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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force **Date:** May 2021

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 1206431F / <i>Advanced EHF MILSATCOM (SPACE)</i>
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COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	111.023	0.000	0.000	0.000	0.000	-	-	-	-	-	-
657104: <i>MILSATCOM Space Modernization Initiative (SMI)</i>	0.000	111.023	0.000	0.000	0.000	0.000	-	-	-	-	-	-
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 joint warfighter relies on the United States Space Force's (USSF) unprecedented ability to deliver global satellite communications (SATCOM) at all levels of warfare across the range of military operations. SATCOM provides survivable communications for Presidential support and nuclear command and control (C2) and affords national and military leaders a means to maintain strategic situational awareness and convey their intent to the Joint Force Commander. 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) evolves current and future SATCOM systems to develop a more affordable and resilient integrated "Fighting SATCOM" enterprise capable of meeting near-term and emerging requirements. Under this construct, SMI will continue the Capabilities Insertion Program (CIP) to enhance the current Advanced Extremely High Frequency (AEHF) constellation and Protected Communications performance to improve system operational resiliency. Additionally, SMI will demonstrate technologies and concepts of operations (CONOPS) that lead to a Protected Anti-Jam Tactical SATCOM (PATs) capability that provides tactical-level military SATCOM (MILSATCOM) users protected, anti-jam SATCOM while operating in a contested environment. Finally, SMI will develop and demonstrate a roadmap to evolve the current stove-piped MILSATCOM C2 management system into a commercial and military integrated "Fighting SATCOM" Enterprise. It will do this by developing and demonstrating flexible terminal interface technologies and improving ground gateways and data networking with the space segment. The Fighting SATCOM goal is to provide warfighters a seamless end-to-end SATCOM service in a CDO environment.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, 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 ESS weapon system capability. The use of such program

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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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	117.290	0.000	0.000	0.000	0.000
Current President's Budget	111.023	0.000	0.000	0.000	0.000
Total Adjustments	-6.267	0.000	0.000	0.000	0.000
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-2.575	0.000			
• SBIR/STTR Transfer	-3.692	0.000			
• Other Adjustments	0.000	0.000	0.000	0.000	0.000

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2020	FY 2021	FY 2022
<p>Title: Capabilities Insertion Program (CIP)</p> <p>Description: Develop software that will increase the current AEHF constellation and Protected Communications capabilities, broaden overall user base, and accommodate a larger user population through improved resource utilization efficiencies. Develop modifications that will improve the Protected mission operational resiliency. Develop software to increase current AEHF terminal data rates with adaptive coding algorithms. Invest in technology demonstrations that improve the operational mission resiliency and effectiveness for all protected capabilities, which include, but are not limited to; Rapid Adaptive Planning and Situational Awareness for the Warfighter (RAPSAW), Mission Planning Element (MPE) 8.4, Cyber Defense-in-depth, etc.</p> <p>FY 2021 Plans: N/A</p> <p>FY 2022 Plans: N/A</p>	83.085	0.000	0.000
<p>Title: Protected Tactical Testbed</p> <p>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</p>	14.299	0.000	0.000

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
<p>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).</p> <p>FY 2021 Plans: N/A</p> <p>FY 2022 Plans: N/A</p>				
<p>Title: Protected Tactical Waveform (PTW) Modem Development and Demonstrations</p> <p>Description: Develop, demonstrate, test and evaluate PTW modems and components capable of being integrated into existing Army, Air Force, and Navy tactical satellite communication terminals spanning ground, aerial, and naval environments such as the Army's Satellite Transportable Terminal (STT), the Air Force's Ground Multiband Terminal (GMT), airborne terminals, and the Navy Multiband Terminal (NMT). This includes associated End Cryptographic Unit (ECU) development, testing, National Security Agency (NSA) certification, and integration with PTW modems. Conduct trade space and requirements definition with the military Services and terminal program offices to support future PTW-related capabilities. Identify potential assets such as ground hubs and information assurance components that can be further developed by future PTW-related programs. Explore opportunities and releasability of PTW-related technologies to International Partners. PTSFD is a technology demonstration that will develop and demonstrate prototype TM LRUs utilizing PTW over wideband space/ground systems. PTSFD includes an option to demonstrate over a commercial SATCOM system and design and build the MMS simulator. The PTSFD will demonstrate an Anti-Jam (AJ) and Low Probability of Intercept (LPI)/Low Probability of Detection (LPD) communications capability that can be provided to tactical users in all Services through fielded terminals, existing wideband MILSATCOM assets, and potential COMSATCOM assets.</p> <p>FY 2021 Plans: N/A</p> <p>FY 2022 Plans: N/A</p>		2.255	0.000	0.000
<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 STT and GMT tactical users. A3M development includes fabrication of pre-production modems, development of operator training materials, fielding, and sustainment planning.</p>		11.384	0.000	0.000

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: N/A			
FY 2022 Plans: N/A			
Accomplishments/Planned Programs Subtotals	111.023	0.000	0.000

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u> <u>Base</u>	<u>FY 2022</u> <u>OCO</u>	<u>FY 2022</u> <u>Total</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• SPAF 01 ADV555: <i>Advanced EHF</i>	21.894	-	-	-	-	-	-	-	-	-	-

Remarks

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 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.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force **Date:** May 2021

Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 1206431F / <i>Advanced EHF MILSATC OM (SPACE)</i>	Project (Number/Name) 657104 / <i>MILSATCOM Space Modernization Initiative (SMI)</i>
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Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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			
Product Development	C/CPAF	Not specified. : TBD	0.000	-		-		-		-		-	-	-	-
Capabilities Insertion Program (CIP)	SS/CPIF	Lockheed Martin : Sunnyvale, CA	0.000	55.835	Oct 2019	-		-		-		-	-	-	-
W/V Frequency utilization demonstration	MIPR	AFRL : Various	0.000	8.554	Nov 2019	-		-		-		-	-	-	-
Protected Tactical Service Field Demonstration (PTSFD)	Various	Various : Various	0.000	-		-		-		-		-	-	-	-
PTSFD (Modem) Contractor 1	C/CPIF	L3 : Camden, NJ	0.000	-		-		-		-		-	-	-	-
PTSFD (Modem) Contractor 2	C/CPIF	VIASAT : Carlsbad, CA	0.000	-		-		-		-		-	-	-	-
PTSFD (Modem) Contractor 3	C/CPIF	Raytheon : Marlborough, MA	0.000	-		-		-		-		-	-	-	-
PTSFD (Mission Management System simulator)	MIPR	Aerospace : El Segundo, CA	0.000	1.305	Nov 2019	-		-		-		-	-	-	-
Protected Tactical Testbed	Various	Various : Various	0.000	14.299	Dec 2019	-		-		-		-	-	-	-
A3M PTW Modem Development	C/TBD	TBD : TBD	0.000	11.384	Jan 2020	-		-		-		-	-	-	-
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	0.000	-		-		-		-		-	-	-	-
Enterprise SE&I	C/CPAF	Linquest : Los Angeles, CA	0.000	15.000	Feb 2020	-		-		-		-	-	-	-
Subtotal			0.000	106.377		-		-		-		-	-	-	N/A

Management Services (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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			
Management Services	C/CPAF	Not specified. : TBD	0.000	-		-		-		-		-	-	-	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
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	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<i>MILSATCOM Space Modernization Initiative</i>																												
CIP: MPE 8.3 Endurance Mission Replan (EMR)																												
CIP: MPE 8.4 Design Release																												
CIP: Operational Resiliency - Phase 1																												
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 RFP, Source Selection/ Contract Award																												
A3M PTW Modem SFRR, PDR, CDR																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>MILSATCOM Space Modernization Initiative</i>				
CIP: MPE 8.3 Endurance Mission Replan (EMR)	1	2020	3	2020
CIP: MPE 8.4 Design Release	2	2020	4	2020
CIP: Operational Resiliency - Phase 1	1	2020	4	2020
CIP: Operational Resiliency - Phase 2	2	2020	4	2020
W/V Frequency Utilization demonstration	2	2020	4	2020
Protected Tactical Testbed: Support End to End OTA Demonstration (TM LRU, MMS, PHEC)	1	2020	4	2020
A3M PTW Modem RFP, Source Selection/Contract Award	1	2020	3	2020
A3M PTW Modem SFRR, PDR, CDR	4	2020	4	2020