C/CPAF	Engility Corp. : El Segundo, CA	-	-		-		7.455	Nov 2020	-		7.455	Continuing	Continuing	-
Technical Mission Analysis	RO	Aerospace Corp. : El Segundo, CA	-	-		-		6.484	Oct 2020	-		6.484	Continuing	Continuing	-
Subtotal			-	-		-		467.798		-		467.798	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FFRDC	RO	Aerospace Corp. : El Segundo, CA	-	-		-		2.135	Oct 2020	-		2.135	Continuing	Continuing	-
A&AS	Various	Various : Various	-	-		-		5.837	Feb 2021	-		5.837	Continuing	Continuing	-
Other Support	Various	Various : Various	-	-		-		6.243	Oct 2020	-		6.243	Continuing	Continuing	-
Subtotal			-	-		-		14.215		-		14.215	Continuing	Continuing	N/A

Project Cost Totals	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
	-	-	0.000	482.013	-	482.013	Continuing	Continuing	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657121 / <i>Next-Gen OPIR Space, Block 0 Polar</i>

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025							
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
Phase 1																																
Payload & Bus Development									████████████████████																							
PDR									████																							
CDR																	████															
Phase 2																																
Phase 2 ATP																	████															
Assembly, Integration & Test																									████████████████████							

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / <i>Next Generation OPIR</i>	Project (Number/Name) 657121 / <i>Next-Gen OPIR Space, Block 0 Polar</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Phase 1				
Payload & Bus Development	1	2021	3	2022
PDR	3	2021	3	2021
CDR	3	2022	3	2022
Phase 2				
Phase 2 ATP	3	2022	3	2022
Assembly, Integration & Test	4	2022	4	2025

Note

Next-Gen OPIR Polar efforts continue past 2025

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206853SF / <i>National Security Space Launch Program (SPACE) - EMD</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	560.978	0.000	560.978	287.258	221.585	87.173	53.381	Continuing	Continuing
650006: <i>Next Generation Launch System Investment</i>	0.000	0.000	0.000	560.978	0.000	560.978	287.258	221.585	87.173	53.381	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Program MDAP/MAIS Code: 176

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206853F, National Security Space Launch Program (SPACE) - EMD efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206853SF, National Security Space Launch Program (SPACE) - EMD from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

The National Security Space Launch (NSSL) program provides a space launch service that satisfies the government's National Launch Forecast (NLF) requirements to place National Security Space (NSS) space vehicles on orbit. NSSL is a launch service, not a weapon system, which is primarily funded with production funds.

This program, started late FY 2014, funds research and development activities and related studies, to include, but not limited to, items necessary to invest in new and/or upgraded launch systems and associated launch facilities to meet NSS launch needs leveraging domestic commercial launch providers. The RDT&E program will also fund continued research and development activities, mission manifest capability development & future studies for emerging NSS launch needs. These efforts will inform for future launch service development initiatives in order to continue sustained industry competition for Phase 3 starting in FY 2025 and future procurements.

The Space Force is investing in Launch Service Agreement (LSA) public-private partnerships for the development of new and/or upgraded domestic launch systems with commercial launch service providers. The anticipated result is two domestic, commercial launch service providers that will meet all current NSS launch requirements. In addition, the Space Force is continuing a technical maturation program to address the highest risks for rocket propulsion system (RPS) and LSA development. Development of the required RPSs have continued under the LSA public-private partnerships. Future development to capitalize on new technology and innovations developed by industry may continue to utilize public-private partnerships. The Space Force will also be leveraging opportunities to integrate Department of Defense payloads on to launch services procured commercially or by other Government agencies (i.e. NASA) where excess margin is available.

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206853SF / <i>National Security Space Launch Program (SPACE) - EMD</i>
--	--

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

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

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	560.978	0.000	560.978
Total Adjustments	0.000	0.000	560.978	0.000	560.978
• 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	560.978	0.000	560.978

Change Summary Explanation

FY 2021: +\$560.978M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: Rocket Propulsion System Development	0.000	0.000	5.136
Description: Invest in domestic rocket propulsion systems (RPS) under the Launch Service Agreement Other Transaction Authority (OTA) agreements. This investment enables the transition from the use of non-Allied space launch engines to domestic rocket propulsion systems. Continue to execute a single RPS OTA agreement utilizing a public-private partnership.			
FY 2020 Plans: N/A			
FY 2021 Plans: Continuing to execute public-private partnership for an industry upper stage engine common to multiple launch service providers, ensuring a domestic, cost-effective solution. The FY 2021 funding decrease is due to a RPS reduction from seven programmatic milestones in FY 2020 to three programmatic milestones in FY 2021.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)	R-1 Program Element (Number/Name) PE 1206853SF I National Security Space Launch Program (SPACE) - EMD
--	---

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
N/A			
Title: Launch Service Agreement Description: Invest in providers of domestic Launch Services. This investment enables the transition from the use of non-Allied space launch engines to commercial launch services that also meet NSS needs. Execute Other Transaction Authority (OTA) agreements to develop various industry solutions utilizing public-private partnerships. Continued the technical maturation and risk reduction activities in support of Launch Service OTAs. FY 2020 Plans: N/A FY 2021 Plans: Continue investments with public-private partnerships with domestic launch providers for the development of new launch systems or upgrades to existing launch systems. This investment is intended to meet NSS launch needs by leveraging 2 domestic, commercial launch providers. This investment includes RPS and associated technical maturation and risk reduction activities. Activities may include, but are not limited to, program office support, studies, technical analysis, prototyping, etc. LSA profile is based on the CY 2020 award of Phase 2 with LSA efforts continuing with two service providers. Until the Phase 2 award, the LSA funding cannot be broken out by provider due to the competitive nature of this acquisition strategy. Future development to capitalize on new technology and innovations developed by commercial space may continue to utilize public-private partnerships. The program was increased to properly execute the LSAs based on milestone projections. FY 2020 to FY 2021 Increase/Decrease Statement: N/A	0.000	0.000	555.842
Accomplishments/Planned Programs Subtotals	0.000	0.000	560.978

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• SPAF 01 Line Item MSEELV: <i>Evolved Expendable Launch Veh (Space)</i>	787.646	1,237.635	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2,025.281
• SPAF 01 Line Item <i>MSEELC: Evolved Expendable Launch Capability</i>	615.081	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	615.081
• SPSF 01 NSSL00: NSSL	-	-	1,043.171	-	1,043.171	1,394.270	1,436.978	1,688.279	1,898.687	13,411.619	20,873.004

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206853SF / <i>National Security Space Launch Program (SPACE) - EMD</i>
--	--

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
------------------	----------------	----------------	-------------------------------	------------------------------	--------------------------------	----------------	----------------	----------------	----------------	-----------------------------------	-------------------

Remarks

E. Acquisition Strategy

The Department intends to pursue a strategy to competitively invest in two or more domestic launch providers' development of new launch systems or upgrades to existing systems for future NSS launch services. This shared investment approach may also leverage commitments to a portion of the planned launch services (between FY 2020 and FY 2025) to decrease the required up front Government investment.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206853SF / <i>National Security Space Launch Program (SPACE) - EMD</i>	Project (Number/Name) 650006 / <i>Next Generation Launch System Investment</i>
---	--	--

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Aerojet Rocketdyne OTA	C/Various	Aerojet Rocketdyne : Canoga Park, CA	-	-		-		5.136	Nov 2020	-		5.136	0.000	5.136	-
FFRDC Mission Assurance	SS/CPAF	Aerospace : El Segundo, CA	-	-		-		32.689	Nov 2020	-		32.689	9.966	42.655	-
Launch Enterprise System Engineering and Integration	C/FP	Various : Various	-	-		-		20.480	Mar 2021	-		20.480	8.828	29.308	-
Launch Service Agreement (Including the Rocket Propulsion System)	C/TBD	TBD : TBD	-	-		-		477.265	Dec 2020	-		477.265	577.671	1,054.936	-
Subtotal			-	-		-		535.570		-		535.570	596.465	1,132.035	N/A

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Organic Civilian Support	Reqn	DOD : El Segundo, CA	-	-		-		2.019	Oct 2020	-		2.019	8.673	10.692	15.628
Subtotal			-	-		-		2.019		-		2.019	8.673	10.692	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FFRDC	SS/CPAF	Aerospace : El Segundo, CA	-	-		-		2.147	Nov 2020	-		2.147	4.225	6.372	5.263
Advisory and Assistance Services	Various	Various : Various	-	-		-		6.717	Dec 2020	-		6.717	26.446	33.163	15.258
Other Support	Various	Various : Various	-	-		-		14.525	Nov 2020	-		14.525	13.588	28.113	1.254
Subtotal			-	-		-		23.389		-		23.389	44.259	67.648	N/A

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force							Date: February 2020				
Appropriation/Budget Activity 3620F / 5				R-1 Program Element (Number/Name) PE 1206853SF / <i>National Security Space Launch Program (SPACE) - EMD</i>			Project (Number/Name) 650006 / <i>Next Generation Launch System Investment</i>				
	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract		
Project Cost Totals	-	-	0.000	560.978	-	560.978	649.397	1,210.375	N/A		

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206853SF / <i>National Security Space Launch Program (SPACE) - EMD</i>	Project (Number/Name) 650006 / <i>Next Generation Launch System Investment</i>

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

Rocket Propulsion System (RPS) Development																												
Aerojet Rocketdyne OTA																												
Launch Service Agreement (LSA)																												
Blue Origin OTA																												
Northrop Grumman OTA																												
United Launch Services OTA																												

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206853SF / <i>National Security Space Launch Program (SPACE) - EMD</i>	Project (Number/Name) 650006 / <i>Next Generation Launch System Investment</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Rocket Propulsion System (RPS) Development</i>				
Aerojet Rocketdyne OTA	1	2021	4	2021
<i>Launch Service Agreement (LSA)</i>				
Blue Origin OTA	1	2021	1	2025
Northrop Grumman OTA	1	2021	2	2025
United Launch Services OTA	1	2021	3	2025

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 6:</i> <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 1206116SF / <i>Space Test and Training Range Development</i>
--	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	20.281	0.000	20.281	20.709	21.079	21.458	21.851	Continuing	Continuing
666156: <i>Space Test and Training Range Development</i>	-	0.000	0.000	20.281	0.000	20.281	20.709	21.079	21.458	21.851	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206116F, Space Test and Training Range Development efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206116SF, Space Test and Training Range Development from Appropriation 3600, Budget Activity 06 due to the creation of a new Appropriation for Space Force.

Supports the development of Space Test and Training Range (STTR) capabilities critical for developmental and operational test, training, exercises and tactics development for Space Control systems and Joint National Space Architecture. Includes development, demonstration and delivery of test assets, special test equipment, capabilities and systems required to test, validate, and verify performance of integrated space control systems. Provides a safe, secure, controllable and repeatable environment for the testing of space control mission systems and training operators in both realistic and relevant environments. Additionally, using an agile incremental development approach for range capabilities, this program develops test range assets for both the fixed node Space Range Operations Center (SROC) at Schriever Air Force Base and a deployable Signal Monitoring Unit capability to support complex Joint and AF exercises. The virtual range as part of the Family of Systems (FoS), called Advanced Threat Simulation Environment (ATSE) virtual range, is being developed to accomplish the STTR mission. ATSE integrates to a Distributed Mission Architecture, tying into cyber, air, and space ranges for increased realism and complexity required to prepare space operators for real-world threats. This technology will allow for the first-ever use of a realistic signal environment to increase the realism and efficiency of space control squadron training. Additionally, the STTR Next Space Orbital Engagement (OE) range risk reduction projects will analyze, prototype, and demonstrate potential range systems that are used to support the testing and training of new advanced development space systems, advanced training for space operator orbital engagement maneuvers and future exercises. These risk reduction activities will include on-orbit capabilities, ground components, communication between nodes, and other required infrastructure.

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

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force</i> / BA 6: <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 1206116SF / <i>Space Test and Training Range Development</i>
--	---

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	20.281	0.000	20.281
Total Adjustments	0.000	0.000	20.281	0.000	20.281
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	20.281	0.000	20.281

Change Summary Explanation

FY 2021: +\$20.281M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Title: Range Control</p> <p>Description: Continue development of virtual range integration with cyber and air ranges hosting network emulators and other environments allowing tactics, techniques, and procedures (TTP) development, realistic operational testing, and enable more realistic exercises integrating joint air, space and cyber effects. Continue risk reduction/mitigation efforts for Space Orbital Engagement Range Risk Reduction Projects which will analyze, prototype and demonstrate potential range systems that will be used to support the live and virtual testing of new advanced development space systems, space operator orbital engagement maneuvers (OEM) advanced training, and future SPACE FLAG exercises using live and virtual systems. Continue overhaul of fixed range capabilities, replacement of obsolete equipment, outdated servers, and performing software upgrades focusing on updating signal monitoring hardware with visualization tools and new monitoring capabilities and cybersecurity automation. Rapidly respond and implement system resiliency and situational awareness necessary to operate in the contested space domain. Acquire additional system capability to enable and enhance training against new and emerging adversarial assets, to integrate mission scenarios into one graphic user interface, to integrate training into joint operations across multi-domain training events, to reduce size, weight, and power, and to replace</p>	0.000	0.000	20.281

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 1206116SF / <i>Space Test and Training Range Development</i>
--	---

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>software defined radio cards. Integrate joint DoD solutions for counterspace and space superiority effects. RDT&E funding is required to support this transformation and enable Space Superiority end-to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue development of virtual range integration with cyber and air ranges hosting network emulators and other environments allowing tactics, techniques, and procedures (TTP) development, realistic operational testing, and enable more realistic exercises combining air, space and cyber effects. Continue Interim Contractor support (ICS) of virtual range. Continue risk reduction/mitigation efforts for Space Orbital Engagement Range Risk Reduction Projects which will analyze, prototype and demonstrate potential range systems that will be used to support the live and virtual testing of new advanced development space systems, space operator orbital engagement maneuvers (OEM) advanced training, and future SPACE FLAG exercises using live and virtual systems. Continue overhaul of fixed range capabilities, replacement of obsolete equipment, outdated servers, and performing software upgrades focusing on updating signal monitoring hardware with visualization tools and new monitoring capabilities and migrating to Linux for automation of cybersecurity. Rapidly respond and implement system resiliency and situational awareness necessary to operate in the contested space domain. Acquire additional system capability for new and emerging adversarial assets and replace obsolete equipment to reduce sustainment costs. Integrate joint DoD solutions for counterspace and space superiority effects. RDT&E funding is required to support this transformation and enable Space Superiority end-to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>			
Accomplishments/Planned Programs Subtotals	0.000	0.000	20.281

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

Remarks

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

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 1206392SF / <i>Space and Missile Center (SMC) Civilian Workforce</i>
--	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	183.930	0.000	183.930	177.201	178.043	182.378	186.423	Continuing	Continuing
664280: <i>SMC Civilian Pay</i>	-	0.000	0.000	183.930	0.000	183.930	177.201	178.043	182.378	186.423	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206392F, Space and Missile Center (SMC) Civilian Workforce efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206392SF, Space and Missile Center (SMC) Civilian Workforce from Appropriation 3600, Budget Activity 06 due to the creation of a new Appropriation for Space Force.

The Space and Missile Systems Center (SMC) equips US and allied forces with operational space and missile systems, launch systems, and command and control infrastructure in support of global military and national security operations. SMC operates with over 6,300 people and an annual budget exceeding \$6.4B providing joint warfighters navigation, communication, weather, warning, force application, and space control capabilities. In FY12, as an AF pilot initiative, SMC acquisition workforce civilian personnel funding was transferred from O&M to RDT&E, AF funds.

SMC is authorized to employ approximately 1,897 civilian acquisition professionals providing the management, tools, and technical capabilities needed to oversee acquisition programs to include material solution analysis, technology development, engineering and manufacturing development, production and deployment, and operations and support. This funding does not include costs for base operating support civilian personnel supporting the Los Angeles AFB 61 Air Base Group. Funding SMC civilian payroll from the RDT&E appropriation provides program managers the flexibility to hire additional civilian personnel with program dollars versus additional contractors in concert with initiatives in response to the Defense Acquisition Workforce Improvement Act. This program element supports both civilian pay and non-pay support requirements.

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

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 1206392SF / <i>Space and Missile Center (SMC) Civilian Workforce</i>
--	---

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	183.930	0.000	183.930
Total Adjustments	0.000	0.000	183.930	0.000	183.930
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	183.930	0.000	183.930

Change Summary Explanation

FY 2021: +\$183.930M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: SMC Acquisition Workforce	0.000	0.000	183.930
Description: Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center programs. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc.			
FY 2020 Plans: N/A			
FY 2021 Plans: Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center programs.			
FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals			
	0.000	0.000	183.930

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force Date: February 2020

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 6: RDT&E Management Support	R-1 Program Element (Number/Name) PE 1206392SF I Space and Missile Center (SMC) Civilian Workforce
--	--

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

Remarks
N/A

E. Acquisition Strategy
N/A

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force / BA 6:</i> <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 1206398SF / <i>Space & Missile Systems Center - MHA</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	9.765	0.000	9.765	10.723	10.776	11.002	11.235	Continuing	Continuing
664280: <i>SMC Civilian Pay</i>	-	0.000	0.000	9.765	0.000	9.765	10.723	10.776	11.002	11.235	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206398F, Space & Missile Systems Center - MHA efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206398SF, Space & Missile Systems Center - MHA from Appropriation 3600, Budget Activity 06 due to the creation of a new Appropriation for Space Force.

The Space and Missile Systems Center (SMC) equips US and allied forces with operational space and missile systems, launch systems, and command and control infrastructure in support of global military and national security operations. SMC operates with over 6,300 people and an annual budget exceeding \$6.4B providing joint warfighters navigation, communication, weather, warning, force application, and space control capabilities. In FY 2012, as an AF pilot initiative, SMC acquisition workforce civilian personnel funding was transferred from O&M to RDT&E, AF funds.

Program Element 1206398F, Project: 664281 Space and Missile Systems Center - Major Headquarters Activities (MHA) was established to improve overall performance, strengthen business operations, and achieve efficiencies, effectiveness and cost savings that can be transferred to higher priority needs. PE adds approximately 75 acquisition professionals. Funding in FY 2021 is transferred to PE 1206398SF.

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

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 1206398SF / <i>Space & Missile Systems Center - MHA</i>
--	--

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	9.765	-	9.765
Total Adjustments	0.000	0.000	9.765	-	9.765
• 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			
• Transfer of Funds to Space Force	-	-	9.765	-	9.765

Change Summary Explanation

FY 2021: +\$9.765M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: SMC - Major Headquarters Activities	0.000	0.000	9.765
Description: Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center Management Headquarters Activities. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to SMC Staff support, studies, technical analysis, prototyping, etc.			
FY 2020 Plans: N/A			
FY 2021 Plans: Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center Management Headquarters Activities.			
FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	9.765

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

N/A

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity
3620F: *Research, Development, Test & Evaluation, Space Force I BA 6:*
RDT&E Management Support

R-1 Program Element (Number/Name)
PE 1206398SF / *Space & Missile Systems Center - MHA*

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

Remarks

E. Acquisition Strategy

N/A

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 1206860SF / <i>Rocket Systems Launch Program (SPACE)</i>
--	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	17.993	0.000	17.993	21.074	20.502	19.039	19.388	Continuing	Continuing
661023: <i>Rocket System Launch Program (RSLP)</i>	-	0.000	0.000	17.993	0.000	17.993	21.074	20.502	19.039	19.388	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206860F, Rocket Systems Launch Program (SPACE) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206860SF, Rocket Systems Launch Program (SPACE) from Appropriation 3600, Budget Activity 06 due to the creation of a new Appropriation for Space Force.

Rocket Systems Launch Program (RSLP) provides responsive space and Research, Development, Test and Evaluation (RDT&E) launch vehicle support to DoD and other government agencies using commercial launch systems and excess ballistic missile assets. The RSLP mission was established by the Secretary of Defense in 1972. The small launch program complements the National Security Space Launch (NSSL) program with multiple options to acquire dedicated spacelift and rideshare services for developmental, demonstration, and small operational space vehicles. It provides mission planning, payload integration, vehicle acquisition, processing, launch operations, booster storage and disposition, aging surveillance, maintenance and logistics support for selected DoD responsive space and RDT&E launches. Costs directly attributable to a specific launch or program (e.g., reliability of flight testing, maintenance of launch vehicle processing infrastructure) are paid by the user (Air Force, Space Force, Navy, Army, Missile Defense Agency (MDA), Defense Advanced Research Project Agency (DARPA), National Reconnaissance Office (NRO), etc.). RSLP maintains exclusive control of deactivated Minuteman and Peacekeeper assets used in testing to include refurbishment, transportation and handling, storage, aging surveillance, and launch services. RSLP also funds general research, development, prototyping, integration, and supplemental reliability of flight testing efforts for launch to enhance the reliability of the Minotaur and other fleet vehicles (e.g., updates to the Modular Mechanical Ordnance Destruct System).

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

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

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 6: RDT&E Management Support	R-1 Program Element (Number/Name) PE 1206860SF I Rocket Systems Launch Program (SPACE)
--	--

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	17.993	-	17.993
Total Adjustments	0.000	0.000	17.993	-	17.993
• 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	17.993	-	17.993

Change Summary Explanation

FY 2021: +\$17.993M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Title: Storage/Refurbishment/Flight Readiness/Demil</p> <p>Description: Storage, refurbishment, inventory control, and demil/disposal of deactivated Minuteman, Peacekeeper and other missile flight test assets</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue storage, refurbishment, inventory control, and demil/disposal of deactivated Minuteman, Peacekeeper and other missile flight test assets and perform research and development support operations as required. Investigate and develop shipping throughput capacity to maximize opportunity for motor disposal. Continue support activities to include but not limited to sustainment replacement and refurbishment of support equipment, mission support, special studies etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>	0.000	0.000	15.051
<p>Title: Aging Surveillance</p> <p>Description: Perform aging surveillance-related activities on stored motors</p> <p>FY 2020 Plans:</p>	0.000	0.000	2.142

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 1206860SF / <i>Rocket Systems Launch Program (SPACE)</i>
--	---

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
N/A			
<p>FY 2021 Plans: Continue performing aging surveillance-related activities on stored motors; continue performing analysis/studies to identify and evaluate potential safety-related issues affecting stored motors; continue program office support and related support activities such as, but not limited to mission support, special studies, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>			
<p>Title: Other Launch Support Services</p> <p>Description: Perform launch services activities</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue launch vehicle acquisition, processing, launch services support, mission assurance, reliability of flight and operations to launch RDT&E payloads.</p> <p>Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>	0.000	0.000	0.800
Accomplishments/Planned Programs Subtotals	0.000	0.000	17.993

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

Remarks

E. Acquisition Strategy
N/A

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 1206864SF / <i>Space Test Program (STP)</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	26.541	0.000	26.541	27.103	27.588	28.084	28.599	Continuing	Continuing
662617: <i>Free-Flyer Spacecraft Missions</i>	-	0.000	0.000	26.541	0.000	26.541	27.103	27.588	28.084	28.599	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206864F, Space Test Program (STP) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206864SF, Space Test Program (STP) from Appropriation 3600, Budget Activity 06 due to the creation of a new Appropriation for Space Force.

The Space Test Program (STP) conducts space test missions for the purpose of accelerating DoD space technology transformation while lowering developmental risk. The program integrates, launches, and operates an optimally selected number of DoD-sponsored experiments consistent with Space Experiments Review Board (SERB) priority, opportunity, and funding. STP missions provide a cost-effective way to flight test new militarily relevant space system technologies, concepts, and designs, providing a way to:

- Support the acquisition block development approach
- Demonstrate and develop responsive research and development (R&D) space capabilities
- Provide early operational capabilities to quickly react to new developments
- Perform operational risk reduction through direct flight test of prototype components
- Improve operational design by characterizing the space environment, event, or sensor physics proposed for an operational system/system upgrade
- Develop, integrate, test, and acquire advanced payload support hardware for launch vehicles (LV), commercial launch services, and human-rated spaceflight vehicles
- Expand and leverage international opportunities to further access for the US and its allies' R&D payloads

The Deputy Secretary of Defense Space Test Program Management & Funding Policy, issued in July 2002, reaffirmed STP as the primary provider of spaceflight for the DoD space research community. The July 2002 policy statement also reaffirmed STP's role as the single manager for all DoD payloads on the International Space Station (ISS).

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 6:</i> <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 1206864SF / <i>Space Test Program (STP)</i>
--	--

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

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	26.541	0.000	26.541
Total Adjustments	0.000	0.000	26.541	0.000	26.541
• 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	26.541	0.000	26.541

Change Summary Explanation

FY 2021: +\$26.541M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Title: Payload Integration</p> <p>Description: Integrate payloads onto spaceflight missions, including free-flyer payloads, hosted payloads, sounding rockets, experiments on the International Space Station (ISS), and commercial missions. Includes acquisition of associated spacecraft and integration hardware.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue payload integration of STP-H7 and STP-H9, and begin design for future ISS missions. Complete satellite integration and testing, launch operations, and payload interface verification for STPSat-6. Continue satellite acquisition and integration of STPSat-7.</p>	0.000	0.000	22.041

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 6: RDT&E Management Support</i>		R-1 Program Element (Number/Name) PE 1206864SF / <i>Space Test Program (STP)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
Execute commercial rideshare opportunities for SERB experiments and continue pursuing the approved access to space missions for international R&D payloads. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: Launch Vehicle and Launch Services Description: Purchase launch services, launch vehicles and launch vehicle support for free-flyer payloads, hosted payloads, sounding rockets, experiments on the ISS, and commercial spaceflight missions, and support the spaceflight worthiness and "Do No Harm" certification for Space and Missile Systems Center (SMC) and US Space Force (USSF) HQ. FY 2020 Plans: N/A FY 2021 Plans: Continue to support spaceflight worthiness and "Do No Harm" certification. Execute S-28 small launch initiative of up to 3 launch vehicles. FY 2020 to FY 2021 Increase/Decrease Statement: N/A		0.000	0.000	4.134
Title: On Orbit Satellite Operations Description: Execute first-year operations and operations support for STP-sponsored missions. FY 2020 Plans: N/A FY 2021 Plans: Continue first year on-orbit operations anomaly support for STPSat-6 and continue on-going operations for ISS payloads. FY 2020 to FY 2021 Increase/Decrease Statement: N/A		0.000	0.000	0.366
Accomplishments/Planned Programs Subtotals		0.000	0.000	26.541

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force Date: February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 6:</i> <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 1206864SF / <i>Space Test Program (STP)</i>
--	--

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 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force / BA 7: Operational Systems Development	R-1 Program Element (Number/Name) PE 1201017SF / Global Sensor Integrated on Network (GSIN)
---	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	3.708	0.000	3.708	0.000	0.000	0.000	0.000	Continuing	Continuing
675368: GSIN (Global Integrated Sensor Network)	-	0.000	0.000	3.708	0.000	3.708	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1201017F, Global Sensor Integrated on Network (GSIN) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1201017SF, Global Sensor Integrated on Network (GSIN), from Appropriation 3600, Budget Activity 07 due to the creation of a new Appropriation for Space Force.

\$1.889M is included in FY 2021 in the request for Appropriation 3600, Research, Development, Test & Evaluation, Air Force, PE 1201017F; these funds should have been requested under Appropriation 3620 Research, Development, Test & Evaluation, Space Force, PE 1201017SF. Justification and plans for these funds are included in RDT&E, AF, PE 1201017F, Global Sensor Integrated on Network (GSIN), R-1 Line #301.

The missions of USSPACECOM and USSTRATCOM include establishing and providing full-spectrum, global strike, coordinated space and information operations capabilities to meet both deterrent and decisive national security objectives and to provide operational space support, integrated missile defense, Global Command Control, Communications, and Computers Intelligence Surveillance and Reconnaissance (C4ISR), and specialized planning expertise to the joint warfighter.

The Nation's strategic C2 sensors, and mission planning programs cannot rapidly exchange information across multiple missions creating ambiguity that delays time critical national C2 decision making processes. GSIN developed and established a unified schema that integrates disparate Missile Warning/Missile Defense (MW/MD) data into a single, exposed data set, providing redundant and unambiguous MW/MD data to national leadership. GSIN also enables existing radars and sensors to provide data in net-centric formats consumable by other authorized systems and mission areas, thus reducing the need to acquire more systems. Activities also include studies and analysis to support current program planning, execution, and future program planning.

GSIN directly supports USSPACECOM, USSTRATCOM and other Combatant Command and MAJCOM mission sets. GSIN meshes together selected systems and sensors (from tactical to strategic), including the Nation's most modern and capable assets, taking advantage of their larger numbers, improved algorithms, mobility, and forward deployment to provide earlier cross-cueing and expanded decision space when every second counts. Repurposing these traditionally stove-piped systems and sensors, GSIN enables the warfighter in several ways. GSIN enables creation of a User Defined Operating Picture (UDOP) to provide a single, unambiguous missile event picture allowing realtime collaboration for nuclear C2 and improved senior leader situational awareness (SA) for effective decision-making. GSIN also improves Space Situational Awareness (SSA) by tapping additional sensor capability and provides this data for the larger space order of battle capabilities. GSIN dramatically improves the ingestion of nontraditional, but readily available, non-US government and commercial data to the United States Space Force (USSF) satellite catalog. GSIN addresses NORTHCOM/STRATCOM's signed Joint Emergent Operational Need (JEON) ST-0010 request for uninterrupted traditional and non-traditional

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1201017SF / <i>Global Sensor Integrated on Network (GSIN)</i>
---	--

sensor data integration and the Global Threat Characterization Assessment (GTCA) Operational Planning Team report. GSIN provides critical and unique data to the USSPACECOM SSA data repositories to facilitate the large Space Battle Management Command and Control (BMC2) suite of capabilities/programs. Finally, GSIN provides Machine Learner and Data Analysis functions to optimize and operate situational awareness in the field.

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

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Global Data Integration (GDI) weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	3.708	0.000	3.708
Total Adjustments	0.000	0.000	3.708	0.000	3.708
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	3.708	0.000	3.708

Change Summary Explanation

FY 2021: +\$3.708M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: Radar, sensor, technical intelligence (TI), and Allied Systems	0.000	0.000	3.600

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>		R-1 Program Element (Number/Name) PE 1201017SF / <i>Global Sensor Integrated on Network (GSIN)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Description: Radar, sensor, technical intelligence and Allied Systems: Designs, develops, exposes and integrates data from radar, sensors and technical intelligence systems in regions of the world where potential GSIN users currently do not have coverage. Provide real time data from systems that previously reported in hours or days after critical events. Conduct studies/surveys/meetings as necessary to continually identify systems meeting GSIN user data exposure needs. Space Situational Awareness (SSA): Designs, develops, tests, exposes, and integrates SSA data from previously untapped systems into space production systems and the Global Information Grid (GIG). Develop implementation plans to mature data exposure capabilities.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans:</p> <ul style="list-style-type: none"> - Complete development of Radar/Sensor/TI Project 5. - Complete Production/Fielding of Radar/Sensor/TI Project 5. - Complete Integration and Testing of Radar/Sensor/TI Project 5. - Rapidly respond and implement system resiliency and situational awareness necessary to operate in the contested space domain. RDT&E funding is required to support this transformation and enable Space Superiority end-to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events. <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
<p>Title: Data Services, Net Centric Integration and Configuration Control, and program outreach</p> <p>Description: Develop common XML net-enabled data schemas and configuration management processes and procedures for Missile Warning, Missile Defense, Space, MASINT/Technical Intelligence, and Sensor data to manage the XML schema and associated XML messaging and services. Develop technical outreach for potential new GSIN data consumers and providers who require GSIN sensor data. Upgrade GSIN capabilities as DISA Enterprise Services evolve. Continue modifications to data services. Support integration of GSIN sensor data into appropriate registries/catalogs. Continue development of GSIN data services to enable visualization in a common operating picture. Conduct studies and demonstrations of SSA capabilities, data correlation, and assessment services for risk reduction evaluations.</p> <p>FY 2020 Plans:</p>		0.000	0.000	0.108

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1201017SF / <i>Global Sensor Integrated on Network (GSIN)</i>
---	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
N/A			
<p><i>FY 2021 Plans:</i></p> <ul style="list-style-type: none"> - Complete development of Radar/Sensor/TI Project 6. - Complete Production/Fielding of Radar/Sensor/TI Project 6. - Complete Integration and Testing of Radar/Sensor/TI Project 6. - Begin Design/Development of Radar/Sensor/TI Project 7. - Develop GSIN Next to leverage Block Chain and Artificial Intelligence technologies and provide metadata of data type, data attributes and data limitation - Develop algorithms that support fusion of GSIN state vectors and alternate information. - Begin pursuit of long-term Data Enterprise Messaging System to include data analytics, Artificial Intelligence (AI)/ block chain, and several classified programs. These will address capability gaps as determined over the next 5 years. <p>\$1.889M is incorrectly requested in PE 1201017F for FY 2021; these funds should have transferred to 1201017SF.</p> <p><i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> N/A</p>			
Accomplishments/Planned Programs Subtotals	0.000	0.000	3.708

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

N/A

Remarks

E. Acquisition Strategy

GSIN uses existing government contract vehicles, from agencies such as Missile Defense Agency (MDA) or Air Force Life Cycle Management Center (AFLCMC); to develop and modernize the combined SSA/MW/MD/MASINT/TI data exposure architecture and solution. The contracts are managed by the relevant organization's contracting office. GSIN does not award or manage any contracts. The AFLCMC at Hanscom AFB and SMC at Los Angeles AFB provide necessary program management, financial management, and other support as may be applicable for GSIN.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
3620F / 7				PE 1201017SF / Global Sensor Integrated on Network (GSIN)				675368 / GSIN (Global Integrated Sensor Network)							
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
GSIN Space Situational Awareness Data Exposure - Radar/Sensor/TI Project 5	C/CPAF	RAYTHEON : Colorado Springs, CO	-	-		-		1.109	Dec 2020	-		1.109	Continuing	Continuing	-
GSIN Space Situational Awareness Data Exposure - Radar/Sensor/TI Project 6	C/CPAF	RAYTHEON : Boston, MA	-	-		-		0.708	Dec 2020	-		0.708	Continuing	Continuing	-
GSIN Space Situational Awareness Data Exposure - Enhancements/Upgrades	TBD	TBD : TBD	-	-		-		0.742	Jan 2021	-		0.742	Continuing	Continuing	-
GSIN Space Situational Awareness Data Exposure-Data Exploitation & Launch Characterization	C/Various	MIT/LL : Boston, MA	-	-		-		0.700	Jan 2021	-		0.700	Continuing	Continuing	-
Subtotal			-	-		-		3.259		-		3.259	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS	C/FFP	Various : Omaha, NE	-	-		0.000		0.449	Oct 2020	-		0.449	Continuing	Continuing	-
Subtotal			-	-		0.000		0.449		-		0.449	Continuing	Continuing	N/A
Project Cost Totals			-	-		0.000		3.708		-		3.708	Continuing	Continuing	N/A
Remarks															

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1201017SF / <i>Global Sensor Integrated on Network (GSIN)</i>	Project (Number/Name) 675368 / <i>GSIN (Global Integrated Sensor Network)</i>

FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
GSIN Data Exposure																												
(MASINT 5) Production/Fielding									■	■	■	■																
(MASINT 5) Integration and Testing											■	■																
(MASINT 5) Operational																												
(Radar/MASINT 6) Production/Fielding									■	■	■	■																
(Radar/MASINT 6) Integration and Testing											■	■																
(Radar/MASINT 6) Operational																												

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1201017SF / <i>Global Sensor Integrated on Network (GSIN)</i>	Project (Number/Name) 675368 / <i>GSIN (Global Integrated Sensor Network)</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
GSIN Data Exposure				
(MASINT 5) Production/Fielding	1	2021	2	2021
(MASINT 5) Integration and Testing	3	2021	3	2021
(MASINT 5) Operational	4	2021	4	2021
(Radar/MASINT 6) Production/Fielding	1	2021	2	2021
(Radar/MASINT 6) Integration and Testing	3	2021	3	2021
(Radar/MASINT 6) Operational	4	2021	4	2021

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development	R-1 Program Element (Number/Name) PE 1203001SF I Family of Advanced BLoS Terminals (FAB-T) CPT
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	247.229	0.000	247.229	190.594	102.337	76.196	74.578	0.000	690.934
672490: Family of Advanced Beyond Line-of-Sight Terminals (FAB-T) CPT	0.000	0.000	0.000	18.294	0.000	18.294	15.000	2.800	0.000	0.000	0.000	36.094
673035: Presidential and National Voice Conferencing	0.000	0.000	0.000	62.199	0.000	62.199	43.525	27.878	3.246	0.291	0.000	137.139
673040: Force Element Terminal	0.000	0.000	0.000	166.736	0.000	166.736	132.069	71.659	72.950	74.287	0.000	517.701

Program MDAP/MAIS Code: 199

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203001F, Family of Advanced BLoS Terminals (FAB-T) CPT efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203001SF Family of Advanced BLoS Terminals (FAB-T) CPT from Appropriation 3600, Budget Activity 07 due to the creation of a new Appropriation for Space Force.

The FAB-T CPT, FET and PNVC Integrator programs transitioned from AFPEO/SP to AFPEO/NC effective December 2018.

The FAB-T CPT project replaces legacy Milstar terminals and will provide Extremely High Frequency (EHF), protected, high data rate communication for nuclear and conventional forces to include Presidential and National Voice Conferencing (PNVC). FAB-T will provide the new, highly secure, state-of-the-art capability for DoD platforms to include strategic platforms and airborne/ground command posts via Milstar, and AEHF Satellites. FAB-T CPT terminals will also support the critical command and control (C2) of the Milstar and AEHF satellite constellations.

The Force Element Terminal (FET) project provides secure, protected, and survivable communications for the strategic and tactical warfighter through airborne-based MILSATCOM terminals. The FET will provide the B-52 and RC-135 aircraft with worldwide nuclear and non-nuclear, survivable, anti-jam Low Probability of Detect (LPD)/ Low Probability of Intercept (LPI) data and voice communications. The FET will be interoperable with Milstar, AEHF, Enhanced Polar Systems - Recapitalization (EPS-R), and Evolved Strategic SATCOM (ESS) satellite constellations utilizing both Low Data Rate (LDR) and Extended Data Rate (XDR) waveforms. FET was designated as MTA Middle Tier Acquisition in Feb 2019.

The PNVC capability is a critical element of the Nuclear Command, Control, and Communications (NC3) System. PNVC is the Survivable Emergency Conferencing Network (SECN) replacement capability which provides anti-jam, anti-scintillation, survivable, and endurable voice communications through the AEHF satellite system for national and strategic users. There are several components being developed and procured by other organizations that must be synchronized to expeditiously field the capability. The PNVC Integrator is responsible for end-to-end integration of these components, to include requirements traceability, end-to-end system testing, configuration and checkout activities, training and technical manuals, network transition support, identification of deficiencies in overall PNVC system capability,

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203001SF / <i>Family of Advanced BLoS Terminals (FAB-T) CPT</i>
---	---

enterprise, and life cycle support for PNVC components. The AFPEO/SP approved entry into the acquisition lifecycle as a post MS-A ACAT III Program of Record in January 2016. Starting in December 2018 PNVC Integrator is responsible the requests for funding of all program elements related to the Defense Information Systems and Agency (DISA) components of the PNVC System in accordance with FY 2018 National Defense Authorization Act, Sec. 1661.

In February 2019, the AFPEO/NC declared the PNVC Integrator an ACAT II Program based on the inclusion of DISA funding in the program budget.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver FAB-T CPT weapon system capability. The use of such program funds is in addition to the civilian pay expenses budgeted in program element 0605831F.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	247.229	0.000	247.229
Total Adjustments	0.000	0.000	247.229	0.000	247.229
• 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	247.229	0.000	247.229

Change Summary Explanation

FY 2021: +\$247.229M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3620F / 7					R-1 Program Element (Number/Name) PE 1203001SF / Family of Advanced BLoS Terminals (FAB-T) CPT				Project (Number/Name) 672490 / Family of Advanced Beyond Line-of-Sight Terminals (FAB-T) CPT			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
672490: Family of Advanced Beyond Line-of-Sight Terminals (FAB-T) CPT	0.000	0.000	0.000	18.294	0.000	18.294	15.000	2.800	0.000	0.000	0.000	36.094
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The FAB-T program replaces legacy Milstar terminals and will provide Extremely High Frequency (EHF), protected high data rate communication for nuclear and conventional forces to include Presidential and National Voice Conferencing (PNVC). FAB-T will provide this new, highly secure, state-of-the-art capability for DoD platforms to include strategic platforms and airborne/ground command posts via Milstar, AEHF, and Enhanced Polar System (EPS) satellites. FAB-T terminals will also support the critical command and control (C2) of the Milstar, AEHF and EPS satellite constellations. The Air Force will continue development of the FAB-T Command Post Terminal (CPT), performing systems engineering, architecture studies, development & operational test efforts, FAB-T terminal interoperability with the full AEHF satellite constellation activities, and other program activities to meet current and future emerging SATCOM requirements.

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

	FY 2019	FY 2020	FY 2021
Title: FAB-T CPT Development	0.000	0.000	18.294
Description: The FAB-T program will provide EHF voice and data MILSATCOM for nuclear and conventional forces as well as airborne and ground command posts with connectivity to Milstar, AEHF, and EPS satellites.			
FY 2020 Plans: N/A			
FY 2021 Plans: The FAB-T program will continue to provide EHF voice and data MILSATCOM for nuclear and conventional forces as well as airborne and ground command posts with connectivity to Milstar, AEHF, and EPS satellites. Additional development will be for National Security Agency (NSA) AEHF terminal certification.			
FY 2020 to FY 2021 Increase/Decrease Statement: FY2020 PB to FY 2021 PB, Increased by \$1.3M the work being accomplished continues to include program office support, studies, technical analysis, experimentation, prototyping, etc. to fund continued Reliability Growth Testing of the new Airborne Antenna CPT configuration to ensure the configuration satisfies maintainability criteria.			
Accomplishments/Planned Programs Subtotals	0.000	0.000	18.294

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / Family of Advanced BLoS Terminals (FAB-T) CPT	Project (Number/Name) 672490 / Family of Advanced Beyond Line-of-Sight Terminals (FAB-T) CPT

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

Line Item	FY 2019	FY 2020	FY 2021			FY 2022	FY 2023	FY 2024	FY 2025	Cost To	
			Base	OCO	Total					Complete	Total Cost
• APAF 05 FBLOST: FAB-T	14.280	9.610	1.575	-	1.575	-	-	-	-	0.000	25.465
• SPAF 01 FBLOST: FAB-T	22.268	32.105	60.994	-	60.994	34.100	22.210	19.100	13.800	0.000	204.577
• SPAF 01 PNVC: PNVC	-	1.915	5.244	-	5.244	5.877	1.577	1.606	1.636	0.000	17.855
• SPAF 01 FET:: FET	-	-	-	-	-	-	88.885	90.487	154.787	0.000	334.159
• SPAF 01 FAB-T: FAB-T	6.134	-	-	-	-	-	-	-	-	0.000	6.134
• SPAF 02 SSPARE Spares and Repair...: FAB-T	15.568	0.057	-	-	-	-	-	-	-	0.000	15.625
• RDTE 07 1203001F: FAB-T	58.582	195.288	-	-	-	-	-	-	-	0.000	245.870

Remarks

D. Acquisition Strategy

FAB-T Acquisition Strategy: In FY 2012, the government restructured the FAB-T development program to introduce competition into the acquisition strategy in order to reduce risk in delivering this capability as well as to drive down production costs. To ensure the best value to the government, the Air Force awarded production contracts in September 2013 to both contractors (Boeing and Raytheon). The production contracts began with production planning for both contractors. In June 2014, the Air Force down-selected to Raytheon. Development and production of FAB-T Command Post Terminals continued with Raytheon. The first Production contract options to produce CPT terminals were exercised after a successful Milestone C decision was approved September 1, 2015.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / Family of Advanced BLoS Terminals (FAB-T) CPT	Project (Number/Name) 672490 / Family of Advanced Beyond Line-of-Sight Terminals (FAB-T) CPT
---	--	--

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
FAB-T CPT Prime Contract	C/Various	Raytheon : Marlboro, MA	-	-		-		16.782	Oct 2020	-		16.782	Continuing	Continuing	-
FAB-T CPT Technical Mission Analysis	Various	MITRE : Various, MA	-	-		-		1.348	Oct 2020	-		1.348	Continuing	Continuing	-
FAB-T CPT GFE	Various	TBD: TBD : Various, MA	-	-		-		0.002	Dec 2020	-		0.002	Continuing	Continuing	-
Subtotal			-	-		-		18.132		-		18.132	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
FAB-T CPT Other Support	Various	Various : MA	-	-		-		0.162	Dec 2020	-		0.162	Continuing	Continuing	-
Subtotal			-	-		-		0.162		-		0.162	Continuing	Continuing	N/A

Project Cost Totals	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
	-	-	0.000	18.294	-	18.294	Continuing	Continuing	N/A

Remarks
 Prior Years funding, FY 2016/FY 2017 \$95.229M was executed in PE 0303001F. Prior to FY 2016, \$180.602M was executed in PE 0303601F.

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / Family of Advanced BLoS Terminals (FAB-T) CPT	Project (Number/Name) 672490 / Family of Advanced Beyond Line- of-Sight Terminals (FAB-T) CPT

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

FAB-T																												
FAB-T CPT AEHF Terminal Certification																												

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / <i>Family of Advanced BLoS Terminals (FAB-T) CPT</i>	Project (Number/Name) 672490 / <i>Family of Advanced Beyond Line-of-Sight Terminals (FAB-T) CPT</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
FAB-T				
FAB-T CPT AEHF Terminal Certification	1	2021	2	2023

Note
FAB-T Raytheon Development Contract actual award date 4Q 2012, completion is 2Q 2020.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3620F / 7					R-1 Program Element (Number/Name) PE 1203001SF / Family of Advanced BLoS Terminals (FAB-T) CPT				Project (Number/Name) 673035 / Presidential and National Voice Conferencing			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
673035: Presidential and National Voice Conferencing	0.000	0.000	0.000	62.199	0.000	62.199	43.525	27.878	3.246	0.291	0.000	137.139
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The PNVC capability is a critical element of the Nuclear Command, Control, and Communications (NC3) System. PNVC is the Survivable Emergency Conferencing Network (SECN) replacement capability which provides anti-jam, anti-scintillation, survivable, and endurable voice communications through the AEHF satellite system for national and strategic users. There are several components being developed and procured by other organizations that must be synchronized to expeditiously field this capability. The PNVC Integrator is responsible for end-to-end integration of these components, to include requirements traceability, end-to-end system testing, configuration and checkout activities, training and technical manuals, network transition support, identification of deficiencies in overall PNVC system capability and enterprise and life cycle support for PNVC components. The AFPEO/SP approved entry into the acquisition lifecycle as a post MS-A ACAT III Program of Record in January 2016. In February 2019 the AF PEO/NC declared the PNVC Integrator an ACAT II Program based on updated approved budget request.

Starting in December 2018, PNVC Integrator is responsible for all program elements' requests for funding related to the Defense Information Systems Agency (DISA) components of the PNVC System in accordance with FY 2018 National Defense Authorization Act, Sec. 1661.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver PNVC weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F.

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

	FY 2019	FY 2020	FY 2021
Title: PNVC Integrator	0.000	0.000	62.199
Description: PNVC is the SECN replacement capability which provides anti-jam, anti-scintillation, survivable, and endurable voice communications through the AEHF satellite system for national and strategic users. The PNVC capability consists of constituent programs being developed and produced by other organizations. This program will integrate test and support configuration of hardware from these other programs. PNVC components will be installed at ground fixed and mobile command locations as well as three aircraft platforms.			
FY 2020 Plans: N/A			
FY 2021 Plans: PNVC Integrator government team will conduct Phase 2 Developmental Test for the remaining operational nodes and end-to-end system test with support from the integrator contractor. In parallel, the integrator contractor and component contractors will			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / Family of Advanced BLoS Terminals (FAB-T) CPT	Project (Number/Name) 673035 / Presidential and National Voice Conferencing
---	--	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>continue to resolve any hardware and software deficiencies identified during test, conduct regression and interoperability testing using both contractor and government test laboratories, and conduct planning for future planned system upgrades. The PNVC Integrator will also conduct integration and checkout activities and training at remaining operational sites world-wide, conduct cybersecurity testing, and continue to work closely with sustainment organizations on the preparations for transition to depot support.</p> <p>PNVC Integrator activities will include but are not limited to program office support, studies, technical analysis, prototyping, test planning and execution, deficiency resolution, logistics and sustainment support planning, component product support, risk reduction activities, technical analysis and studies, platform integration support, and integration laboratory support.</p> <p>Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY2020 PB to FY2021 PB PNVC Decreased by \$3.184M. In FY2021 PNVC will continue developmental tests, resolve any hardware and software deficiencies, conduct integration and checkout activities and training at remaining operational sites and continue to work closely with sustainment organizations on the preparations for transition to depot support.</p>			
Accomplishments/Planned Programs Subtotals	0.000	0.000	62.199

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• RDTE 07 1203001F: PNVC	23.961	-	-	-	-	-	-	-	-	0.000	23.961
• APAF 05 FBLOST: FAB-T	14.280	9.610	1.575	-	1.575	-	-	-	-	0.000	25.465
• SPAF 01 FBLOST: FAB-T	22.268	32.105	60.994	-	60.994	34.100	22.210	9.100	13.800	0.000	194.577
• SPAF 01 PNVC: PNVC	-	1.915	5.244	-	5.244	5.877	1.577	1.606	1.636	0.000	17.855
• SPAF 01 FET: FET	-	-	-	-	-	-	88.885	90.487	154.787	0.000	334.159
• APAF 06 Aircraft Spares and Repa...: FAB-T	6.134	-	-	-	-	-	-	-	-	0.000	6.134
• SPAF 02 SSPARE Spares and Repair...: FAB-T	15.568	0.057	-	-	-	-	-	-	-	0.000	15.625

Remarks

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / Family of Advanced BLoS Terminals (FAB-T) CPT	Project (Number/Name) 673035 / Presidential and National Voice Conferencing

D. Acquisition Strategy

PNVC Acquisition Strategy: On May 15, 2015 the Deputy Secretary of Defense assigned the PNVC End-to-End Integration responsibility to the Air Force; effective May 16, 2015, SAF/AQ designated the AFPEO/SP. In February 2019 the AF PEO/NC declared the PNVC Integrator an ACAT II Program based on updated approved budget request. The PNVC End-to-End Integrator program is responsible for requirements traceability, End-to-End system testing, site configuration activities, training and technical manuals, network transition support, identifying deficiencies in the PNVC capability, and enterprise and life cycle support for all PNVC components. Starting in December 2018 PNVC Integration is responsible for all program elements' requests for funding related to the Defense Information Systems and Agency (DISA) components of the PNVC System in accordance with FY 2018 National Defense Authorization Act, Sec. 1661.

PNVC will continue to support component fielding, conduct site integration and checkout, and prepare for and execute integrated developmental test activities in advance of the PNVC system Initial Operating Capability.

Beginning in FY2020, all PNVC funds were transferred from DISA to BPAC 673035, for execution.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
3620F / 7				PE 1203001SF / Family of Advanced BLoS Terminals (FAB-T) CPT				673035 / Presidential and National Voice Conferencing							
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
PNVC Prime Contract	Various	Various : Various, MA	-	-		-		43.284	Oct 2020	-		43.284	Continuing	Continuing	-
PNVC Technical Mission Analysis	Various	Various : Various, MA	-	-		-		10.110	Oct 2020	-		10.110	Continuing	Continuing	-
PNVC Enterprise SE&I	Various	Various : Various, MA	-	-		-		1.990	Oct 2020	-		1.990	Continuing	Continuing	-
Subtotal			-	-		-		55.384		-		55.384	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
PNVC Government Test and LDTO Support	Various	Various : Various	-	-		-		2.020	Oct 2020	-		2.020	Continuing	Continuing	-
Subtotal			-	-		-		2.020		-		2.020	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Services	C/CPAF	Not specified. : TBD	-	-		-		-		-		-	0.000	0.000	-
PNVC FFRDC	MIPR	TBD : TBD	-	-		-		2.730	Oct 2020	-		2.730	Continuing	Continuing	-
PNVC A&AS	Various	Various : Various TBD	-	-		-		1.790	Oct 2020	-		1.790	Continuing	Continuing	-
PNVC Other Support	Various	Various : MA	-	-		-		0.275	Oct 2020	-		0.275	Continuing	Continuing	-
Subtotal			-	-		-		4.795		-		4.795	Continuing	Continuing	N/A
Project Cost Totals			-	-		0.000		62.199		-		62.199	Continuing	Continuing	N/A

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force							Date: February 2020			
Appropriation/Budget Activity 3620F / 7			R-1 Program Element (Number/Name) PE 1203001SF / <i>Family of Advanced BLoS Terminals (FAB-T) CPT</i>			Project (Number/Name) 673035 / <i>Presidential and National Voice Conferencing</i>				
	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	

Remarks

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / <i>Family of Advanced BLoS Terminals (FAB-T) CPT</i>	Project (Number/Name) 673035 / <i>Presidential and National Voice Conferencing</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>PNVC Integrator</i>				
Phase II Dry-Runs & Development Test 2	2	2021	3	2021
Multi-Service Operational Test & Evaluation	1	2022	2	2022
Test, Integration, & Check Out	1	2021	1	2025
Deficiency Workoff	1	2021	1	2022

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / Family of Advanced BLoS Terminals (FAB-T) CPT	Project (Number/Name) 673040 / Force Element Terminal
---	--	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
673040: Force Element Terminal	0.000	0.000	0.000	166.736	0.000	166.736	132.069	71.659	72.950	74.287	0.000	517.701
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Force Element Terminal (FET) program provides secure, protected, and survivable communications for the strategic and tactical warfighter through airborne-based MILSATCOM terminals. The FET will provide the B-52 and RC-135 aircraft with worldwide nuclear and non-nuclear survivable, anti-jam, Low Probability of Detect (LPD)/Low Probability of Intercept (LPI) data and voice communications. The FET will be interoperable with Milstar, AEHF, Enhanced Polar Systems - Recapitalization (EPS-R), and Evolved Strategic SATCOM (ESS) Satellite constellations utilizing both Low Data Rate (LDR) and Extended Data Rate (XDR) waveforms.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver FAB-T FET weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F.

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

	FY 2019	FY 2020	FY 2021
<p>Title: FAB-T FET</p> <p>Description: Description: Continue development of Force Element Terminals. Development activities include, but are not limited to, FET design, development and qualification testing.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Funding is for the continued development of Force Element Terminals. Design activities will include, but not limited to, the conduct of design reviews including a Critical Design Review. FET development activities will include nuclear hardness parts analysis and testing, performance of reliability growth testing, fabrication of prototypes and test assets to support terminal environmental and functional qualification and flight testing.</p> <p>Planning and support activities will continue qualification test planning, logistics support planning, risk reduction activities, technical analysis and studies, platform integration support, and program office support.</p> <p>Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement:</p>	0.000	0.000	166.736

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / Family of Advanced BLoS Terminals (FAB-T) CPT	Project (Number/Name) 673040 / Force Element Terminal

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
FY2020 PB to FY2021 PB FET Increased by \$56.919M. Funding is for the continued development of Force Element Terminals. Design activities will include, but are not limited to, the conduct of design reviews including a Critical Design Review. FET development activities will include nuclear hardness parts analysis and testing, performance of reliability growth testing, and fabrication of prototypes test assets to support terminal environmental and functional qualification, and flight testing.			
Accomplishments/Planned Programs Subtotals	0.000	0.000	166.736

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• RDTE 04 1203001F: <i>FET</i>	22.100	-	-	-	-	-	-	-	-	0.000	22.100
• APAF 05 FBLOST: <i>FAB-T</i>	14.280	9.610	1.575	-	1.575	-	-	-	-	0.000	25.465
• APAF 05 PNVC: <i>PNVC</i>	-	-	-	-	-	-	-	-	-	0.000	0.000
• SPAF 01 FBLOST: <i>FAB-T</i>	22.268	32.105	60.994	-	60.994	34.100	22.200	19.100	13.800	0.000	204.567
• RDTE 07 PNVC: <i>PNVC</i>	26.261	-	-	-	-	-	-	-	-	0.000	26.261
• SPAF 01 SPAF FET: <i>FET</i>	-	-	-	-	-	-	88.885	90.487	154.787	0.000	334.159
• APAF 06 Aircraft Spares and Repa...: <i>FAB-T</i>	6.134	0.000	-	-	-	-	-	-	-	0.000	6.134
• SPAF 02 SSPARE Spares and Repair...: <i>FAB-T</i>	15.568	0.057	-	-	-	-	-	-	-	0.000	15.625

Remarks

D. Acquisition Strategy

FET Acquisition Strategy: Per the Acquisition Strategy Panel briefed to SAF/AQ on February 7, 2019, FET is pursuing a Rapid Prototyping development Section 804 approach of the National Defense Authorization Act for FY 2016 (Public Law 114-92). This Rapid Prototyping program enables FET to accelerate the nominal program development timeline in support of the accelerated USSTRATCOM-requested Initial Operating Capability. FET will award a development effort in FY 2020 leading to a rapid production decision in FY 2023. The rapid Prototyping effort enables FET to rapidly develop, install, and obtain operationally-representative test data from early B-52 and RC-135 FET prototypes which will also have residual operations capability. The overall development effort includes system design and build of sufficient test assets to allow for expeditious development, testing, qualification and integration support of the FET capability. FET will meet B-52 and RC-135 platform requirements to support USSTRATCOM's Strategic Nuclear Command Control and Communication (NC3) mission.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / Family of Advanced BLoS Terminals (FAB-T) CPT	Project (Number/Name) 673040 / Force Element Terminal
---	--	---

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FAB-T FET Development Contracts	Various	TBD : TBD, MA	-	-		-		139.110	Oct 2020	-		139.110	Continuing	Continuing	-
FAB-T FET Technical Mission Analysis	Various	TBD : TBD, MA	-	-		-		19.619	Oct 2020	-		19.619	Continuing	Continuing	-
Subtotal			-	-		-		158.729		-		158.729	Continuing	Continuing	N/A

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FAB-T FET Test & Evaluation and Assets	PO	Multiple Agencies : TBD	-	-		-		2.004		-		2.004	Continuing	Continuing	-
Subtotal			-	-		-		2.004		-		2.004	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FAB-T FET Other Support	Various	Various : Various, MA	-	-		-		0.501	Nov 2020	-		0.501	Continuing	Continuing	-
FAB-T FET A&AS	Various	Various : Various, MA	-	-		-		5.502	Dec 2020	-		5.502	Continuing	Continuing	-
Subtotal			-	-		-		6.003		-		6.003	Continuing	Continuing	N/A

			Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-	0.000	166.736	-	166.736	Continuing	Continuing	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / Family of Advanced BLoS Terminals (FAB-T) CPT	Project (Number/Name) 673040 / Force Element Terminal

FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

FET	
FAB-T Force Element Terminal Development	
FAB-T FET Parts Hardness Testing	
FAB-T FET Design, Fabrication and Development of Prototypes and Test Assets	
FAB-T FET Qualification Testing	
FAB-T Force Element Terminal Production	

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / <i>Family of Advanced BLoS Terminals (FAB-T) CPT</i>	Project (Number/Name) 673040 / <i>Force Element Terminal</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
FET				
FAB-T Force Element Terminal Development	1	2021	4	2024
FAB-T FET Parts Hardness Testing	1	2021	1	2021
FAB-T FET Design, Fabrication and Development of Prototypes and Test Assets	1	2021	4	2022
FAB-T FET Qualification Testing	3	2021	1	2023
FAB-T Force Element Terminal Production	1	2023	4	2025

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203110SF / <i>Satellite Control Network (SPACE)</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	75.480	0.000	75.480	53.679	44.013	39.356	34.380	Continuing	Continuing
673276: <i>Satellite Control Network</i>	-	0.000	0.000	75.480	0.000	75.480	53.679	44.013	39.356	34.380	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203110F, Satellite Control Network (SPACE) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203110SF Satellite Control Network (SPACE) from Appropriation 3600, Budget Activity 07 due to the creation of a new Appropriation for Space Force.

The Air Force Satellite Control Network (AFSCN) is a satellite ground terminal network comprised of two communication nodes (Schriever AFB & Vandenberg AFB) and 15 antenna systems. The antennas are distributed around the globe at seven locations -- Vandenberg Tracking Station (VTS), Diego Garcia Station (DGS), Guam Tracking Station (GTS), Hawaii Tracking Station (HTS), New Hampshire Tracking Station (NHS), Thule Tracking Station (TTS) and Telemetry and Commanding Station (TCS) at RAF Oakhanger, England -- to ensure global coverage for over 170 satellites in various orbits. The AFSCN conducts an average of 450 satellite contacts per day supporting Positioning, Navigation and Timing (PNT), Intelligence, Surveillance and Reconnaissance (ISR), Missile Warning, Communications, Weather, Launch Vehicle Support, and Research and Development (R&D) in support of Department of Defense (DoD), Intelligence Community (IC), and National Aeronautics and Space Administration (NASA) operations. While most of the 490 satellite contacts/day are routine command and control activities, the AFSCN is also used for satellite emergencies (e.g. tumbling satellite) because its high power antennas are often the only earthbound assets that can contact a non-responsive satellite to re-establish command & control. During FY 2019 the AFSCN supported 11 space vehicle emergencies resulting in the preservation of \$4.1B worth of satellites. In addition to routine and emergency satellite operations C2, the AFSCN provides support to launch vehicle and early orbit operations, ensuring worldwide antennas receive telemetry as the rocket travels through the atmosphere and transmit commands to a newly orbiting satellite to initiate early orbit checkout. In FY 2019, the AFSCN supported 19 launches delivering \$13.7B worth of satellites to their operational orbits. Finally, the AFSCN provides Factory Compatibility Testing (FCT) to ensure satellites and rockets can communicate via the AFSCN before the satellite is launched. These funds are used to develop next-generation tools to improve the AFSCN and ensure the capability is available to support DoD, Intelligence Community, and civil users. These efforts support cyber hardening, Defensive Cyberspace Operations (DCO-S) and and Systems Engineering & Integration (SE&I) activities for the space enterprise, as well as align with the evolving future space domain demands through Ground Enterprise Next (GEN) to include transmit and receive, and data transport.

AFSCN Deficiency Resolution: Provides test, cyber security, requirements management, and system architecture support to the AFSCN.

Ground Enterprise Next (GEN): Provides the means to communicate with all future spacecraft through diverse communication networks. The program is pursuing more capable ground based antennas, space based communication links, augmenting the existing ASFCN with commercial and civil antennas, upgrading satellite scheduling to commercial standards, and developing infrastructure for long haul communications driven by increase in antennas, cyber security and resilience requirements.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203110SF / <i>Satellite Control Network (SPACE)</i>
---	---

In FY 2021, Defensive Cyber Operations Space (DCO-S) funds in PE 1203614F JSpOC Mission System moved to PE 1203110F Satellite Control Network to consolidate Space Force Space DCO-S development activities.

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

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

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	75.480	0.000	75.480
Total Adjustments	0.000	0.000	75.480	0.000	75.480
• 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	75.480	0.000	75.480

Change Summary Explanation

FY 2021: +\$75.480M; Funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force. This total includes a \$59.263M increase for Multi-Band, Multi Mission antennas and a classified requirement.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: AFSCN Deficiency Resolution	0.000	0.000	3.183

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>		R-1 Program Element (Number/Name) PE 1203110SF / <i>Satellite Control Network (SPACE)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Description: Provides test, cyber security, requirements management, and system architecture support to the AFSCN. Additionally, the Space Force is investigating multiple cyber defense tools for integration onto the AFSCN baseline.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Address deficiencies in fielded systems to include Remote Tracking Station Block Change (RBC), Enhanced Power Amplifier (EHPA) and AFSCN Scheduling Tool. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
<p>Title: Satellite Operations Transmit and Receive</p> <p>Description: Provide enterprise transmit, receive and resource management solutions to enable continuous satellite operations (SATOPS) during contested, degraded and operationally denied environment.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Release Request for Proposal and award Technical Maturation and Risk Reduction (TMRR) for Multi-Band Multi-Mission antennas to multiple vendors. Complete CAS development activities and begin development/operational testing. Begin requirement development for Advance Planning Scheduling System (APSS). Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. Award Commercial Augmentation Services and Civil Augmentation development and integration contracts.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>		0.000	0.000	65.577
<p>Title: Defensive Cyberspace Operations - Space (DCO-S)</p>		0.000	0.000	2.137

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>		R-1 Program Element (Number/Name) PE 1203110SF / <i>Satellite Control Network (SPACE)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Description: Funding supports cyber hardening and Defensive Cyberspace Operations for Space (DCO-S) activities for the space enterprise. Provides space enterprise defensive cyber solutions to counter advanced persistence cyber threats, through rapid fielding of operational prototypes using agile development methods.</p> <p>This effort implements a combined Development/Security/Operations (DEVSECOPS) framework which incorporates methodologies, technologies, and tools to deeply embed security best practices into the modern development workflow and tool-chain. This effort will institute four product lines: Manticore (detect), Pegasus (protect), Chimera (identify), and Kraken (respond). The DCO-S capabilities are developed and deployed as an agile program, leveraging a DEVSECOPS framework to facilitate rapid and timely fielding to operations.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue to enhance Defensive Cyber Operations for Space (DCO-S) enterprise-wide, through development and integration of Defensive Cyber Operations tools, including Manticore, Pegasus, Chimera, and Kraken product lines. Manticore will continue to develop, integrate and field endpoint and network data collection, and data extraction and fusion analytic capabilities. Pegasus will continue to address hardware and software supply chain risk management (HW/SW SCRMM), enterprise cryptography, and cyber hardening activities. Chimera will continue to develop threat identification through system characterization, vulnerability mapping, and cyber/intelligence integration. Kraken will continue to develop capability for incident management, forensics, and tailored response. Collectively these tool capabilities will fill cyber deficiencies across the space enterprise.</p> <p>Continue to plan and deploy DCO-S product line capabilities to the following mission systems: AFSCN, GPS OCS, AEHF, Enterprise Ground Services (EGS), GEN and Eastern/Western Ranges. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
<p>Title: Enterprise Systems Engineering and Integration</p> <p>Description: SE&I manages the government controlled system and subsystem level baseline requirements including analysis of future changes to the fielded baseline. SE&I provides "government as the integrator" engineering support to ensure multiple</p>		0.000	0.000	4.583

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203110SF / <i>Satellite Control Network (SPACE)</i>
---	---

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
separate modernizations and the sustainment baselines are synchronized. SE&I will develop and recommend investment strategies to keep the AFSCN operating well beyond the Future Years Defense Plan.			
FY 2020 Plans: N/A			
FY 2021 Plans: Continue Program Office support and independent SE&I efforts as required to integrate development and modernization across the AFSCN. Provide systems and subsystem level definition, baseline, architecture, integration planning and support for the AFSCN. Additionally, SE&I will provide support to Space & Missile Systems Center (SMC) initiatives supporting Ground Enterprise Next (GEN) activities. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.			
FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	75.480

D. Other Program Funding Summary (\$ in Millions)										
Line Item	FY 2019	FY 2020	FY 2021	FY 2021	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Cost To
			Base	OCO	Total					Complete
• SPAF 01 Line Item AFSCOM: <i>AF Satellite Comm System</i>	35.326	56.298	-	-	-	-	-	-	-	Continuing
• RDTE 07 1203182SF: <i>Spacelift Range System (SPACE)</i>	20.168	10.837	-	-	-	-	-	-	-	Continuing
• SPSF 01 Line Item AFSCOM: <i>AF Satellite Comm System</i>	-	-	48.326	0.000	48.326	49.317	50.231	51.136	52.075	Continuing

Remarks
 Procures the mission critical electronics and telecommunications equipment to upgrade the aging AFSCN Range and Network Operations segments.

E. Acquisition Strategy
 RDT&E efforts focus on completing upgrades as well as future architectures and studies to ensure the best use of investment funding. The SE&I contractor maintains the DoD Architecture Framework (DoDAF) architecture and requirements baseline for Government approval and may perform studies to determine Government options. Limited RDT&E will be applied to the Consolidated AFSCN Modifications, Maintenance, and Operations (CAMMO) contract when sustaining engineering expertise is

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity	R-1 Program Element (Number/Name)
3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	PE 1203110SF / <i>Satellite Control Network (SPACE)</i>

needed to finalize Government-approved architectures. Federally Funded Research and Development Corporation technical depth and breadth will be leveraged to ensure AFSCN modernization efforts are compatible with mission rules and do not pose a risk to safe and cost-effective satellite contacts.

Ground Enterprise Next (GEN) activities will leverage existing prototypes and risk reduction activities. The Space Force plans to pursue the use of Other Transaction Authority for Resilient Enterprise Ground for Multi Band Multi Mission (MBMM) and Commercial Augmentation Segmentation (CAS).

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203110SF / <i>Satellite Control Network (SPACE)</i>	Project (Number/Name) 673276 / <i>Satellite Control Network</i>
---	---	---

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Ground Enterprise Next Scheduling	Various	Stottler-Henke : Colorado Springs, CO	-	-		-		1.540	Jan 2021	-		1.540	Continuing	Continuing	-
AFSCN Deficiency Resolution	Various	Various : Colorado Springs, CO	-	-		-		3.184	Jul 2021	-		3.184	Continuing	Continuing	-
Ground Enterprise Next Commercial Augmentation	MIPR	AFRL : Kirtland AFB, NM	-	-		-		30.000	Dec 2020	-		30.000	Continuing	Continuing	-
Ground Enterprise Next Multi-Band Multi-Mission	MIPR	DIU : Mountain View, CA	-	-		-		30.765	Aug 2021	-		30.765	Continuing	Continuing	-
Defensive Cyberspace Operations - Space (DCO-S)	Various	TBD : Colorado Springs	-	-		-		2.137	Dec 2020	-		2.137	Continuing	Continuing	-
Enterprise Systems Engineering and Integration	C/CPIF	ENSCO : Colorado Springs, CO	-	-		-		4.583	Nov 2020	-		4.583	Continuing	Continuing	-
Technical Mission Analysis	RO	Aerospace Corp : El Segundo, CA	-	-		-		1.460	Oct 2020	-		1.460	Continuing	Continuing	-
Subtotal			-	-		-		73.669		-		73.669	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	Various	Aerospace Corp, : El Segundo, CA	-	-		-		0.901	Apr 2021	-		0.901	Continuing	Continuing	-
A&AS	Various	Gartner : Colorado Springs, CO	-	-		-		0.910	Apr 2021	-		0.910	Continuing	Continuing	-
Subtotal			-	-		-		1.811		-		1.811	Continuing	Continuing	N/A

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203110SF / <i>Satellite Control Network (SPACE)</i>	Project (Number/Name) 673276 / <i>Satellite Control Network</i>

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
AFSCN																												
AFSCN Deficiency Resolution																												
GEN Satellite Operations Transmits and Receive																												
GEN Defensive Cyberspace Operations for Space (DCO-S)																												
Multi Band Multi Mission (MBMM) EMD																												
Commercial Augmentation Segmentation (CAS) EMD																												

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203110SF / <i>Satellite Control Network (SPACE)</i>	Project (Number/Name) 673276 / <i>Satellite Control Network</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
AFSCN				
AFSCN Deficiency Resolution	1	2021	4	2025
GEN Satellite Operations Transmits and Receive	1	2021	4	2025
GEN Defensive Cyberspace Operations for Space (DCO-S)	1	2021	4	2025
Multi Band Multi Mission (MBMM) EMD	2	2021	4	2025
Commercial Augmentation Segmentation (CAS) EMD	2	2021	3	2023

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203165SF / NAVSTAR Global Positioning System (Space and Control Segments)
---	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	1.984	0.000	1.984	1.991	2.026	0.000	0.000	Continuing	Continuing
67A025: <i>GPS Enterprise Integrator</i>	-	0.000	0.000	1.984	0.000	1.984	1.991	2.026	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203165F, NAVSTAR Global Positioning System (Space and Control Segments) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203165SF, NAVSTAR Global Positioning System (Space and Control Segments) from Appropriation 3600, Budget Activity 07 due to the creation of a new Appropriation for Space Force.

Detailed information on this effort remains classified and will be provided on a need-to-know basis.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary (\$ in Millions)	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	1.984	0.000	1.984
Total Adjustments	0.000	0.000	1.984	0.000	1.984
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	1.984	0.000	1.984

Change Summary Explanation

FY 2021: +\$1.984M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>
Title: Classified Effort	0.000	0.000	1.984

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203165SF / NAVSTAR <i>Global Positioning System (Space and Control Segments)</i>
---	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Description: Classified effort</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Classified effort</p> <p>Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to, continued program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>			
Accomplishments/Planned Programs Subtotals	0.000	0.000	1.984

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

N/A

Remarks

E. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203165SF / NAVSTAR Global Positioning System (Space and Control Segments)	Project (Number/Name) 67A025 / GPS Enterprise Integrator

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Test Event				
Classified Effort	1	2021	4	2022

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203173SF / <i>Space and Missile Test and Evaluation Center</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	4.397	0.000	4.397	4.013	4.085	4.158	4.234	Continuing	Continuing
67A014: <i>R&D Space & Missile Operations</i>	-	0.000	0.000	4.397	0.000	4.397	4.013	4.085	4.158	4.234	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203173F, Space and Missile Test and Evaluation Center efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203173SF, Space and Missile Test and Evaluation Center from Appropriation 3600, Budget Activity 07 due to the creation of a new Appropriation for Space Force.

The Research and Development Space and Missile Operations (RDSMO) program, executed by the Innovation and Prototyping Directorate at Kirtland AFB, NM, conducts space and missile Research and Developmental Test and Evaluation (RDT&E) and Initial Operational Test and Evaluation (IOT&E) in support of prototype experimental, demonstration, and operational satellites at the RDT&E Support Complex (RSC) and the Mobile Range Flight (MRF) at Kirtland, NM and at Schriever AFB, CO. The RDSMO program develops, acquires, delivers, integrates, tests, operates and sustains the Multi-Mission Satellite Operations Center (MMSOC) satellite command and control (C2) Ground System Enterprise (GSE) and fixed/deployable telemetry, tracking, and commanding (TT&C) antenna systems in support of AF and DoD missions and transitions designated satellite missions to the operational command upon user needs. Funds in the General Information Technology (Space) line in appropriation 3022, Procurement, Space Force, procures Information Technology products to support RDSMO.

The objective of the MMSOC C2/GSE environment is to develop the capability to rapidly support R&D, prototype and operational systems and to transition R&D space vehicle technology with residual military utility to operational status for immediate warfighter support. MMSOC is a multiple mission operation system that uses standard hardware and software infrastructure to (1) perform satellite C2 in support of launch requirements; (2) develop and test tactics, techniques, procedures and concepts to conduct satellite operations; (3) provide a satellite C2 incremental block evolution resource for RDT&E of new satellite and C2 systems and concepts; and (4) deliver operational flexibility for new and legacy satellite missions.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development	R-1 Program Element (Number/Name) PE 1203173SF I Space and Missile Test and Evaluation Center
---	---

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	4.397	0.000	4.397
Total Adjustments	0.000	0.000	4.397	0.000	4.397
• 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	4.397	0.000	4.397

Change Summary Explanation

FY 2021: +\$4.397M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
---	----------------	----------------	----------------

Title: MMSOC Development	0.000	0.000	4.397
Description: Evolution of the Ground Services Architecture (GSA) through the Multi-Mission Satellite Operations Center (MMSOC). Development, integration, and test of common services for space vehicle prototype and operational capabilities, including shared orbital analysis and mission planning tools, data distribution and dissemination, cyber defense, cloud computing, multi-security level operations, and enhanced ground entry points for geosynchronous proto-ops.			
FY 2020 Plans: N/A			
FY 2021 Plans: Continue providing capability to USSF HQ for reduced cost of operations and maintenance through evolution of the ground services architecture and automated processes. Integrate EGS backwards functionality into MMSOC C2. Continue LDPE-1 & 2 while providing initial support to Tetra-1 & 2 and LDPE-3A & 4 mission C2. Provide backup to Enterprise Ground Services (EGS) program mission schedule. Continue support to the AFSPC-12 payload, Navigation Technology Satellite-3 (NTS-3) and Tetra prototyping projects. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203173SF / <i>Space and Missile Test and Evaluation Center</i>
---	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	4.397

D. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• SPAF 01 BP23 GNRLIT / 1203173F: <i>General Information Technology</i>	1.361	1.894	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
• SPSF 01 BP23 GNRLIT / 1203173SF: <i>General Information Technology</i>	0.000	0.000	1.926	0.000	1.926	1.962	1.999	2.035	2.073	Continuing	Continuing

Remarks
 In FY2021, P-1 Line Item GNRLIT / General Information Technology efforts were transferred to Appropriation 3022, Procurement, Space Force, from Appropriation 3021 due to the creation of a new Appropriation for Space Force.

E. Acquisition Strategy
 Modernize ground system capabilities and leverage MMSOC sustainment as a test bed for new ground service development, integration testing and operationalization. This includes integration and testing of early EGS prototypes for the Space Based Infra-Red System (SBIRS) Highly Elliptical Orbit (HEO) Migration to EGS (HOME), Operationally Responsive Space (ORS)-5, ROOSTER (formerly Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA)) Augmented Geostationary Laboratory Experiment (EAGLE), Mycroft, Long Duration Propulsive ESPA (LDPE), AFSPC-12 payload, NTS-3 and Tetra prototyping projects. The US Space Force competitively awarded the new Engineering, Development, Integration, and Sustainment (EDIS) Contract to support MMSOC, MRF and EGS activities. Additionally, MMSOC is using a competitively awarded Space Test and Engineering Contract (STEC) and uses Advisory & Assistance Support (A&AS) contracts. These contracts are all managed by Space and Missile Systems Center (SMC).

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
3620F / 7				PE 1203173SF / Space and Missile Test and Evaluation Center				67A014 / R&D Space & Missile Operations							
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Ground Services R&D Engineering, Development, Integration, and Test	C/Various	Various : TBD	-	-		-		2.554	Oct 2020	-		2.554	Continuing	Continuing	-
Core Services Development and Configuration	MIPR	Various : TBD	-	-		-		0.200	Jan 2021	-		0.200	Continuing	Continuing	-
Service Bus Architecture Standards	MIPR	NASA Goddard : Greenbelt, MD	-	-		-		0.050	May 2021	-		0.050	Continuing	Continuing	-
Information Assurance Engineering	MIPR	SAF/FMBIB : Albuquerque, NM	-	-		-		0.127	Jan 2021	-		0.127	Continuing	Continuing	-
Subtotal			-	-		-		2.931		-		2.931	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Space Test and Engineering Contract (STEC) (MMSOC)	C/CPAF	LINQUEST : Kirtland, AFB, NM	-	-		-		0.382	Nov 2020	-		0.382	Continuing	Continuing	-
Subtotal			-	-		-		0.382		-		0.382	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS- METIS	Various	Various : Kirtland, AFB, NM	-	-		-		1.084	Mar 2021	-		1.084	Continuing	Continuing	-
Subtotal			-	-		-		1.084		-		1.084	Continuing	Continuing	N/A

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force								Date: February 2020			
Appropriation/Budget Activity 3620F / 7				R-1 Program Element (Number/Name) PE 1203173SF / <i>Space and Missile Test and Evaluation Center</i>				Project (Number/Name) 67A014 / <i>R&D Space & Missile Operations</i>			
	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract		
Project Cost Totals	-	-	0.000	4.397	-	4.397	Continuing	Continuing	N/A		

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203173SF / <i>Space and Missile Test and Evaluation Center</i>	Project (Number/Name) 67A014 / <i>R&D Space & Missile Operations</i>

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
MMSOC Development																												
MMSOC Ground Services Architecture (GSA) Evolution																												
GSA Backwards Compatibility, Test, and Mission Schedule Relief																												
Core Services Development and Configuration																												
MMSOC Space Test Program Satellite-2 (STPSat-2)																												
MMSOC Space Test Program Satellite-3 (STPSat-3) (Customer Funded)																												
MMSOC CloudSat Supt (Customer Funded)																												
MMSOC Green Propellant Infusion Mission (GPIM) Support (Customer Funded)																												
MMSOC Demonstration and Science Experiment (DSX) Support (Customer Funded)																												
MMSOC ORS-5 Support (Customer Funded)																												
Navigation Technology Satellite NTS-3																												
MMSOC Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA) Augmented Geostationary Laboratory Experiment (EAGLE) Support (Customer Funded)																												
MMSOC Mycroft Support (Customer Funded)																												
MMSOC Long Duration Propulsive ESPA-1 (Customer Funded)																												

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203173SF / <i>Space and Missile Test and Evaluation Center</i>	Project (Number/Name) 67A014 / <i>R&D Space & Missile Operations</i>
---	--	--

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

Long Duration Propulsive ESPA (LDPE)- Tetra	[REDACTED]
AFSPC-12 Payload Support	[REDACTED]

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203173SF / <i>Space and Missile Test and Evaluation Center</i>	Project (Number/Name) 67A014 / <i>R&D Space & Missile Operations</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>MMSOC Development</i>				
MMSOC Ground Services Architecture (GSA) Evolution	1	2021	4	2025
GSA Backwards Compatibility, Test, and Mission Schedule Relief	1	2021	3	2023
Core Services Development and Configuration	1	2021	4	2025
MMSOC Space Test Program Satellite-2 (STPSat-2)	1	2021	4	2025
MMSOC Space Test Program Satellite-3 (STPSat-3) (Customer Funded)	1	2021	4	2025
MMSOC CloudSat Supt (Customer Funded)	1	2021	4	2023
MMSOC Green Propellant Infusion Mission (GPIM) Support (Customer Funded)	1	2021	2	2021
MMSOC Demonstration and Science Experiment (DSX) Support (Customer Funded)	1	2021	2	2022
MMSOC ORS-5 Support (Customer Funded)	1	2021	4	2025
Navigation Technology Satellite NTS-3	1	2021	1	2025
MMSOC Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA) Augmented Geostationary Laboratory Experiment (EAGLE) Support (Customer Funded)	1	2021	4	2021
MMSOC Mycroft Support (Customer Funded)	1	2021	4	2022
MMSOC Long Duration Propulsive ESPA-1 (Customer Funded)	1	2021	3	2022
Long Duration Propulsive ESPA (LDPE)- Tetra	1	2021	3	2025
AFSPC-12 Payload Support	1	2021	4	2025

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203174SF / <i>Space Innovation, Integration and Rapid Technology Development</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	44.746	0.000	44.746	24.643	24.851	67.128	68.358	Continuing	Continuing
67A011: <i>Space Analysis and Application Development</i>	-	0.000	0.000	44.746	0.000	44.746	24.643	24.851	67.128	68.358	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203174F, Space Innovation, Integration and Rapid Technology Development efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203174SF, Space Innovation, Integration and Rapid Technology Development from Appropriation 3600, Budget Activity 07 due to the creation of a new Appropriation for Space Force.

Located at Peterson AFB, Colorado, the Space Innovation, Integration and Rapid Technology Development (SIIRTD) program develops and modifies modeling and simulation tools that the US Space Force (USSF) HQ's Space Analysis Center uses for operations research, military utility analyses, tradeoff studies, and other evaluations of space mission areas to guide planning, programming, requirements generation, analyses of alternatives, and other activities. Development activities incorporate changes in fielded and projected space operational capabilities, as well as technical improvements, into the group's software tools to ensure their data and technology remain current. Space Training Simulators develop and upgrades space training emulators using Standard Space Trainer (SST) to meet Space Mission Force (SMF) threat-based, advanced training requirements as well as funds connection to Distributed Mission Operations (DMO) training networks. Finally, its innovation, education, and training activities foster solutions to operational deficiencies and enhance the integration of space systems into Air Force operations, thereby enabling service and joint warfighters to realize the full potential of existing and planned space capabilities.

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

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

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development	R-1 Program Element (Number/Name) PE 1203174SF / Space Innovation, Integration and Rapid Technology Development
---	---

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	44.746	0.000	44.746
Total Adjustments	0.000	0.000	44.746	0.000	44.746
• 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	44.746	0.000	44.746

Change Summary Explanation

FY 2021: +\$44.746M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Title: Model/Tool Development and Capability Upgrades</p> <p>Description: Develops, verifies, and validates models for space mission areas and modifies existing models to portray new capabilities that meet the national senior leader intent. Advancing M&S tools to incorporate space effects at the campaign, mission and engagement levels with the goal of enhancing decision support, visualization, exercise and wargaming. Rapidly meet downward-directed guidance implementing the system resiliency and situational awareness necessary to win in a contested space domain. Activities may include, but are not limited to, acquisition, program office support, studies, technical analysis, prototyping, etc. The space M&S is used for military utility analyses, trade studies, and other space program evaluations supporting OSD, Joint Staff, Headquarters Air Force, US Space Force (USSF) Headquarters, and the Space and Missile Center.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue development of campaign and mission level models/tools to support force structure decisions as well as OPLAN risk assessments.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>	0.000	0.000	9.769
Title: Space Analysis Model/Tool Development and Capability Upgrades	0.000	0.000	1.724

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>		R-1 Program Element (Number/Name) PE 1203174SF / <i>Space Innovation, Integration and Rapid Technology Development</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Description: Develops, verifies, and validates models for space mission areas and modifies existing models to portray new capabilities that meet the national senior leader intent. Advancing M&S tools to incorporate space effects at the campaign, mission and engagement levels with the goal of enhancing decision support, visualization, exercise and wargaming. Rapidly meet downward-directed guidance implementing the system resiliency and situational awareness necessary to win in a contested space domain. Activities may include, but are not limited to, acquisition, program office support, studies, technical analysis, prototyping, etc. The space M&S is used for military utility analyses, trade studies, and other space program evaluations supporting OSD, Joint Staff, Headquarters Air Force, US Space Force (USSF) Headquarters, and the Space and Missile Center.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue development of campaign and mission level models/tools to support force structure decisions as well as OPLAN risk assessments</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
<p>Title: Standardized Space Trainer Simulators</p> <p>Description: Develop/upgrade Standard Space Trainer (SST) simulators to meet Space Mission Force (SMF) threat-based, advanced training requirements as well as build connectivity to Distributed Mission Operations (DMO) training networks. Follows direction set out in USAF Operational Training Infrastructure (OTI) Flight Plan, as well as meets STRATCOM Integrated Priority List (IPL) priorities.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Accelerate completion of GSSAP SST, UEWR SST, and advanced training capabilities for MILSATCOM SSTs. Begin development for SSTs supporting training for phased-array radars based at Eglin AFB and Cavalier AFS as well as threat-based advanced training capabilities for the Space-Based Infrared System (SBIRS) SST. Continue ongoing enterprise mission training and DMO-S M&S development for Blue/White/Red consoles based on evolving mission requirements and threat analyses.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>		0.000	0.000	33.253
Accomplishments/Planned Programs Subtotals		0.000	0.000	44.746

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203174SF / <i>Space Innovation, Integration and Rapid Technology Development</i>
---	--

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• SPAF 01 GNRLIT: <i>General IT</i>	1.064	1.350	-	-	-	-	-	-	-	Continuing	Continuing
• SPSF 10 GNRLIT: <i>General IT</i>	-	-	1.373	-	1.373	1.397	1.424	1.450	1.477	Continuing	Continuing

Remarks

Funding and content procures equipment for the SIIRTD AFSPC Virtual Analysis Capability (AVAC) system. Supports space and cyber modeling and analysis using a variety of Linux and Windows based hardware and software suites. Also procures Information Technology (IT) hardware & software infrastructure for the Distributed Communications Architecture for ACC.

E. Acquisition Strategy

Any new projects funded in this program will be awarded using competitive procedures to the maximum extent possible.

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203174SF / <i>Space Innovation, Integration and Rapid Technology Development</i>	Project (Number/Name) 67A011 / <i>Space Analysis and Application Development</i>

FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

SIIRTD	
Model development/modification, verification, and validation	
Space Training Simulators	

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203174SF / <i>Space Innovation, Integration and Rapid Technology Development</i>	Project (Number/Name) 67A011 / <i>Space Analysis and Application Development</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
SIIRTD				
Model development/modification, verification, and validation	1	2021	4	2025
Space Training Simulators	1	2021	4	2025

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203182SF / <i>Spacelift Range System (SPACE)</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	11.020	0.000	11.020	11.253	11.456	10.986	10.597	Continuing	Continuing
674137: <i>Launch and Test Range System (LTRS) Modernization</i>	-	0.000	0.000	11.020	0.000	11.020	11.253	11.456	10.986	10.597	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203182F, Spacelift Range System (SPACE) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203182SF, Spacelift Range System (SPACE) from Appropriation 3600, Budget Activity 07 due to the creation of a new Appropriation for Space Force.

The Spacelift Range System (SLRS), also known as the Launch and Test Range System (LTRS), provides public safety and assured access to space. LTRS operates at the Eastern Range (ER) at Patrick AFB/Cape Canaveral AFS, FL and the Western Range (WR) at Vandenberg AFB, CA. LTRS provides tracking, telemetry, communications, flight safety, and other capabilities to support launch of national security space (NSS), civil and commercial space payloads, Intercontinental and Sea Launched ballistic missile and missile defense evaluations, and aeronautical and guided weapon tests. LTRS enables national security, civil, and commercial spacelift operations to be conducted safely; together with national security space launch capability, LTRS provides assured access to space for the nation. The ER and WR are designated as Department of Defense Major Range and Test Facility Bases (MRTFB).

LTRS is comprised of twelve subsystems that together provide this capability to the ranges. The Range Safety and Command Destruct subsystems provide the capability to destroy an errant rocket, if necessary to protect public safety. These subsystems rely on the Telemetry, Radar, and Optics subsystems to provide tracking data. The Weather and Surveillance subsystems allow range operators and customers to determine if conditions are safe for launch. The Communications, Data Handling, and Timing & Sequencing subsystems ensure critical data is expeditiously routed from remote sensors (e.g. radars, optics) to range operators and customers. Finally, the Planning and Scheduling subsystem ensures all assets are available when needed for a launch or test operation.

The Space Force requires RDT&E funds to conduct digital data processing and transport prototype projects supporting Range of the Future (ROTF) launch operations. Funds will provide engineering and analysis to develop promising technology and validate LTRS architecture ability to meet the accelerating national launch requirement and introduce advanced data transport formats. These include demonstration of virtualized and remote data processing as well as dispersed and disaggregated flight tracking.

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203182SF / <i>Spacelift Range System (SPACE)</i>
---	--

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

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	11.020	0.000	11.020
Total Adjustments	0.000	0.000	11.020	0.000	11.020
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	11.020	0.000	11.020

Change Summary Explanation

FY 2021: +\$11.020M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: LTRS Range Technology Integration	0.000	0.000	7.486
Description: Provides Advisory and Assistance Services (A&AS) support of the operational baseline (all twelve subsystems) to include configuration management of all range assets, requirements analyses, and special studies. Provides support for Systems Program Office operations, Systems Engineering and Technical Assistance (SETA), and Federally Funded Research and Development Centers (FFRDC). Strategically executes experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.			
FY 2020 Plans: N/A			
FY 2021 Plans:			

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development	R-1 Program Element (Number/Name) PE 1203182SF I Spacelift Range System (SPACE)
---	---

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Analyze, engineer and prototype Range of the Future (ROTF) concepts to increase LTRS authorization, data transport and data processing. Develop telemetry data virtual processing capability and test dispersed and disaggregated telemetry receipt and processing concepts. Activities may include but are not limited to program office support studies, technical analysis, experimentation, prototyping, etc. FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Title: Enterprise Systems Engineering and Integration to Support Government-Controlled Baseline Description: SE&I manages the government controlled system and subsystem level baseline requirements including analysis of future changes to the fielded baseline. SE&I provides "government as the integrator" engineering support to ensure multiple separate modernizations and the sustainment baseline are synchronized. SE&I will develop and recommend investment strategies to keep the Eastern and Western Ranges operating well beyond the FYDP. FY 2020 Plans: N/A FY 2021 Plans: Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. FY 2020 to FY 2021 Increase/Decrease Statement: N/A	0.000	0.000	3.534
Accomplishments/Planned Programs Subtotals	0.000	0.000	11.020

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2021</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u>	<u>Total Cost</u>
			<u>Base</u>	<u>OCO</u>	<u>Total</u>					<u>Complete</u>	
• SPAF 01 Line Item SPRNGE: <i>Spacelift Range System Space</i>	117.637	118.140	-	-	-	-	-	-	-	-	Continuing
• RDTE 07 1203110SF: <i>Satellite Control Network (SPACE)</i>	26.374	57.891	-	-	-	-	-	-	-	-	Continuing
• RDT&E 07 1203182F: <i>Spacelift Range System (Space)</i>	20.168	20.837	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-	Continuing

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203182SF / <i>Spacelift Range System (SPACE)</i>
---	--

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• SPSF 01 Line Item SPRNGE: <i>Spacelift Range System Space</i>	-	-	100.492	0.000	100.492	94.962	75.786	109.903	105.458	Continuing	Continuing

Remarks

E. Acquisition Strategy

Range of the Future (ROTF) ensures LTRS Architecture is not a constraint to the accelerating National launch cadence executing on the ER and WR. Innovative utilization of digital data processing and distribution is targeted as enabling the ROTF capability. Promising prototypes and technology will be leveraged into LTRS architecture investments delivering increased operational capacity and state-of-art data formatting and transport to launch operations. The competitively-selected SE&I contractor manages government-controlled requirements and processes as well as provide support to the "government as the integrator" between LTRS Integrated Support Contract (LISC) and separately competed modernization projects. FFRDC provides mission assurance oversight to ensure capabilities meet operational need.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203182SF / <i>Spacelift Range System (SPACE)</i>	Project (Number/Name) 674137 / <i>Launch and Test Range System (LTRS) Modernization</i>
---	--	---

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Enterprise Systems Engineering and Integration	C/FPIF	ENSCO INC : Falls Church, VA	-	-		-		3.534	Oct 2020	-		3.534	Continuing	Continuing	-
LTRS Range of the Future (ROTF) Technology Integration	C/Various	Various : TBD	-	-		-		6.781	May 2021	-		6.781	Continuing	Continuing	-
Subtotal			-	-		-		10.315		-		10.315	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FFRDC	RO	Aerospace : El Segundo, CA	-	-		-		0.485	Nov 2020	-		0.485	Continuing	Continuing	-
OTHER SUPPORT	PO	Various : El Segundo, CA	-	-		-		0.220	Nov 2020	-		0.220	Continuing	Continuing	-
Subtotal			-	-		-		0.705		-		0.705	Continuing	Continuing	N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals		-	-	0.000	11.020	11.020	Continuing	Continuing	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203182SF / <i>Spacelift Range System (SPACE)</i>	Project (Number/Name) 674137 / <i>Launch and Test Range System (LTRS) Modernization</i>

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

LTRS																												
Range Technology Integration																												
Enterprise SE&I																												

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203182SF / <i>Spacelift Range System (SPACE)</i>	Project (Number/Name) 674137 / <i>Launch and Test Range System (LTRS) Modernization</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
LTRS				
Range Technology Integration	1	2021	4	2025
Enterprise SE&I	1	2021	4	2025

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203265SF / <i>GPS III Space Segment</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	10.777	0.000	10.777	7.296	1.598	3.382	7.722	0.000	30.775
67A019: <i>GPS III</i>	0.000	0.000	0.000	10.777	0.000	10.777	7.296	1.598	3.382	7.722	0.000	30.775
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

Program MDAP/MAIS Code: 292

A. Mission Description and Budget Item Justification

GPS III is the next-generation SV supporting the GPS constellation and is funded in PE 1203265SF. GPS III SVs will deliver significant enhancements, including a new international civil (L1C) Galileo-compatible signal, and enhanced anti-jam power. GPS III SVs 03-10 are in the Production and Deployment Phase.

PE 1203265SF funds GPS III and supports RDT&E of GPS III SVs 01-02 and risk-reducing simulators through a systems engineering approach that matures and delivers SVs for launch. This program includes SVs 01-02 engineering studies and analyses, trade studies, system development, test and evaluation efforts, integrated logistics support products, on-orbit support, and mission operations support for civil and military applications that protect U.S. military and allied use of GPS. The program also includes Contingency Operations (COps) as a bridge capability to fly GPS III SVs until the delivery of the GPS OCX program.

Mission Readiness Campaign (MRC) activities include launch preparation, planning, mission readiness testing to validate space-ground-user interfaces, mission crew exercises and rehearsals, launch vehicle integration, and On-Orbit Checkout activities to validate performance prior to launch and post launch. Newly certified launch vehicles must be incorporated into the GPS III launch baseline. Integration requires the development of plans and procedures and procurement of special support equipment.

GPS supports the early deployment of Global M-Code to meet a congressional mandate limiting user equipment purchase to M-Code capable receivers starting in FY 2017. The funds will cover the M-Code Early Use (MCEU) program and support development costs associated with the GPS control segment software to provide core M-Code capabilities to the warfighter, as well as the ability to command and control, process, and monitor the M-Code signal. MCEU mitigates delays with GPS OCX, supports MGUE testing, and allows for early M-Code operations. M-Code provides greater security to protect navigation and timing in electronically contested environments.

Impacts of the M-Code deployment include:

- Compliance with The US Space Command Commander's mandate to provide global monitoring necessary for early M-code operational use and verification of NAVWAR effects.
- Direction to improve the resiliency of the GPS capability.
- Confirmation that Enterprise modernization efforts are integrated and properly deployed.
- Testing and Verification of M-Code capability on MGUE/GPS III solution and early M-Code use tied to MGUE fielding.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203265SF / <i>GPS III Space Segment</i>
---	---

The feasibility studies and preliminary engineering analyses that are funded by this budget item will determine whether an initiative to host GPS M-Code augmentation payloads on other satellite systems is practical and beneficial. The primary goal is to provide additional mission assurance through redundant systems not directly connected with the current U.S. GPS satellite constellation.

This PE encompasses the GPS III (SVs 01-10) and MCEU.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	10.777	0.000	10.777
Total Adjustments	0.000	0.000	10.777	0.000	10.777
• 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	10.777	0.000	10.777

Change Summary Explanation

FY 2021: +\$10.777M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: GPS III SVs 01-02	0.000	0.000	7.145
Description: Development, test, and evaluation of GPS III SVs 01-02 and associated simulators, engineering studies and analyses, trade studies, system development, test and evaluation efforts, and integrated logistics support products.			
FY 2020 Plans: N/A			
FY 2021 Plans: Continue on-going on-orbit activities and engineering support for GPS III SV 01 and SV 02 to validate performance through life testing, technical support, system engineering, and mission operations. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to, continued program office support, studies, technical analysis, experimentation, prototyping, etc.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203265SF / <i>GPS III Space Segment</i>
---	---

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
N/A			
<p>Title: Architecture Evolution Plan (AEP) M-Code Monitoring</p> <p>Description: The M-Code Early Use (MCEU) program initiative will cover the development costs associated with updating the legacy control segment software, AEP, with additional capabilities needed to provide M-Code operations. MCEU will provide the Combined Space Operations Center (CSpOC) with command and control (C2), processing, and integrity monitoring for the M-Code signal. The development will also include the integration of modernized Monitor Station Technology Improvement Capability (MSTIC) receivers, which are being procured separately using Operations and Maintenance (O&M) funding as a Form-Fit- Functional replacement for the legacy Monitor Station Receiver Element (MSRE) Y-Code receivers. MCEU will add a software upgrade to MSTIC receivers to allow it to process M-Code signals. Prime contract was awarded to start software development and test activities; includes insertion of Legacy Hot Start, Demilitarized Zone, and Receiver Protection Profile requirements into the MCEU baseline.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Complete Operational Test and Evaluation (OT&E), performance assessment and contract closeout activities. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>	0.000	0.000	3.632
Accomplishments/Planned Programs Subtotals	0.000	0.000	10.777

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• SPAF 01 Line Item GPS III: <i>GPS III</i>	69.386	31.466	-	-	-	-	-	-	-	0.000	100.852
• SPSF 01 Line Item GPS III: <i>GPS III</i>	-	-	20.122	-	20.122	21.302	19.312	7.868	1.883	15.314	85.801
• RDTE,AF 07 1203265F: <i>GPS III Space Segment</i>	139.180	42.440	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	181.620

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203265SF / <i>GPS III Space Segment</i>
---	---

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
Remarks											

E. Acquisition Strategy

The GPS III next generation space segment (SV 01-10) rapidly and affordably responds to warfighter capability requirements. The acquisition approach utilizes a disciplined systems engineering approach which focuses on mitigating cost and schedule risk through a lower-risk incremental delivery of mature technologies. This approach focuses on mission success and on-time delivery. The GPS III SVs will have GPS IIF capabilities plus up to a 3x-8x increase in anti-jam signal power, 3x improved accuracy, 3+ year increased design life, a new international civil (L1C) signal compatible with the European Galileo system, and a satellite bus capable of supporting future SV capability additions.

RDT&E funding for SVs 11 and 12 is in PE 1203269F and PE 1203269SF, Project GPS IIIF. Procurement funding for SVs 13-32 is captured in PE 1203269F and PE 1203269SF, Project GPS IIIF.

The AF is using its research laboratories to mature an On-Orbit Reprogrammable Digital Waveform Generator (ORDWG) which provide signal flexibility to change the signal form while the satellite is on-orbit. This effort is funded with AFRL's S&T funding and PE 1203265F, to increase the number of alternate navigation payloads and inform future PNT architectures.

On 21 Jan 2017, PEO Space approved the Acquisition Strategy for the MCEU program. The MCEU acquisition strategy enables the GPS Enterprise to provide core M-Code capabilities to the warfighter prior to GPS OCX delivery. MCEU will also support the scheduled operational testing of MGUE. MCEU will update the GPS control segment software, AEP, to allow for command and control, processing, and integrity monitoring of the M-Code signal. MCEU acquires this capability by using the existing GPS III prime contract vehicle to modify the operational AEP software.

The Air Force approved reinstatement of a previously deferred Key Support Area (KSA) on 10 Feb 2016. The MSTIC receivers currently under development will get a software upgrade to process M-Code data. This \$7.96M project to procure the M-MSTIC receivers was funded through both O&M and SPAF funds in FY 2016-FY 2018. Performance monitoring, integration, and test will be conducted by the MCEU program and sustained under the Global Positioning Operations Support and Sustainment Division contract with Lockheed Martin.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203265SF / GPS III Space Segment	Project (Number/Name) 67A019 / GPS III
---	--	--

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
GPS III Engineering Support	C/CPIF	Lockheed Martin : Denver, CO	-	-	-	-		1.900	Dec 2020	-		1.900	17.251	19.151	-
GPS III SV01-02 On Orbit Incentive Fee	C/CPIF	Lockheed Martin : Denver, CO	-	-	-	-		1.500	Jan 2021	-		1.500	0.000	1.500	-
GPS III Development_MCEU	C/CPIF	Lockheed Martin : Denver, CO	-	-	-	-		2.520	Dec 2020	-		2.520	0.000	2.520	-
GPS III Technical Mission Analysis	MIPR	Various : Various	-	-	-	-		1.365	Dec 2020	-		1.365	1.095	2.460	-
GPS III Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	-	-	-	-		0.214	Oct 2020	-		0.214	0.000	0.214	-
GPS III Launch Support	RO	45th : Cape Canaveral, FL	-	-	-	-		2.000	Mar 2021	-		2.000	0.000	2.000	-
Subtotal			-	-	-	-		9.499		-		9.499	18.346	27.845	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
GPS III FFRDC	MIPR	Various : El Segundo, CA	-	-	-	-		0.600	Apr 2021	-		0.600	0.512	1.112	-
GPS III A&AS	Various	Various : Various	-	-	-	-		0.573	Apr 2021	-		0.573	0.875	1.448	-
GPS III Other Support	Various	Various : Various	-	-	-	-		0.105	Oct 2020	-		0.105	0.265	0.370	-
Subtotal			-	-	-	-		1.278		-		1.278	1.652	2.930	N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-	0.000	10.777	-	10.777	19.998	30.775	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203265SF / <i>GPS III Space Segment</i>	Project (Number/Name) 67A019 / <i>GPS III</i>
---	---	---

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

GPS III	
GPS III SV01/02 On-Orbit Engineering Support/Performance Validation	
MCEU	
MCEU Operational Test Readiness Certification	

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203265SF / <i>GPS III Space Segment</i>	Project (Number/Name) 67A019 / <i>GPS III</i>
---	---	---

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
GPS III				
GPS III SV01/02 On-Orbit Engineering Support/Performance Validation	1	2021	4	2025
MCEU				
MCEU Operational Test Readiness Certification	1	2021	1	2021

Note

GPS III SV 02 was launched on 22 August 2019
 GPS III SV01/SV02 will perform on-going on-orbit engineering support and performance validation through FY 2025
 MCEU schedule milestones adjusted to match approved Acquisition Program Baseline threshold dates

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203873SF / <i>Ballistic Missile Defense Radars</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	28.179	0.000	28.179	16.084	7.941	0.000	0.000	Continuing	Continuing
674820: <i>Sensor Development</i>	-	0.000	0.000	28.179	0.000	28.179	16.084	7.941	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203873F, Ballistic Missile Defense Radars efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203873SF, Ballistic Missile Defense Radars from Appropriation 3600, Budget Activity 7 due to the creation of a new Appropriation for Space Force.

COBRA DANE (CD) is a 40+ year old radar located on Eareckson AS, AK (Shemya Island, AK), executing two missions: Missile Defense (MD) and Space Domain Awareness(SDA). SDA mission supports New Foreign Launches (NFLs) and Space Catalog maintenance to include space debris tracking. CD will acquire through design, development, Integration, and test a modern architecture to enhance mission capability providing Warfighter and Stakeholder customers direct operational benefit. CD utilizes Federally Funded Research and Development Centers (FFRDC), Systems Engineering and Integration (SE&I), University Affiliated Research Center (UARC) and Assistance and Advisory Services (A&AS) Contractors to support programmatic and technical activities. Activities include studies and analysis to support both current program planning and execution and future program planning. Specifically, the Automated Data Processing Equipment (ADPE) Rehost program upgrades the CD system's radar back end mission data processing, radar management and control, and signal processing capabilities to a modern architecture that facilitates long term mission resiliency, cyber security, system viability, high operational availability, and rapid hardware and software development and deployment capability. FY17 Above Threshold Reprograming (ATR) RDT&E funds were provided to the Missile Defense Agency (MDA) to accelerate the joint Air Force and MDA modernization program of the CD radar which opens the door for a non-traditional acquisition approach using an Other Transaction Authority (OTA) agreement through the OSD Defense Innovation Unit (DIU) Organization. This program element may include necessary civilian pay expenses required to manage, execute, and deliver COBRA DANE's weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605831F. In addition to funds being used to modernize this back end of the radar, these funds will also be used for out-year planning of front end component modernization including enhancement of communication elements.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203873SF / <i>Ballistic Missile Defense Radars</i>
---	--

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	28.179	-	28.179
Total Adjustments	0.000	0.000	28.179	-	28.179
• 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	28.179	-	28.179

Change Summary Explanation

FY 2021: Transfer of funds to Space Force

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
---	----------------	----------------	----------------

Title: ADPE Rehost Upgrade, Phase II	0.000	0.000	28.179
---	-------	-------	--------

Description: The Automated Data Processing Equipment (ADPE) Rehost Phase II continues evolutionary, non-traditional prototype development funded under FY17 Congressional ATR and FY18 Missile Defense Agency funds to deliver an operational capability. FY20 funds extend the prototype development toward integration, complete a System Integration Lab and transition to operationalize prototypes procured using non-traditional acquisition methods which will evolve the COBRA DANE radar back end mission data processing, radar management and control, and signal processing capabilities to a modern open architecture. This architecture will facilitate long term mission resiliency, cyber security, system viability, high operational availability, and rapid hardware and software development and deployment capability. In addition to funds being used to modernize the back end of the radar, these funds may also be used for planning of front end component modernization including enhancement of communication elements.

FY 2020 Plans:

N/A

FY 2021 Plans:

Planned projects include software lab evolution and development support, continued development of system hardware and software, system integration and spiral development and testing. Initial limited capability deployments to the site to include integration hardware support. In addition to funds being used to modernize the back end of the radar, these funds may also be

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203873SF / <i>Ballistic Missile Defense Radars</i>
---	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
used for planning enhancements of communication elements. This program element may include necessary civilian pay expenses required to manage, execute, and deliver COBRA DANE's weapon system capability. FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	28.179

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

Remarks

E. Acquisition Strategy

This acquisition strategy will continue to use a non-traditional approach to modernize and enhance existing capabilities adding a deployment phase to one of the program's currently awarded efforts through the Defense Innovation Unit (DIU) Other Transaction Authority (OTA) Agreement. This approach will provide an extension of system service life to ensure warfighter capability thru at least 2030. This evolutionary migration to a current open system approach also provides foundation for adaptable system sustainment and addition of future capabilities.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force												Date: February 2020			
Appropriation/Budget Activity 3620F / 7				R-1 Program Element (Number/Name) PE 1203873SF / Ballistic Missile Defense Radars					Project (Number/Name) 674820 / Sensor Development						
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	C/CPAF	Not specified. : TBD	-	-		-		-		-		-	Continuing	Continuing	-
ADPE Phase II, Development; S/W & H/W integration	TBD	Various : TBD	-	0.000		0.000		22.653	Jan 2021	-		22.653	Continuing	Continuing	-
Subtotal			-	0.000		0.000		22.653		-		22.653	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Support (integration)	C/CPAF	various : TBD	-	-		0.000		1.680	Feb 2021	-		1.680	Continuing	Continuing	-
Subtotal			-	-		0.000		1.680		-		1.680	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	C/CPAF	Not specified. : TBD	-	-		-		0.300	Feb 2021	-		0.300	Continuing	Continuing	-
Subtotal			-	-		-		0.300		-		0.300	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Services	C/CPAF	Not specified. : TBD	-	-		-		-		-		-	Continuing	Continuing	-
Program Management Support	TBD	Various : TBD	-	-		0.000		3.546	Jan 2021	-		3.546	Continuing	Continuing	-
Subtotal			-	-		0.000		3.546		-		3.546	Continuing	Continuing	N/A

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203873SF / <i>Ballistic Missile Defense Radars</i>	Project (Number/Name) 674820 / <i>Sensor Development</i>

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025							
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
<i>ADPE Rehost Phase II</i>																																
Prototype Phase I completion MDA Funded RDT&E																																
Prototype Phase 2 Requirements, Infrastructure & Early Development																																
Phase 2 Hardware/Software Development																																
Phase 2 Systems Integration & Test																																
Phase 2 Operational Assessment																																
BMC3 Comm Modernization																																
Beam Steering Group Modernization																																

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203873SF / <i>Ballistic Missile Defense Radars</i>	Project (Number/Name) 674820 / <i>Sensor Development</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>ADPE Rehost Phase II</i>				
Prototype Phase I completion MDA Funded RDT&E	1	2019	1	2020
Prototype Phase 2 Requirements, Infrastructure & Early Development	3	2020	3	2022
Phase 2 Hardware/Software Development	3	2020	4	2023
Phase 2 Systems Integration & Test	1	2021	4	2023
Phase 2 Operational Assessment	3	2022	4	2023
BMC3 Comm Modernization	3	2022	4	2023
Beam Steering Group Modernization	4	2022	4	2024

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203913SF / <i>NUDET Detection System (SPACE)</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	29.157	0.000	29.157	25.456	26.714	11.000	13.000	Continuing	Continuing
672808: <i>Nuc Detonation Det Sys (sensors)</i>	-	0.000	0.000	29.157	0.000	29.157	25.456	26.714	11.000	13.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203913F, NUDET Detection System (SPACE) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203913SF, NUDET Detection System (SPACE) from Appropriation 3600, Budget Activity 7 due to the creation of a new Appropriation for Space Force.

The United States Nuclear Detonation (NUDET) Detection System (USNDS) provides a near real-time worldwide, highly survivable/endurable capability to detect, locate, and report any nuclear detonations in the earth's atmosphere or in near space. USNDS supports NUDET detection requirements across five mission areas: Integrated Tactical Warning and Attack Assessment (ITW/AA), Nuclear Force Management (NFM), Space Control (SC), Treaty Monitoring (TM), and a classified mission.

The USNDS program is jointly sponsored and funded by the Department of Defense (DoD), through the Space Force, and the Department of Energy (DOE), through the National Nuclear Security Administration (NNSA) and its Nuclear Detonation Detection (NA-22) office, respectively. NNSA/NA-22 supplies USNDS space sensors as Government Furnished Equipment (GFE) to the Space Force's USNDS Program Office, which is responsible for all acquisition and Systems Engineering, Integration and Test (SEI&T) activities on Space Vehicles (SVs), to include Global Positioning System (GPS) and additional hosts, and their supporting ground control segments. The AF directly funds the development of the USNDS ground segment (described below). DoD funds their contribution to the USNDS program in Program Element (PE) 1203913SF with Research, Development, Test and Evaluation, Space Force (RDT&E, SF), Space Procurement, Space Force (SPSF), and Operations and Maintenance (O&M).

USNDS consists of space sensors and complex ground segments. The space segment sensors, funded by DOE, consists of three nuclear detection sensor payloads: the Radiation Detection Capability (RADEC) payload for Defense Support Program (DSP) satellites, the Global Burst Detection (GBD) payload for Medium Earth Orbit (MEO) platforms (GPS satellites), and the Space Atmospheric Burst Reporting System (SABRS) payload for Geosynchronous Earth Orbit (GEO) platforms (classified GEO host), and Space Test Platform (STP) 3. Together, these sensors and associated communications capability provided by the host satellites comprise the global NUDET space segment detection capability for the USNDS. Space sensors communicate NUDET indications to the fixed ground segment, the RADEC Data Processor (RDP), and the Integrated Correlation and Display System (ICADS), the five deployable mobile ground segment survivable Ground Nuclear Detonation Detection System Terminals (GNTs), and the survivable/endurable Universal Ground NDS Terminals (UGNTs), when fielded. The ground segment provides ground receiving analysis and reporting capabilities to national authorities, commands, and forward users as well as Department of State (DOS) for the Treaty Monitoring and Verification mission. The ground control segment is being modernized and continuously improved through an incremental, evolutionary acquisition approach.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203913SF / <i>NUDET Detection System (SPACE)</i>
---	--

The upgrades to the GNTs are the survivable/endurable UGNT which are funded with RDT&E in this PE. The UGNT provides NUDET Detection Reports to end users through survivable/endurable USNDS communications via Milstar/Advanced Extremely High Frequency (AEHF) circuits. The GNT supports ITW/AA and NFM missions. The UGNT program modifies the baseline of the GNT program and deploys as an integral part of the Space Based Infrared System Survivable (SBIRS) / Endurable Evolution (S2E2) Mobile Ground System (SMGS) units also in support of ITW/AA and NFM. The UGNT, when integrated with the SMGS, will perform NUDET event processing with fused NDS data from GPS and DSP. SMGS capability refers to the result of the S2E2 upgrade program for the Mobile Ground System (MGS) mission processing capability, including the integration of UGNT. The intended end state of UGNT integration is delivery of enhanced NUDET detection capabilities which meet survivable/ endurable attack assessment requirements directed by the President, Secretary of Defense (SECDEF), Joint Staff, and USSTRATCOM, delivering long-term, cost effective, multi-role, multi-mission space effects to the war fighter across the range of military operations.

This budget line includes systems engineering, research and development, on-orbit and field testing and end-to-end verification of USNDS space sensors, ground analysis and reporting systems in support of the five USNDS mission areas. Sensor integration for GPS III and GPS IIIF are funded in their respective PEs.

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

This PE may include necessary civilian pay expenses required to manage, execute, and deliver NUDET Detection System (SPACE) weapon system capability. The use of such program funds is in addition to the civilian pay expenses budgeted in PEs 1206392SF and 1206398SF.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary (\$ in Millions)	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	29.157	0.000	29.157
Total Adjustments	0.000	0.000	29.157	0.000	29.157
• 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	29.157	0.000	29.157

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>		R-1 Program Element (Number/Name) PE 1203913SF / <i>NUDET Detection System (SPACE)</i>		
<p>Change Summary Explanation FY 2021: +\$29.157M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force; this total includes a \$15.000M increase for classified integration efforts for SABRS on existing USNDS ground systems.</p>				
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Title: Integration with SBIRS S2E2 Mobile Ground Terminals (SMGTs) and On-orbit support</p> <p>Description: Support the Integration and test activities between UGNTs and the S2E2 SMGTs, which together provide NUDET Detection Reports and missile warning data to end users through survivable/endurable USNDS communications via Milstar/AEHF circuits. The UGNTs deploy as an integral part of the SBIRS S2E2 SMGS units also in support of ITW/AA and NFM. Support program scope analyzation for USNDS receiver and Integrated Data Denial (IDD) components. Additional support costs includes such activities as; receiver system engineering support, on-orbit NDS sensor integration, conceptual hardware and software design, check-out/support, testing, and system engineering.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Preparation and execution of FPAK operational testing and evaluation (OT&E). Support US Space Force Headquarters (USSF HQ) Operational Acceptance (OA) and Initial Operational Capability (IOC) decisions. Respond to tasks/RFIs and plan additional testing to ensure USSF HQ has the required information to approve OA and IOC. Support the operational Trial Period (TP). Respond to unit Technical Assists (TA), Emergency Depot Level Maintenance (EDLM), Urgent Depot Level Maintenance (UDLM) as required to ensure TP success. Supported optical algorithm study, system readiness review, material development preparation, Hard Radiation System (HRS), Electromagnetic Pulse (EMP) and Spectral Imaging Geolocation Hyper-Temporal Sensor (SIGHTS) telemetry definitions. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>		0.000	0.000	14.157
<p>Title: SABRS Integration</p> <p>Description: Classified Integration efforts of SABRS and existing USNDS ground systems.</p> <p>FY 2020 Plans:</p>		0.000	0.000	15.000

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203913SF / <i>NUDET Detection System (SPACE)</i>
---	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
N/A			
FY 2021 Plans: Classified			
FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	29.157

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• SPAF 01 NUDETS: <i>Nudet Detection Sys Space</i>	9.205	7.432	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
• 01 Space Force NUDETS: <i>Nudet Detection Sys Space</i>	0.000	0.000	6.638	0.000	6.638	6.774	6.900	0.000	0.000	Continuing	Continuing

Remarks

E. Acquisition Strategy
The USNDS Acquisition Strategy is to develop, integrate, field and sustain USNDS satellite sensors and USNDS ground data processing and distribution hardware and software as well as mission operational and technical program support to sustain the USNDS capability on GPS, DSP, and an Alternate Host; funding is sent by Military Interdepartmental Purchase Request (MIPR) from DoD and DOE to Sandia, Lawrence Livermore, Los Alamos National Laboratories and other agencies on existing DOE/NNSA contracts.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203913SF / NUDET Detection System (SPACE)	Project (Number/Name) 672808 / Nuc Detonation Det Sys (sensors)
---	---	---

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
USNDS ICADS, GNT/UGNT, and Integration Support	MIPR	Sandia National Laboratory : Albuquerque, NM	-	-		-		6.658	Nov 2020	-		6.658	Continuing	Continuing	-
USNDS Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	-		-		1.990	Dec 2020	-		1.990	Continuing	Continuing	-
USNDS Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	-	-		-		0.835	Dec 2020	-		0.835	Continuing	Continuing	-
Classified Development	C/TBD	Classified : Classified	-	-		-		15.000	Jan 2021	-		15.000	Continuing	Continuing	-
Subtotal			-	-		-		24.483		-		24.483	Continuing	Continuing	N/A

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
USNDS Testing	Various	17th Test Squadron, JITC : Schriever AFB, CO	-	-		-		0.148	Dec 2020	-		0.148	Continuing	Continuing	-
USNDS On-orbit Sensor Testing	MIPR	Various : LANL, SNL, NM	-	-		-		3.100	Dec 2020	-		3.100	Continuing	Continuing	-
Subtotal			-	-		-		3.248		-		3.248	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
USNDS FFRDC	Various	Aerospace, MITRE : El Segundo, CA	-	-		-		0.663	Dec 2020	-		0.663	Continuing	Continuing	-
USNDS A&AS	Various	Various : Various	-	-		-		0.588	Nov 2020	-		0.588	Continuing	Continuing	-
USNDS Other Support	C/CPAF	Various : Various	-	-		-		0.175	Nov 2020	-		0.175	Continuing	Continuing	-
Subtotal			-	-		-		1.426		-		1.426	Continuing	Continuing	N/A

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force								Date: February 2020			
Appropriation/Budget Activity 3620F / 7			R-1 Program Element (Number/Name) PE 1203913SF / NUDET Detection System (SPACE)				Project (Number/Name) 672808 / Nuc Detonation Det Sys (sensors)				
	Prior Years	FY 2019	FY 2020		FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals	-	-	0.000		29.157	-	29.157	Continuing	Continuing	N/A	

Remarks

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203913SF / <i>NUDET Detection System (SPACE)</i>	Project (Number/Name) 672808 / <i>Nuc Detonation Det Sys (sensors)</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>UGNT</i>				
Acceptance, Test, Support, Readiness Campaign, Integration UGNT 2019 1-5	1	2021	1	2021
<i>USNDS</i>				
NDS Payload Checkout and Activation	1	2021	4	2023
<i>Integration with SMGT Trailers</i>				
Integration with SMGT trailers	1	2021	4	2021

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203940SF / <i>Space Situation Awareness Operations</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	44.809	0.000	44.809	58.968	67.760	66.676	45.107	Continuing	Continuing
67A017: <i>Sensor Service Life Extension Program</i>	-	0.000	0.000	44.809	0.000	44.809	58.968	67.760	66.676	45.107	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203940F, Space Situation Awareness Operations, Project 67A017, Sensor Service Life Extension Program efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203940SF, Space Situation Awareness Operations, Project 67A017, Sensor Service Life Extension Program from Appropriation 3600, Budget Activity 07 due to the creation of a new Appropriation for Space Force.

Space Situational Awareness (SSA) is knowledge of all aspects of space related to operations. As the foundation for space control, SSA encompasses surveillance of all space objects and activities; detailed reconnaissance of specific space assets; monitoring space environmental conditions; monitoring cooperative space assets; gathering intelligence on adversary space operations; and conducting integrated command, control, communications, processing, analysis, dissemination, and archiving activities. SSA also encompasses the integration, exploitation and delivery of data sources to facilitate the battle management and command and control of space forces. This program element fields, upgrades, modifies, modernizes, operationalizes, operates and maintains Space Force sensors and information integration capabilities within the SSA Space Surveillance Network (SSN) while companion program element 1206425F, Space Situational Awareness Systems, develops new network sensors and improved information integration capabilities across the network. Activities funded in this program element (1203940SF) focus on surveillance of objects in earth orbit to aid tasks including satellite tracking; space object identification; tracking and cataloging; satellite attack warning; notification of satellite flyovers to U.S. forces; space treaty monitoring; and technical intelligence gathering.

Service Life Extension Programs (SLEPs) are efforts to upgrade, operationalize and extend the life of operational SSA sensors. These SLEPs extend the serviceable life of assets and maintain critical capability by replacing aging and increasingly unsustainable components with modern and sustainable equipment. In addition, the SLEPs themselves may be designed to increase capabilities not currently realized. As the need arises in the execution year, funds in this project may be used to begin SLEPs on additional efforts. These efforts may include prototyping and technology demonstrations.

Global Sensor Watch (GSW) Program provides an integrated SSA Tip & Cue capability that implements a survivable architecture providing overlapping, assured, and viable surveillance options for executing event response, multiple level security processing of SSA data and automated cross-sensor tipping & cueing worldwide. Other efforts to support Battle Management Command & Control (BMC2) in space include developing & deploying advanced software algorithms to identify, acquire, characterize, and maintain custody of both space objects of interest and new foreign launches; enhancing space environmental monitoring solutions; optimizing commercial, intelligence community (IC) & Missile Defense Agency sensors to better support BMC2; developing & executing Joint Functional Space Component Command (JFSCC) exercises such as Combined Space Operations Center and National Space Defense Center Experimentation, Test and Training Initiative to test & optimize Space Control capabilities, Concept of Operations (CONOPS) development to increase probability of survival for blue assets, and refining requirements

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203940SF / <i>Space Situation Awareness Operations</i>	
<p>across the space enterprise; enhancing sensor performance to close the solar exclusion gap leveraging technologies such as optical daylight tracking and incorporating commercial & IC sensors; and improving legacy paths to support bi-directional machine-to-machine sensor communications enabling a more complete BMC2 capability.</p> <p>Space Surveillance Telescope (SST) provides rapid un-cued search, detection and tracking of dim objects in deep space and offers enhanced capabilities addressing critical space situational awareness gaps.</p> <p>Ground Based Radar Upgrades improves the sensitivity, search capabilities and CONOPS of existing ground-based SSA sensors to better support custody and fire control timelines.</p> <p>The FY 2021 funding request was reduced by \$3.446 million to account for the availability of prior year execution balances.</p> <p>Programs and projects in the space warfighting enterprise are evaluating ways to maximize innovation, resiliency, and our ability to rapidly respond to known and emerging threats. Space enterprise efforts aim to execute technology risk reduction efforts, integration of new or repurposed capabilities, enterprise decision-making tools, experimentation, and rapid prototyping and fielding via all appropriate acquisition authorities and contract mechanisms.</p> <p>Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.</p> <p>This program element may include necessary civilian pay expenses required to manage, execute, and deliver the weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 120639S2F and 1206398SF.</p> <p>This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.</p>		

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203940SF / <i>Space Situation Awareness Operations</i>
---	--

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	44.809	0.000	44.809
Total Adjustments	0.000	0.000	44.809	0.000	44.809
• 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	44.809	0.000	44.809

Change Summary Explanation

FY 2021: +\$44.809M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force. This total includes a \$26.975M increase from FY 2020 to FY 2021 accounts for: 1) dedicated funding for the SSA data architecture (known as the Unified Data Library) and 2) funding to upgrade sensors for classified activities. Increased funding is also supporting operational roll-out of capability whose development was started in FY 2020.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Title: Global Sensor Watch Program</p> <p>Description: Global Sensor Watch (GSW) Program provides an integrated SSA Tip and Cue capability that implements a survivable architecture that provides overlapping, assured, and viable surveillance options for executing event response, multiple level security processing of SSA data and automated cross-sensor tipping and cueing around the globe. Other efforts to support Battle Management Command & Control (BMC2) in space include developing & deploying advanced software algorithms to identify, acquire, characterize, and maintain custody of deep space SHIOs; optimizing intelligence community & MDA sensors to better support BMC2; enhancing space environmental monitoring solutions; developing & executing JFCC Space exercises to test & optimize Space Control capabilities, CONOPS development to increase probability of survival for blue assets, and refining requirements across space enterprise; enhancing sensor performance to close the solar exclusion gap leveraging technologies and improving legacy communication paths to support bi-directional machine-to-machine sensor communications enabling a more complete BMC2 capability.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans:</p>	0.000	0.000	39.897

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>		R-1 Program Element (Number/Name) PE 1203940SF / <i>Space Situation Awareness Operations</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
Complete prime contractor testing. Conduct system training with RAAF Operators and Australian Level 1 maintainers. Accomplish DT&E and complete OT&E planning. FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: Space Surveillance Telescope DT&E/OT&E Description: Space Surveillance Telescope (SST) provides rapid un-cued search, detection and tracking of dim objects in deep space and offers enhanced capabilities addressing critical space situational awareness gaps. SST relocation from White Sands Missile Range, NM to Western Australia is expected complete in FY 2021. Efforts include executing SST sensor reassembly, subsystem integration and testing subsequent to Australian facility delays. This includes completion of SST integration into a new facility, SST subsystem and system testing & Developmental Test/Operational Test and Evaluation (DT/OT&E). FY 2020 Plans: N/A FY 2021 Plans: Complete SST reassembly, subsystem integration, and testing, including facility integration, SST subsystem and system testing, and DT/OT&E. Space Acquisition must respond with speed and agility to emerging adversary threats. Space acquisition must respond with speed and agility to emerging adversary threats. Rapidly respond and implement system resiliency and situational awareness necessary to operate in the contested space domain. RDT&E funding is required to support this transformation and enable Space Superiority end-to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events. FY 2020 to FY 2021 Increase/Decrease Statement: N/A		0.000	0.000	4.912
Accomplishments/Planned Programs Subtotals		0.000	0.000	44.809
D. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203940SF / <i>Space Situation Awareness Operations</i>
---	--

E. Acquisition Strategy
The acquisition strategies for the Global Sensor Watch and Space Surveillance Telescope programs includes a mix of modifications to existing Air Force or Space Force contracts and directing funds to other AF, SF or DoD organizations for contract support.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203940SF / <i>Space Situation Awareness Operations</i>	Project (Number/Name) 67A017 / <i>Sensor Service Life Extension Program</i>
---	--	---

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
GSW Operationalization	C/TBD	Multiple : Colorado Springs, CO	-	-		-		31.697	Dec 2020	-		31.697	Continuing	Continuing	-
GSW SW Development 1	Various	AFRL : Various	-	-		-		2.750	Feb 2021	-		2.750	Continuing	Continuing	-
GSW SW Development 2	Various	MIT/LL : Lexington, MA	-	-		-		2.800	Jan 2021	-		2.800	Continuing	Continuing	-
GSW SW Development 3	Various	Sandia National Labs : Albuquerque, NM	-	-		-		0.600	Nov 2020	-		0.600	Continuing	Continuing	-
Space Surveillance Telescope	Various	Multiple : Exmuth Australia	-	-		-		4.912	Oct 2020	-		4.912	Continuing	Continuing	-
Subtotal			-	-		-		42.759		-		42.759	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
A&AS	Various	Multiple : Colorado Springs, CO	-	-		-		1.200	Nov 2020	-		1.200	Continuing	Continuing	-
FFRDC	Various	Multiple : Colorado Springs, CO	-	-		-		0.700	Dec 2020	-		0.700	Continuing	Continuing	7.788
Other Support	Various	Muliple : Colorado Springs, CO	-	-		-		0.150	Nov 2020	-		0.150	Continuing	Continuing	16.626
Subtotal			-	-		-		2.050		-		2.050	Continuing	Continuing	N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract		
Project Cost Totals		-	-	0.000	-	44.809	-	44.809	Continuing	Continuing	N/A

Remarks

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203940SF / <i>Space Situation Awareness Operations</i>	Project (Number/Name) 67A017 / <i>Sensor Service Life Extension Program</i>

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Sensor SLEP																												
Global Sensor Watch (GSW) Program																												
GSW Operationalization																												
GSW SW Development 1 (Operationalized)																												
GSW SW Development 2 (Legacy)																												
GSW SW Development 3 (Non-traditional)																												
SST OT&E																												

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203940SF / <i>Space Situation Awareness Operations</i>	Project (Number/Name) 67A017 / <i>Sensor Service Life Extension Program</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Sensor SLEP				
Global Sensor Watch (GSW) Program	1	2021	4	2025
GSW Operationalization	1	2021	4	2023
GSW SW Development 1 (Operationalized)	1	2021	4	2021
GSW SW Development 2 (Legacy)	1	2021	4	2022
GSW SW Development 3 (Non-traditional)	1	2023	4	2025
SST OT&E	1	2022	2	2022

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	481.999	0.000	481.999	406.136	290.873	124.617	0.000	0.000	1,303.625
67A021: OCX	0.000	0.000	0.000	421.664	0.000	421.664	341.216	290.873	124.617	0.000	0.000	1,178.370
67A025: <i>GPS Enterprise Integrator</i>	0.000	0.000	0.000	60.335	0.000	60.335	64.920	0.000	0.000	0.000	0.000	125.255

Program MDAP/MAIS Code: 456

Note
This program, BA 07, PE 1206423SF, project 67A021, OCX Block 3F, is a new start.

A. Mission Description and Budget Item Justification
In FY 2021, PE 1206423F, Global Positioning System III - Operational Control Segment efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206423SF, Global Positioning System III - Operational Control Segment from Appropriation 3600, Budget Activity 07 due to the creation of a new Appropriation for Space Force.

The Global Positioning System (GPS) is a space based Positioning, Navigation and Timing (PNT) distribution system which operates through all weather. GPS supports both civil and military users in air, space, sea and land operations. GPS is a satellite-based radio navigation system that serves military and civil users worldwide. GPS users process satellite signals to determine accurate position, velocity and time. GPS must comply with Title 10 United States Code (USC) Sec 2281 which requires that the Secretary of Defense (SECDEF) ensures the continued sustainment and operation of GPS for military and civilian purposes, and 51 USC Sec 50112, which requires that GPS complies with certain standards and facilitates international cooperation.

Program Element (PE) 1206423SF funds Research, Development, Test and Evaluation (RDT&E) for the GPS Next Generation Operational Control System (OCX), the upgrade to OCX called OCX Block 3F to incorporate Regional Military Protection (RMP), command and control functionality for GPS III Follow-on (GPS IIIF) satellites, and the GPS Enterprise Integrator (EI). OCX acquisition was established to 1) provide command and control of legacy and GPS III satellites, 2) incorporate situational awareness to support Navigation Warfare (NAVWAR) and signal monitoring, 3) enable mission capability upgrades to support a warfighter effects-based approach to operations, and 4) integrate Department of Defense (DoD) information assurance and cybersecurity controls and capabilities. OCX Block 3F will upgrade OCX with new capabilities to synchronizes with GPS IIIF Space Segment capabilities. GPS EI is responsible for architecture and system definition (the analysis and definition, management, maintenance, and evolution of the GPS Enterprise requirements and interface technical documents) as well as for the planning, execution, and fielding of the GPS Enterprise.

OCX funds support efforts such as engineering studies and analyses, architectural engineering studies, trade studies, technology needs forecasting, modernization initiatives, systems engineering, system development, resolving obsolescence issues, test and evaluation efforts, and mission operations. These activities support

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>	
<p>upgrades and product improvements for military and civil applications necessary to enable efforts to protect United States (U.S.) Military and Allies' use of GPS. Additionally, funds ensure OCX efforts meet current and future Joint Requirements Oversight Council (JROC) approved required capabilities.</p> <p>OCX Block 3F will upgrade OCX with new capabilities to synchronize with GPS IIF Space Segment and Military GPS User Equipment (MGUE) Increment 2 capabilities. This includes advanced concept development such as systems analysis, modernized control segment development, modernization/deployment of 17 monitoring stations, mission planning development, training simulators, integrated logistics support products, test resources, systems engineering required to meet the Government's obligations to the international, military and civil communities, and system requirements verification. OCX Block 3F will maintain backward compatibility to support the legacy constellation develop solutions necessary to command, control and monitor GPS IIF, to include advance collection and integration of RMP high power regional M-code signals, rapid warfighter effects and support to GPS auxiliary payloads.</p> <p>The GPS Enterprise consists of Space, Ground Control, Nuclear Detonation (NUDET) Detection System (NDS) and User Equipment Segments. The Government is responsible for the integration of the GPS Segments such that they provide worldwide GPS capability to support the warfighter and over a billion national security, civil, Allied, and commercial GPS users.</p> <p>The GPS EI project includes the efforts associated with the Government's prime contract tasks necessary to accomplish critical integrating function with the three GPS enterprise material segments along with the logistics, operational and transition communities. The GPS EI maintains the GPS current architecture and system definition, controls and validates interfaces, ensures compatibility of Generation II and III systems, and develops/manages plans for execution and fielding of the GPS Enterprise. Further, GPS EI provides modeling, simulation, and technical analyses of impacts for Government directed enterprise level trades among the GPS segments leading to definition, management, maintenance, and evolution of the GPS Enterprise requirements and interface technical documents to build and ensure the integrity of the enterprise technical baseline, and perform system requirements verification.</p> <p>In addition, the GPS EI project funds the technical evolution, risk reduction, enterprise-level testing and delivery of all GPS Enterprise capabilities. Examples for Generation II include electronic protection; for Generation III, additional anti-jamming protection and additional civil signals. To accomplish this, GPS EI delivers Test and Verification capabilities, Requirements and Interface Management, and Systems Integration support across the Space, Control, and User Segments. In this capacity, GPS EI is responsible for managing this cross-program work to provide these and other capabilities.</p> <p>GPS EI's analyses guides Government decisions to ensure efficient and effective synchronization and execution across all Generation II and III GPS programs. For Enterprise-wide integration to be successful, the GPS EI: works with the GPS and NDS prime contractor teams to develop plans for early risk reduction System Integration Demonstrations to ensure system interfaces and functionality meet user and system requirements; ensures all equipment and documentation is ready when needed; integrates and analyzes enterprise schedules; and conducts formal test and verification, including Requirement Verification Plans and System Test Plans and Procedures. GPS EI performs all these efforts across all GPS programs in all acquisition phases. The Government owns the GPS Enterprise system requirements and integration, and highly leverages the GPS EI team to eliminate the need to fund a development prime contractor to perform these functions. This enhances Government control, oversight and program accountability.</p> <p>The FY 2021 funding request was reduced by \$6.448 million to account for the availability of prior year execution balances.</p>		

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>
---	---

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

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

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	481.999	0.000	481.999
Total Adjustments	0.000	0.000	481.999	0.000	481.999
• 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	481.999	0.000	481.999

Change Summary Explanation

FY 2021: +\$481.999M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3620F / 7					R-1 Program Element (Number/Name) PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>				Project (Number/Name) 67A021 / OCX			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
67A021: OCX	0.000	0.000	0.000	421.664	0.000	421.664	341.216	290.873	124.617	0.000	0.000	1,178.370
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program, BA 07, PE 1206423SF, project 67A021, OCX Block 3F, is a new start.

A. Mission Description and Budget Item Justification

GPS is a space based PNT distribution system which operates through all weather. This project funds the research and development for OCX. This includes, but is not limited to, advanced concept development, systems engineering and analysis, modernized control segment and mission planning development, modernization/ deployment of 17 monitoring stations, training simulators, integrated logistics support products, and test resources.

OCX acquisition was established to: 1) provide command and control of legacy and GPS III satellites; 2) incorporate situational awareness to support NAVWAR and signal monitoring; 3) enable mission capability upgrades to support a warfighter effects-based approach to operations; and 4) integrate DoD information assurance and cybersecurity controls and capabilities. OCX funds will support efforts such as engineering studies and analyses, architectural engineering studies, trade studies, technology needs forecasting, technology development, systems engineering, system development, test and evaluation efforts and mission operations in support of upgrades and product improvements for military and civil applications necessary to support efforts to protect U.S. military and Allies' use of GPS. Additionally, funds will ensure efforts to meet current and future JROC approved required capabilities.

OCX Block 0 (through Iteration 1.5) is the Launch and Control System (LCS) intended to conduct Launch and Early Orbit (LEO) operations and the on-orbit checkout of all GPS III satellites. OCX Block 0 is a subset of OCX Block 1.

OCX Block 1 (adds Iterations 1.6, 1.7 and 2.1 to Block 0) fields the operational capability to control all legacy satellites and civil signals (L1C/A), military signals (L1P(Y), L2P(Y)) as well as the GPS III satellites and the modernized civil signal (L2C) and the aviation safety-of-flight signal (L5). In addition, Block 1 will field the basic operational capability to control the modernized military signals (L1M and L2M M-Code), and the globally compatible signal (L1C). It also fully meets information assurance/cyber defense requirements.

OCX Block 2 fields the advanced operational capability to control the advanced features of the modernized military signals (L1M and L2M M-Code). Blocks 1 & 2 are being delivered concurrently as a result of the Oct 2016 Nunn-McCurdy review.

OCX Block 3F will modify OCX Blocks 1 and 2 to field new capabilities in support of the GPS III Follow-On (GPS IIIF) production program and incorporate Regional Military Protection (RMP) to handle future threats. OCX Block 3F will upgrade OCX with new capabilities to synchronizes with GPS IIIF Space Segment and Military GPS User Equipment (MGUE) Increment 2 capabilities. OCX Block 3F will maintain backward compatibility with the existing capabilities to support the legacy GPS constellation and integrate into Block 1 and 2 and future efforts to support GPS IIIF. The OCX Block 3F effort will develop solutions necessary to command, control, and

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>	Project (Number/Name) 67A021 / OCX		
monitor GPS IIIIF spacecraft and include advance collection and integration of RMP high-power regional Military Code (M-Code) signals, rapid warfighter effects, and support to GPS IIIIF auxiliary payloads (including Search and Rescue (SAR), Nuclear Detonation (NUDET) Detection System (NDS).				
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Title: OCX Development</p> <p>Description: Development of GPS OCX system to launch GPS III, operate a mixed GPS II and GPS III constellation, and provide for a robust Information Assurance system.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Complete Iteration 1.7 and 2.1 integration and test activities. Continue contractor support of the Block 0 baseline that is supporting GPS III satellite launch and checkout. Complete system level Site Acceptance Testing (SAT). Complete system maturity demonstrations, known as TRROs, in support of transition from the legacy OCS to OCX. Continue software and hardware obsolescence remediation and replacement of obsolete IBM servers. Begin and complete system acceptance and DD250. Begin interim contractor support activities. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>		0.000	0.000	308.403
<p>Title: OCX Block 3F</p> <p>Description: OCX Block 3F will upgrade OCX Block 1 & 2 with new capabilities in support of GPS IIIIF and incorporate RMP to handle future threats. OCX Block 3F will maintain backward compatibility to support the legacy constellation develop solutions necessary to command, control and monitor GPS IIIIF, to include advance collection and integration of RMP high power regional M-code signals, rapid warfighter effects and support to GPS auxiliary payloads.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Award OCX Block 3F contract. Conduct requirements analysis and necessary systems engineering to start the development and test planning leading to a sprint design review in mid 2021 in order to upgrade the system simulator and implement all changes required to the OCX baseline to support GPS IIIIF SV.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement:</p>		0.000	0.000	72.600

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>	Project (Number/Name) 67A021 / OCX

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
FY 2021 is a new start for OCX Block 3F.			
Title: Technical Support	0.000	0.000	40.661
Description: Development of the Standardized Space Trainer (SST) to provide GPS III operator training. Development of Enterprise Mission Planning Systems. Facilities upgrades for Control Stations and associated equipment and servers. Systems Engineering (SE) including Technical Mission Analysis (TMA), Modernization SE and Technical Support, and Test and Evaluation (T&E).			
FY 2020 Plans: N/A			
FY 2021 Plans: Complete work on the SST and development demonstration of capabilities. Continue data collection, and tuning of the monitoring stations equipment and OMSRE. Begin technical support of Transition Risk Reduction Operations (TRROs) and Integrated System Test.			
FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	421.664

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• RDTE,AF 07 PE 1203265F: <i>GPS III Space Segment</i>	139.180	42.440	-	-	-	-	-	-	-	0.000	181.620
• RDTE,SF 07 PE 1203265SF: <i>GPS III Space Segment</i>	-	-	10.777	-	10.777	7.296	1.598	3.382	7.722	0.000	30.775
• RDTE,AF 05 PE 1203269F: <i>GPS III Follow-On</i>	412.202	462.875	-	-	-	-	-	-	-	0.000	875.077
• RDTE,SF 05 PE 1203269SF: <i>GPS III Follow-On</i>	-	-	263.496	-	263.496	267.542	294.706	286.279	177.074	1,167.479	2,456.576
• SPAF 01 Line Item GPSIII: <i>GPS III Space Segment</i>	69.386	31.466	-	-	-	-	-	-	-	0.000	100.852
• SPSF 01 Line Item GPSIII: <i>GPS III Space Segment</i>	-	-	20.122	-	20.122	21.302	19.312	7.868	1.883	92.808	163.295

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>	Project (Number/Name) 67A021 / OCX

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• SPAF 01 Line Item GPS IIIF: <i>GPS III Follow-On</i>	-	414.625	-	-	-	-	-	-	-	0.000	414.625
• SPSF 01 Line Item GPS IIIF: <i>GPS III Follow-On</i>	-	-	627.796	-	627.796	634.821	640.782	920.657	750.853	3,230.317	6,805.226

Remarks

D. Acquisition Strategy

The Air Force is pursuing a "Block" approach for OCX in order to respond to warfighter capability requirements. The strategy calls for capability (e.g., better signal maintainability, Unified S-Band (USB), Search and Rescue (SAR) GPS, and near-real time Command and Control (C2)), on-ramps for the follow-on contract for GPS III Space Vehicles (SVs) (starting no earlier than SV11) which will require updates to the OCX ground segment. Enterprise studies will ensure GPS Enterprise synchronization across space and ground segments. Acquisition strategy for OCX Block 3F is currently in work however program office is targeting a tailored ACAT II program with a targeted award in FY 2021.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>	Project (Number/Name) 67A021 / OCX
---	---	--

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
GPS OCX Phase B OCX Block 1 & 2 Development	C/CPAF	Raytheon : Aurora, CO	-	-		-		280.853	Dec 2020	-		280.853	622.320	903.173	4,413.394
GPS OCX Block 3F Development	TBD	Not specified. : TBD	-	-		-		72.600	Mar 2021	-		72.600	0.000	72.600	-
GPS OCX Technical Mission Analysis	MIPR	Various : Various	-	-		-		15.394	Dec 2020	-		15.394	46.182	61.576	-
GPS OCX Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	-	-		-		6.865	Dec 2020	-		6.865	20.595	27.460	88.187
GPS OCX Modernization/ SE & Technical Support	Various	Various : Various	-	-		-		3.313	Dec 2020	-		3.313	0.000	3.313	-
GPS OCX Standard Space Trainer (SST)	C/CPAF	Sonalyt, Inc : Waterford, CT	-	-		-		6.500	Dec 2020	-		6.500	0.000	6.500	34.000
GPS OCX Enterprise Mission Planning	C/CPIF	Booz Allen Hamilton Eng Services : El Segundo, CA	-	-		-		5.800	Jan 2021	-		5.800	0.000	5.800	33.700
Subtotal			-	-		-		391.325		-		391.325	689.097	1,080.422	N/A

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
GPS OCX T&E	C/Various	Various : Various	-	-		-		9.654	Mar 2021	-		9.654	0.000	9.654	-
Subtotal			-	-		-		9.654		-		9.654	0.000	9.654	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
GPS OCX FFRDC	MIPR	Various : Various	-	-		-		7.132	Oct 2020	-		7.132	21.396	28.528	-
GPS OCX A&AS	Various	Various : Various	-	-		-		12.613	Feb 2021	-		12.613	45.213	57.826	-
GPS OCX Other Support	Various	Various : Various	-	-		-		0.940	Oct 2020	-		0.940	1.000	1.940	-

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>	Project (Number/Name) 67A021 / OCX

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
OCX				
Block 0 Interim Contractor Support	1	2021	3	2022
System Acceptance Test (SAT)	2	2021	2	2021
Block 1/2 DD 250	4	2021	4	2021
OCX Block 1 Ready to Operate (RTO)	3	2022	3	2022
OCX Block 3F				
Contract Award	2	2021	2	2021
Design Review	3	2021	3	2021
Software Factory Ready Use	4	2021	4	2021

Note

Acquisition strategy for OCX Block 3F is currently in work. However, program office is targeting a tailored ACAT II program with a targeted contract award 2QFY21, design review 3QFY21, 4QFY21 OCX3F Software Factory Ready for Use.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3620F / 7					R-1 Program Element (Number/Name) PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>				Project (Number/Name) 67A025 / <i>GPS Enterprise Integrator</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
67A025: <i>GPS Enterprise Integrator</i>	0.000	0.000	0.000	60.335	0.000	60.335	64.920	0.000	0.000	0.000	0.000	125.255
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The GPS Joint Program Office established and maintains the technical baseline and is responsible for the successful fielding of all the GPS Segments (space, control, and user). In order to successfully execute these responsibilities, GPS Enterprise Integrator (EI) creates an enterprise architecture, integrates segment products, verifies the enterprise requirements are adequately met, develops and implements various Systems Engineering documents, defines methods of verification, conducts integrated system test and test analysis, develops and manages the Enterprise technical baseline which reflect multiple stakeholder requirements; Stakeholders include the Department of Defense (DoD), foreign governments, industry, and the general public, (through four public interface specifications). Furthermore, GPS EI ensures GPS capabilities meet the warfighter's, civil agencies', commercial entities', international treaties', and over four billion global GPS users' needs. Moreover, GPS EI is responsible for delivering a reliable PNT signal capability to military operators, the civil user community, and international partners. In addition, GPS EI validates the system performance in various mission threat scenarios during its development as well as, provides in-depth technical expertise to enhance government control, oversight and program accountability. GPS EI is also responsible for all aspects of schedule and technical alignment across the GPS segments (space, control, and user).

More specifically, GPS EI is responsible for technical baseline management, integration, synchronizing, testing, and verifying GPS III, OCX, Military Global Positioning System User Equipment (MGUE), M-Code Early Use (MCEU) and Contingency Operations (COps). Additionally, GPS EI is responsible for creating and managing plans that provide early exercise of the products under development, compatibility analysis, and inter-segment testing. The inter-segment tests are required to prove OCX interoperability with GPS III satellites and modernized user equipment. More importantly, it ensures backwards compatibility with GPS Block II satellites and legacy user equipment. The GPS EI also manages the process through which the JROC validated requirements are matured and flowed down to the system segments, while remaining consistent with various interfaces. This enables the GPS system to meet Title 10 of the USC, Sec 2281, mandated GPS capabilities, and various other obligations to the international community that provide inter-operable PNT signals.

GPS EI also supports the Government Joint Program Office's GPS spectrum protection at international forums such as the International Telecommunications Union. Such support consists of advocating on behalf of the United States (U.S.) Government when negotiating with foreign partners. In addition, GPS EI provides technical expertise to maintain relationships with other U.S. government agencies that include the Federal Aviation Administration (FAA), National Geospatial-Intelligence Agency (NGA), National Aeronautics and Space Administration (NASA), Departments of State (DOS), Transportation (DoT), Homeland Security (DHS), and Commerce (DOC). GPS EI Spectrum also ensures GPS priority for eight essential spectrum signals, including those required for civil air navigation and safety of life. Spectrum Protection prevents encroachment from commercial or foreign entities, which results in the preservation of warfighter's reliable signal. As a result, military operations and the integrity of the global economic infrastructure are protected.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>	Project (Number/Name) 67A025 / <i>GPS Enterprise Integrator</i>
---	---	---

GPS EI also provides the GPS enterprise expertise in System Safety, Enterprise level System Security Engineering covering Acquisition Systems Program Security (i.e., personnel, industrial, operations, information, sensitive compartmented information, communication, and physical), Program Protection, Foreign Disclosure, Public Release reviews, Mission System Certification and Accreditation, and Enterprise Cybersecurity. GPS EI is accountable for the development, execution, and analysis of OCX, cybersecurity, and associated test cases necessary to deliver a secure operational system.

The FY 2021 funding request was reduced by \$6.448 million to account for the availability of prior year execution balances.

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

	FY 2019	FY 2020	FY 2021
<p>Title: GPS Enterprise Integrator</p> <p>Description: The integration and technical baseline control of all elements of the GPS system (space/control/user) in support of both military and civil users. Test and verification of integrated system performance in preparation for operational test and evaluation.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Conduct government security test of OCX block 1 and test planning using simulators to verify test procedures and determine readiness for testing with live assets of OCX Block 1, and GPS III, (IST 3-1) in preparation for an integrated test for OCX that includes OCX Block 1, the full GPS satellite constellation with GPS III, and MGUE available on all four service lead platforms (IST 3-2). In addition, perform OCX adversarial cyber tests, M-code live sky and support OCX operational test. Support MGUE increment one Operational Testing (IST 3-3) on all four service lead platforms. Support delivery and testing for SMPS 5C update that allows full tasking for M-Code and OCX compatibility. Initiate planning for IST 3-4 to verify functionality of MGUE increment 2 and M-Code handheld receivers. Transition MCEU (IST 2-6) from Operational Test activities into operations. Align enterprise to seamlessly transition control of the GPS constellation from OCS to OCX. Support launch and on-orbit checkout testing of SVs 06-07. Support planning and execution of test events for SVs 08. Conduct modeling and simulation to verify capability of GPS IIIF to operate in a contested environment. Continue cybersecurity tests across all GPS segments (space/control/user). Develop technical specifications for operation of Regional Military Protection (RMP). Continue to conduct tests and analyses to protect GPS users from interference sources that threaten performance of GPS receivers. Participate in international GNSS forums to advocate for GPS regulatory and technical interests. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>	0.000	0.000	60.335
Accomplishments/Planned Programs Subtotals	0.000	0.000	60.335

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>	Project (Number/Name) 67A025 / <i>GPS Enterprise Integrator</i>

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2021</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u>	
			<u>Base</u>	<u>OCO</u>	<u>Total</u>					<u>Complete</u>	<u>Total Cost</u>
• RDTE,SF 04 PE 1203164SF: <i>NAVSTAR Global Positioning System (User Equipment) (Space)</i>	-	-	390.704	-	390.704	340.178	283.663	212.735	54.066	0.000	1,196.616
• RDTE,SF 07 PE 1203265SF: <i>GPS III Space Segment</i>	-	-	10.777	-	10.777	7.296	1.598	3.382	7.722	61.861	92.636
• RDTE,SF 05 PE 1203269SF: <i>GPS III Follow-On</i>	-	-	263.496	-	263.496	267.542	294.706	286.279	177.074	1,167.479	2,456.576
• RDTE,SF 07 PE 1203913SF: <i>NUDET Detection System</i>	-	-	29.157	-	29.157	25.456	26.714	11.000	0.000	0.000	135.654
• SPSF 01 Line Item GPSIII: <i>GPS III Space Segment</i>	-	-	20.122	-	20.122	21.302	19.312	7.868	1.883	92.679	163.309
• SPSF 01 GPS IIIIF: <i>GPS III Follow-On</i>	-	-	627.796	-	627.796	634.821	640.782	920.657	750.853	3,230.317	6,805.226
• RDTE,AF 07 1203164F: <i>NAVSTAR Global Positioning System (User Equipment) (Space)</i>	236.789	187.355	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	557.384
• RDTE,AF 07 1203913F: <i>NUDET Detection System</i>	21.578	49.300	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	70.878
• RDTE,AF 07 1203265F: <i>GPS III Space Segment</i>	139.180	42.440	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	181.620
• RDTE,AF 05 1203269F: <i>GPS III Follow-On</i>	412.202	447.875	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	860.077

Remarks

D. Acquisition Strategy

In accordance with a "back to basics" acquisition approach and the exercise of strong oversight of development contractors, the Air Force is required to exercise complete ownership of the architecture, system definition, technical baseline, and integration of the GPS space, ground, and user segments. While this complex inter-segment integration is traditionally performed by a prime contractor under a systems development contract, for GPS, this approach requires the government to be the integrator. To execute this responsibility, the government leverages systems engineering and integration expertise from both Federally Funded Research and Development Center (FFRDC) contractors and a Systems Engineering & Integration (SE&I) contractor. The GPS EI function of the SE&I contractor is currently funded

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)
3620F / 7	PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>	67A025 / <i>GPS Enterprise Integrator</i>

within this PE. The SE&I effort was originally procured in 2007 through a full and open competition, as was the new follow-on SE&I contract awarded in 2015. The SE&I follow-on strategy builds in year over year cost reductions as requirements stabilize. In FY 2023, the GPS EI effort will transition from PE 1206423SF to PE 1203269SF.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>	Project (Number/Name) 67A025 / <i>GPS Enterprise Integrator</i>
---	---	---

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
GPS EI Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	-	-		-		22.000	Oct 2020	-		22.000	24.246	46.246	-
GPS EI Technical Mission Analysis 1	MIPR	Aerospace : El Segundo, CA	-	-		-		10.476	Oct 2020	-		10.476	7.560	18.036	-
GPS EI Technical Mission Analysis 2	RO	MITRE : Various	-	-		-		9.762	Oct 2020	-		9.762	13.870	23.632	-
GPS EI MRTA/MSTA	C/CPIF	Draper Labs : Cambridge, MA	-	-		-		3.502	Dec 2020	-		3.502	3.607	7.109	-
GPS EI Cybersecurity	Various	Various : El Segundo, CA	-	-		-		7.220	Dec 2020	-		7.220	7.835	15.055	-
GPS EI Additional Product Development	Various	Various : Various	-	-		-		2.193	Oct 2020	-		2.193	2.260	4.453	-
Subtotal			-	-		-		55.153		-		55.153	59.378	114.531	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
GPS EI FFRDC	Various	Various : El Segundo, CA	-	-		-		0.165	Oct 2020	-		0.165	0.175	0.340	-
GPS EI A&AS	Various	Various : El Segundo, CA	-	-		-		4.487	Oct 2020	-		4.487	4.943	9.430	-
GPS EI Other Support	Various	Various : Various	-	-		-		0.530	Oct 2020	-		0.530	0.424	0.954	-
Subtotal			-	-		-		5.182		-		5.182	5.542	10.724	N/A

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals		-	-	0.000	60.335	-	60.335	64.920	125.255	N/A

Remarks

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1206423SF / <i>Global Positioning System III - Operational Control Segment</i>	Project (Number/Name) 67A025 / <i>GPS Enterprise Integrator</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
GPS III AFL				
GPS III SV05 Available for Launch	1	2021	1	2021
GPS III SV06 Available for Launch	1	2021	2	2021
GPS III SV07 Available for Launch	2	2021	3	2021
GPS III SV08 Available for Launch	3	2021	4	2021
IST				
IST Preparation and Support	1	2021	4	2022
IST 3-3/MGUE Verification Testing (Phase II-IV)	1	2021	1	2021
IST 2-6/MCEU Verification Testing	1	2021	1	2021
IST 3-1/GPS III and OCX Verification Testing	1	2022	2	2022
IST 3-2/OCX, GPS III, and MGUE Verification testing	3	2022	4	2022
Enterprise				
M-Code Early Use	1	2021	4	2021
SMPS Updates (v5B3 and v5C)	1	2021	3	2021
Preparation and Support for OCS to OCX transition	1	2021	4	2022
Support OCX Block 1 Ready to Transition to Operations (RTO)	3	2022	4	2022

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1206770SF / <i>Enterprise Ground Services</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	116.791	0.000	116.791	194.090	121.447	125.539	58.329	Continuing	Continuing
673140: <i>Enterprise Ground Services EGS</i>	-	0.000	0.000	116.791	0.000	116.791	194.090	121.447	125.539	58.329	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206770F, Enterprise Ground Services efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206770SF, Enterprise Ground Services from Appropriation 3600, Budget Activity 07 due to the creation of a new Appropriation for Space Force.

The Enterprise Ground Services (EGS) program will provide a robust enterprise ground architecture for Space Force space systems. The EGS capability will become the primary ground command and control (C2) suite of services for the Space Force Space Enterprise to meet evolving current and future space domain demands. EGS is based on Multi-Mission Satellite Operations Center (MMSOC) C2 capabilities developed under the Research and Development Space and Missile Operations (RDSMO) program.

The EGS C2 program will perform technology maturation, experiments, prototyping and operational mission transition for increased commonality and resiliency in space program systems. EGS will focus efforts on the rapid development and deployment of tactical C2 services, developing and integrating on-premises and cloud infrastructure and laboratories at multiple sites, advanced concept exploration, prototype development and demonstrations, user experience maturation, training and Concept of Operations (CONOPS) refinement, cyber operations and operational mission training support. These efforts will require support such as systems engineering, integration and test, standards and interface development, architecture development, enhanced cyber security development and implementation. Programs and projects in the space warfighting enterprise are evaluating ways to maximize innovation, resiliency, and our ability to rapidly respond to known and emerging threats. Space enterprise efforts aim to execute technology risk reduction efforts, integration of new or repurposed capabilities, enterprise decision-making tools, experimentation, and rapid prototyping and fielding via all appropriate acquisition authorities and contract mechanisms.

Over the Future Years Defense Program (FYDP) EGS will be developing and deploying C2 services and software applications that support transitioning legacy and new missions such as Missile Warning, Missile Defense, MILSATCOM, Space Situational Awareness and various classified and experimental satellites and missions to the EGS open architecture. The modifications to core software applications provided by EGS are being made in an Agile DevSecOps environment, which has been fundamentally designed into EGS since its inception.

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1206770SF / <i>Enterprise Ground Services</i>
---	--

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

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

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	116.791	0.000	116.791
Total Adjustments	0.000	0.000	116.791	0.000	116.791
• 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	116.791	0.000	116.791

Change Summary Explanation

FY 2021: +\$116.791M; Funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: Enterprise Ground Services (EGS) Development Description: Perform prototype Mission Partner Demonstrations, cybersecurity and crypto development and implementation, standards and interface refining, training and CONOPs refinement, advance concept maturation, integration and test of mission unique software, and integration of common application and services. Expand development environment in order to develop software applications and services in support of onboarding additional satellite missions. FY 2020 Plans: N/A FY 2021 Plans:	0.000	0.000	71.291

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>		R-1 Program Element (Number/Name) PE 1206770SF / <i>Enterprise Ground Services</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Continue maturation of EGS laboratories including providing an on-premises and cloud based DevSecOps capability at the Space Management Battle Lab at the Catalyst Campus in Colorado. Continue the development and deployment of C2 services, prototype mission partner demonstrations, crypto development and implementation, platform development and interface refining, training and CONOPs refinement, advance concept maturation, support integration and test of mission unique software, and integration of common applications and services at the distributed System Integration Lab, and cybersecurity for EGS related systems only. EGS developed cyber services to-date have utility outside of EGS and this position only supports cyber services for EGS. EGS plans to leverage USSF HQ enterprise cyber services to support mission needs and has removed those efforts from its request. Expand User Experience guidelines and user interface specifications to include multiple services beyond TT&C, Ground Resource Manager, and Mission Management. Expand EGS core services based on mission needs. Mature EGS deployment automation and testing. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, demonstrations, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
<p>Title: EGS Pre-Operations (Pre-Ops) Support</p> <p>Description: Maintain EGS hardware and software baselines, update software licenses, cyber security, help desk operations, and associated training.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Conduct pre-ops support activities for satellites using enterprise services to include maintaining EGS hardware and software baselines, updating software licenses, prototyping and extending help desk operations at multiple locations, as well as associated training and cyber security support for EGS only. Implement state of the art hardware components at key EGS operational locations as needed.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>		0.000	0.000	19.600
<p>Title: EGS Deployment</p> <p>Description: Rapidly deploy tactical C2 services and space domain capabilities to support customer-funded mission transition activities including future mission acquisition planning and risk reduction efforts.</p>		0.000	0.000	25.900

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1206770SF / <i>Enterprise Ground Services</i>
---	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: Continue the operational deployment of C2 services, and maturation of networks and links across the EGS enterprise. Continue integration efforts with current and future space domain capabilities. Expand service offerings and functionality for both existing and new satellites that will use EGS. Continue developing the programmatic, technical and architectural roadmap to enable the phased transition of mission partners to EGS. Support customer-funded mission transition plans including future mission acquisition planning and risk reduction efforts.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>			
Accomplishments/Planned Programs Subtotals	0.000	0.000	116.791

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

Remarks

E. Acquisition Strategy
The EGS acquisition strategy focuses on rapidly delivering C2 prototypes and operational capabilities to warfighters, while leveraging industry best practices for agile development and continuous integration /delivery (CI/CD). One of the key tenets of the EGS acquisition strategy is to maintain government ownership of the technical baseline. As a result, EGS uses a combination of existing and new contracts, and agreements with industry and academia to procure prototypes, platform as a service (PaaS) capabilities, system engineering services, and pre-operations support for mission users. Leverage the two SBIR Phase 3 contracts that were awarded in late FY 2019 to scale EGS capabilities and enable more rapid development and deployment of tactical C2 services to operational users.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
3620F / 7				PE 1206770SF / Enterprise Ground Services				673140 / Enterprise Ground Services EGS							
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Pre-Ops Support	Various	Various : Various	-	-		-		19.600	Nov 2020	-		19.600	Continuing	Continuing	-
HW, SW and Integration	Various	Various : Various	-	-		-		6.900	Dec 2020	-		6.900	Continuing	Continuing	-
Development	Various	Various : Various	-	-		-		50.091	Nov 2020	-		50.091	Continuing	Continuing	-
Technical Mission Analysis (FFRDC Aerospace Costs)	MIPR	Aerospace : El Segundo, CA	-	-		-		4.500	Oct 2020	-		4.500	Continuing	Continuing	-
Enterprise Systems Engineering and Integration (SE&I)	Various	MITRE : Bedford, MA	-	-		-		19.000	Oct 2020	-		19.000	Continuing	Continuing	-
Subtotal			-	-		-		100.091		-		100.091	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC (Aerospace)	MIPR	Aerospace : El Segundo, CA	-	-		-		6.500	Oct 2020	-		6.500	Continuing	Continuing	-
A&AS Support	Various	Various : Various	-	-		-		9.600	Dec 2020	-		9.600	Continuing	Continuing	-
Other Support	Various	Various : El Segundo, CA	-	-		-		0.600	Dec 2020	-		0.600	Continuing	Continuing	-
Subtotal			-	-		-		16.700		-		16.700	Continuing	Continuing	N/A
Project Cost Totals			-	-		0.000		116.791		-		116.791	Continuing	Continuing	N/A
Remarks															

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1206770SF / <i>Enterprise Ground Services</i>	Project (Number/Name) 673140 / <i>Enterprise Ground Services EGS</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>EGS Development</i>				
System Integration Lab (SIL)	1	2021	4	2025
Space Management Battle Lab (SMBL)	1	2021	4	2025
Development to Operations (DevOps)	1	2021	4	2025
Initial Enterprise Capability	1	2022	1	2022
<i>EGS Deployment</i>				
EGS Deployment	1	2021	4	2025
Schriever AFB Initial Capability	1	2022	1	2022
Kirtland AFB Initial Capability	1	2023	1	2023
<i>EGS Pre-Ops Support</i>				
EGS Pre-Ops Support	1	2021	4	2025
Mission Integration	1	2021	4	2025
-GNOME (GEO Non-ITW/AA Operations Migration to EGS)	1	2022	1	2022

Note

Singular events depicted above represent milestones. All milestones include effort prior-to and after the event.
 EGS Initial Enterprise Capability milestone includes initial delivery and maturation of tactical C2 enterprise services and space domain capabilities.
 EGS Deployment milestones include initial build-outs of EGS enclaves at operational sites. Continuous Integration/Continuous Deployment is on-going.
 EGS Pre-Ops support milestones include phased initial integration of mission partners and EGS. Pre-ops support is on-going.

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force / BA 8: Software and Digital Technology Pilot Programs</i>	R-1 Program Element (Number/Name) PE 1203614SF / <i>Space C2</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	149.742	-	149.742	156.446	152.350	120.260	121.129	Continuing	Continuing
68A035: <i>SSA/BMC2</i>	-	0.000	0.000	149.742	-	149.742	156.446	152.350	120.260	121.129	Continuing	Continuing

Program MDAP/MAIS Code: N82

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203614F, JSpOC Mission System, Project 67A035, Enterprise Space BMC2 efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, Budget Activity 08, PE 1203614SF, Space C2 from Appropriation 3600, Budget Activity 07 due to the creation of a new Appropriation for Space Force and a new Budget Activity for Software and Digital Technology Pilot Programs.

This effort is not a new start. The FY 2018 NDAA Sections 873/874 directed OSD to streamline software development. Space Command and Control (C2) is an OSD pilot initiative in which all lifecycle funding will be tracked under BA08, Software and Digital Technology Pilot Programs. Pilot programs will test the ability to execute modern software development practices encompassing development, procurement, modification and maintenance activities. The Space C2 pilot program in PE 1203614SF, RDT&E, Space Force, BA08 includes funds transferred from PE 1203614F, JSpOC Mission Systems (RDT&E and SPAF), Air Force and Operations and Maintenance, Air Force.

The Space Force is developing a Space Command and Control (Space C2) and Space Situational Awareness (SSA) capability for the Combined Force Space Component Commander (CFSCC). The enterprise-wide system will provide a common government infrastructure and standards for rapid prototyping of dynamic SSA and Battle Management Command and Control (BMC2) applications to address the evolving and dynamic threat. The system will provide a collaborative environment that will enhance and modernize SSA and BMC2 capabilities; create decision-relevant views of the space environment; rapidly detect, track and characterize objects of interest; identify / exploit traditional and non-traditional sources; perform space threat analysis; and enable efficient distribution of data across the Space Surveillance Network (SSN). Funding includes technical studies, development, experimentation, integration and related support costs.

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

This Program Element may include necessary civilian pay expenses required to manage, execute, and deliver Space C2 weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in Program Elements 1206392SF and 1206398SF.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 8: Software and Digital Technology Pilot Programs</i>	R-1 Program Element (Number/Name) PE 1203614SF / <i>Space C2</i>
--	--

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	149.742	-	149.742
Total Adjustments	0.000	0.000	149.742	-	149.742
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Other Adjustments	-	-	149.742	-	149.742

Change Summary Explanation

FY 2021: +\$118.654M; funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force.

FY 2021: +\$31.088M; funds starting in FY 2021 were transferred from Operations and Maintenance, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: Enterprise Space BMC2	0.000	0.000	118.654
Description: This program delivers a robust and responsive Space Situational Awareness (SSA) and Battle Management Command and Control (BMC2) capability to meet emerging threats. The program will deliver capability for decision makers trying to prevent a conflict from extending to space, or winning it if it does. Capabilities and associated infrastructure include, but are not limited to, SSA, Indications & Warning (I&W), Transmit/Receive, Space Control, Tactical Operations and Common Platforms and Infrastructure, Cyber and Threat Warning. Other activities include dedicated Systems Engineering & Integration (SE&I), Test & Evaluation (T&E), Model Based Systems Engineering (MBSE) and prototype Validation & Verification to support these efforts.			
FY 2020 Plans: N/A			
FY 2021 Plans: Plan and develop a message standard compliant open architecture to support both the SSA and Battle Management Command and Control (BMC2) missions to meet dynamic emerging threats. The architecture and platform/infrastructure will modernize and deliver new capabilities in the National Space Defense Center, Combined Space Operations Center and other operations centers supporting SSA and BMC2. In addition to the architectural efforts, SMC will continue developmental, system engineering and contracting efforts to integrate best in breed commercial, contractor, and government applications through the release of multiple incremental software capability drops throughout FY 2021. Transitions legacy capabilities to an open architecture eco-system			

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
--	----------------------------

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 8: Software and Digital Technology Pilot Programs</i>	R-1 Program Element (Number/Name) PE 1203614SF / <i>Space C2</i>
--	--

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>employing agile software practices. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. Increase in funding from FY20-FY21 allows additional software application and platform development.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>			
<p>Title: Space C2 Sustainment</p> <p>Description: The program maintains existing capability for the CSPOC (Combined Space Operations Center) Mission System (JMS). These tasks include maintaining the COTS software database, removing and canceling decommissioned systems and unused tools, adding new tools required for ongoing support of the system, and maintaining data transport services.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: SMC will fund government software centers, laboratories, and contractors for supporting the update, maintenance and modification, integration, configuration management and cybersecurity requirements of legacy software and associated hardware. Activities may include, but are not limited to, software license acquisition, program office support, studies, technical analysis, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>	0.000	0.000	31.088
Accomplishments/Planned Programs Subtotals	0.000	0.000	149.742

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2021</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
			<u>Base</u>	<u>OCO</u>	<u>Total</u>						
• SPAF 01 SPCMOD: <i>Space Mods</i>	20.366	11.368	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	31.734

Remarks

E. Acquisition Strategy
The Space Force is employing agile software development practices such as flexible requirements, frequent user interaction, and rapid delivery and deficiency retirement. This strategy focuses on rapidly delivering capability to warfighters, leveraging commercial, industry and government partners. Currently there are multiple competitive contractors and no prime contractor, a prime contractor is to be determined.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 8	R-1 Program Element (Number/Name) PE 1203614SF / <i>Space C2</i>	Project (Number/Name) 68A035 / <i>SSA/BMC2</i>
---	--	--

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
ESBMC2 Enterprise Systems Engineering & Integration	Various	Various : Various	-	-		-		10.300	Nov 2020	-		10.300	Continuing	Continuing	-
ESBMC2 Technical Mission Analysis (WS)	MIPR	Various : Various	-	-		-		1.309	Dec 2020	-		1.309	Continuing	Continuing	-
ESBMC2 Applications	Various	Not Specified : TBD	-	-		-		81.068	Dec 2020	-		81.068	Continuing	Continuing	-
ESBMC2 Platform	Various	Not Specified : TBD	-	-		-		17.232	Dec 2020	-		17.232	Continuing	Continuing	-
ESBMC2 Infrastructure	Various	Not Specified : TBD	-	-		-		10.482	Dec 2020	-		10.482	Continuing	Continuing	-
Subtotal			-	-		-		120.391		-		120.391	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Civilian Reimbursable Budget Authority	RO	SMC : El Segunda, CA	-	-		-		0.372	Jan 2021	-		0.372	Continuing	Continuing	-
Subtotal			-	-		-		0.372		-		0.372	Continuing	Continuing	N/A

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Test	Various	Various : Various	-	-		-		4.000	Dec 2020	-		4.000	Continuing	Continuing	-
Subtotal			-	-		-		4.000		-		4.000	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
A&AS	C/FFP	Various : Various	-	-		-		17.764	Nov 2020	-		17.764	Continuing	Continuing	-
FFRDC	Various	Various : Various	-	-		-		6.215	Dec 2020	-		6.215	Continuing	Continuing	-

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 8	R-1 Program Element (Number/Name) PE 1203614SF / <i>Space C2</i>	Project (Number/Name) 68A035 / <i>SSA/BMC2</i>
---	--	--

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

ESBMC2	
Platform/Infrastructure	
Program Increment 8-11	
Program Increment 12-16	
Program Increment 17-20	
Program Increment 21-24	
Program Increment 25-27	
Data Management	
Space C2 Sustainment	
Maintain Existing Capability	

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3620F / 8	R-1 Program Element (Number/Name) PE 1203614SF / <i>Space C2</i>	Project (Number/Name) 68A035 / <i>SSA/BMC2</i>
---	--	--

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>ESBMC2</i>				
Platform/Infrastructure	1	2021	4	2025
Program Increment 8-11	1	2021	4	2021
Program Increment 12-16	4	2021	1	2023
Program Increment 17-20	1	2023	1	2024
Program Increment 21-24	1	2024	1	2025
Program Increment 25-27	1	2025	4	2025
Data Management	1	2021	4	2025
<i>Space C2 Sustainment</i>				
Maintain Existing Capability	1	2021	4	2025

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED