Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force											Date: February 2019	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 1206431F / *Advanced EHF MILSATCOM (SPACE)*							
COST ($ in Millions)	**Prior Years** (+)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	458.323	134.775	144.753	117.290	0.000	117.290	113.469	56.286	15.015	15.285	Continuing	Continuing
657104: *MILSATCOM Space Modernization Initiative (SMI)*	0.000	134.775	144.753	117.290	0.000	117.290	113.469	56.286	15.015	15.285	Continuing	Continuing
Program MDAP/MAIS Code: 261												

(+) The sum of all Prior Years is $458.323 million less than the represented total due to several projects ending

Note

The total FY 2018 funding for PE 1206531F is $134.775 million. However, due to an accounting error, the FY 2018 funding for Project 657104, MILSATCOM SMI, shown above is incorrect. The correct funding for Project 657104 is $130.275 million. The remaining FY 2018 $4.500 million resides in Project 657103, Advanced MILSATCOM.

A. Mission Description and Budget Item Justification

The Space Modernization Initiative (SMI) strategy is to evolve current and future Protected MILSATCOM systems, sustain the existing AEHF system capability and develop a more affordable and resilient MILSATCOM enterprise capable of meeting near term and emerging MILSATCOM requirements. A significant thrust for this initiative is to demonstrate technologies and Concepts of Operations (CONOPS) that lead to a future Protected Anti-Jam Tactical SATCOM (PATS) capability that provides tactical-level MILSATCOM users protected, anti-jam satellite communications while operating in a contested environment. 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) Reduce parts/obsolescence risk to AEHF space vehicles, 2) Continue the Capabilities Insertion Program (CIP) to enhance the current AEHF constellation and Protected Communications performance, and improve system operational resiliency, and 3) Invest in technologies and demonstrations (e.g. Protected Tactical Service Field Demonstration) that enable the future Protected Tactical Enterprise Service and SATCOM programs by continued development of the Protected Tactical Waveform (PTW) technologies, maturing the Protected Tactical Testbed, and demonstrating resilient and affordable wideband protected technologies and CONOPS.

The FY 2020 funding request was reduced by $5.388 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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force	Date: February 2019
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206431F / *Advanced EHF MILSATCOM (SPACE)*

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

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 2018 Air Force penalty total is $14.373M. 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.

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	145.610	151.506	106.378	0.000	106.378
Current President's Budget	134.775	144.753	117.290	0.000	117.290
Total Adjustments	-10.835	-6.753	10.912	0.000	10.912
• Congressional General Reductions	-6.039	-1.753			
• Congressional Directed Reductions	0.000	-5.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-4.796	0.000			
• Other Adjustments	0.000	0.000	10.912	0.000	10.912

Change Summary Explanation

FY 2019: -$5.000M Congressional Reduction for Insufficient Justification.

FY 2020: +$3.300M to fund AEHF Operational Resiliency Phase 3 to expand resiliency capability for all satellites; +$5.000M to fund AEHF ground cyber protection technologies (e.g., defensive cyber operations, on-board cyber intrusion detection software-spacecraft anti-malware); +$8.000M for PTW Army - Air Force Anti-Jam Modem (A3M); and -$5.388M to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 1206431F / *Advanced EHF MILSATCOM (SPACE)*	Project (Number/Name) 657104 / *MILSATCOM Space Modernization Initiative (SMI)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
657104: *MILSATCOM Space Modernization Initiative (SMI)*	0.000	134.775	144.753	117.290	0.000	117.290	113.469	56.286	15.015	15.285	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Due to an accounting error, the FY 2018 funding shown above is incorrect. The correct funding is $130.275 million. The remaining $4.500 million was realigned to Project 657103, Advanced MILSATCOM, for transition to the next-generation cryptographic Key Management Infrastructure.

A. Mission Description and Budget Item Justification

The Space Modernization Initiative (SMI) strategy is to evolve current and future Protected MILSATCOM systems, sustain the existing AEHF system capability and develop a more affordable and resilient MILSATCOM enterprise capable of meeting near term and emerging MILSATCOM requirements. A significant thrust for this initiative is to demonstrate technologies and Concepts of Operations (CONOPS) that lead to a future Protected Anti-Jam Tactical SATCOM (PATS) capability that provides tactical-level MILSATCOM users protected, anti-jam satellite communications while operating in a contested environment. 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) Reduce parts/obsolescence risk to AEHF space vehicles, 2) Continue the Capabilities Insertion Program (CIP) to enhance the AEHF constellation and Protected Communication performance and improve mission operational resiliency and 3) Invest in technologies and demonstrations (e.g., Protected Tactical Service Field Demonstration or PTSFD) that enable the future Protected Tactical Enterprise Service (PTES) and SATCOM programs by continued development of the Protected Tactical Waveform (PTW) technologies, development of PTW enabled modems, maturing the Protected Tactical Testbed, and demonstrating resilient and affordable wideband protected technologies and CONOPS.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Capabilities Insertion Program (CIP)	54.604	89.007	89.915
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. ***FY 2019 Plans:*** Complete Inc 8.2 XDR Transition development and verifications. Continue Inc 8.3 Endurance Mission Replan (EMR). Begin Inc 8.4 Cryptologic upgrades to provide crypto and survivability improvements, maintain user communication when fixed site support is unavailable, adds capability for planning downlink resources and other improvements. Continue Operational Resiliency (OR) 2 & OR2B - Phase 1 (i.e., Engineering analysis of SV 5/6, Command and Control System - Consolidated (CCS-C) maintain vehicle			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206431F / *Advanced EHF MILSATCOM (SPACE)*	**Project (Number/Name)** 657104 / *MILSATCOM Space Modernization Initiative (SMI)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
configuration). Initiate OR2 & OR2B - Phase 2 (i.e., Engineering Analysis of SV-4 and Flight software). Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2020 Plans:*** Continue Advanced AEHF Capabilities Augmentation development, XDR Transition Development and Endurance Mission Re-plan to provide crypto and survivability improvements. Maintain user communication when fixed site support is unavailable, adds capability for planning downlink resources and other improvements. Complete OR2/2B Phase 1 4Q FY 2020. Continue OR2/2B Phase 2 and prepare for OR2/2B Phase 3 (i.e., Engineering analysis of SV 1-3 and Flight software) contract award. Invest in technology demonstrations that improve the operational mission resiliency and effectiveness for all protected capabilities. These activities may include, but are not limited to W/V Frequency utility, combat cloud, crosslinks, Spacecraft as a Sensor, Flexible Commercial Planning, 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 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 increased compared to FY 2019 by $0.908M. Justification for this increase is described in the plans above.			
Title: Protected Tactical Testbed ***Description:*** Protected Tactical Testbed provides a government gold standard of reference for risk reduction and experimentation on critical technology elements for the space payload, terminals and networking segments of the PATS system. 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 PTW. ***FY 2019 Plans:*** Conduct compatibility testing between the ground testbed and the Terminal Modem (TM) Line Replaceable Unit (LRU). This is a precursor activity to the compatibility testing with representative WGS payload hardware. Begin OTA testing. Expand Hub capability for PTES and PTS risk reduction event. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2020 Plans:*** Complete the first phase of OTA testing with the Hub and WGS as well as Commercial satellite assets. Complete compatibility testing between the ground testbed and Terminal Modem (TM) Line Replaceable Unit (LRU). Complete Hub capability to PTES and PTS risk reduction events. ***FY 2019 to FY 2020 Increase/Decrease Statement:***	12.272	11.910	9.450

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206431F / *Advanced EHF MILSATCOM (SPACE)*	**Project (Number/Name)** 657104 / *MILSATCOM Space Modernization Initiative (SMI)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
FY 2020 decreased compared to FY 2019 by $2.46M. Justification for this decrease is described in the plans above.			
Title: Protected Tactical Waveform (PTW) Modem Development and Demonstrations	67.899	43.836	17.925
Description: This major thrust was formerly known as Protected Tactical Service Field Demonstration (PTSFD). 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, 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. Protected Tactical Service Field Demonstration (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 Mission Management System (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. The Army - Air Force Anti-Jam Modem (A3M) will develop PTW modems that meet all environmental, integration, and mission requirements for STT and GMT tactical users. ***FY 2019 Plans:*** Complete Terminal to TM LRU Integration and Test (I&T) for each vendor and each identified service terminal. Complete Compatibility Test involving the first System Integration Lab (SIL) test using the Protected Tactical Testbed. Conduct Modem Certification Test with Army Forces Strategic Command (ARSTRAT). Conduct first Physical Hardware Equipment Chain (PHEC) test to verify compatibility using a WGS emulator on the ground prior to the WGS demo. Conduct over-the-air technology demonstrations over WGS and commercial satellites for PTSFD and conduct the second SIL test. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2020 Plans:*** Complete PTSFD Modem Certification testing with ARSTRAT. Complete PTSFD PHEC testing to verify compatibility using a WGS emulation on the ground prior to the WGS and Commercial satellite demo. Complete OTA technology demonstrations over WGS and commercial satellites for PTSFD and conduct the second SIL test. Award A3M and initiate PTW modem development. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 decreased compared to FY 2019 by $25.911. Justification for this decrease is described in the plans above.			
Accomplishments/Planned Programs Subtotals	134.775	144.753	117.290

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206431F / *Advanced EHF MILSATCOM (SPACE)*	**Project (Number/Name)** 657104 / *MILSATCOM Space Modernization Initiative (SMI)*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• SPAF 01 Line Item ADV555: *Advanced EHF*	55.667	29.829	31.894	-	31.894	17.240	-	-	-	0.000	134.630

Remarks

Army and Air Force Anti-jam Modem (A3M) is a joint effort between the MILSATCOM Directorate (SMC/MC) and the Program Manager (PM) Tactical Networks (TM), Aberdeen Proving Ground (APG) to develop a common modem for the AF Ground Multi-band Terminal (GMT) and Army Satellite Transportable Terminal (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.

D. Acquisition Strategy

A3M will be a Rapid Acquisition program utilizing Rapid Prototyping transitioning to Rapid Fielding IAW Sec 804 NDAA FY 2016. A3M leverages the PTSFD technology maturation resulting in a low risk development effort delivering production ready PTW capable modems with certified ECUs and all required Intellection Property rights, provisioning documentation, and training materials to enable swift terminal modification for operational use and sustainment. The Rapid Prototyping phase will deliver pre-production prototypes ready for "build to print" production for blended developmental testing which includes operational type tests including full environmental, blue, and red team testing prior to the Beta production decision. This acquisition approach reduces operational risk by enabling a fix cycle before production or acceleration if immediate productions is warranted.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206431F / *Advanced EHF MILSATCOM (SPACE)*	**Project (Number/Name)** 657104 / *MILSATCOM Space Modernization Initiative (SMI)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Capabilities Insertion Program (CIP)	SS/CPIF	Lockheed Martin : Sunnyvale, CA	0.000	50.590	Jun 2018	84.411	Jun 2019	72.766	Oct 2019	-		72.766	Continuing	Continuing	205.445
W/V Frequency utilization demonstration	MIPR	AFRL : Various	0.000	-		-		8.600	Nov 2019	-		8.600	Continuing	Continuing	-
Protected Tactical Service Field Demonstration (PTSFD)	Various	Various : Various	0.000	13.810	Oct 2017	15.027	Oct 2018	4.395	Oct 2019	-		4.395	Continuing	Continuing	-
PTSFD (Modem) Contractor 1	C/CPIF	L3 : Camden, NJ	0.000	15.751	Jan 2018	6.986	Dec 2018	1.621	Nov 2019	-		1.621	0.000	24.358	-
PTSFD (Modem) Contractor 2	C/CPIF	VIASAT : Carlsbad, CA	0.000	10.107	Jan 2018	7.631	Dec 2018	1.509	Nov 2019	-		1.509	0.000	19.247	-
PTSFD (Modem) Contractor 3	C/CPIF	Raytheon : Marlborough, MA	0.000	13.868	Jan 2018	7.900	Dec 2018	1.695	Nov 2019	-		1.695	0.000	23.463	-
PTSFD (Mission Management System simulator)	MIPR	Aerospace : El Segundo, CA	0.000	1.226	Nov 2017	1.408	Nov 2018	-		-		-	0.000	2.634	-
Protected Tactical Testbed (TBED)	Various	Various : Various	0.000	11.326	Dec 2017	11.910	Dec 2018	9.450	Dec 2019	-		9.450	Continuing	Continuing	37.500
A3M PTW Modem Development	C/CPIF	TBD : TBD	0.000	-		-		13.000	Jan 2020	-		13.000	Continuing	Continuing	-
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	0.000	2.861	Oct 2017	3.562	Nov 2018	-		-		-	0.000	6.423	-
Enterprise SE&I	C/CPAF	Linquest : Los Angeles, CA	0.000	9.597	Nov 2017	-		-		-		-	0.000	9.597	-
		Subtotal	0.000	129.136		138.835		113.036		-		113.036	Continuing	Continuing	N/A

Remarks

Due to an accounting error, the FY 2018 CIP funding shown above is incorrect. The correct funding is $46.090 million. The remaining $4.500 million was realigned to Project 657103, Advanced MILSATCOM, for the transition to the next-generation cryptographic Key Management Infrastructure.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 1206431F / *Advanced EHF MILSATCOM (SPACE)*	Project (Number/Name) 657104 / *MILSATCOM Space Modernization Initiative (SMI)*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	MIPR	Aerospace : El Segundo, CA	0.000	3.226	Nov 2017	2.246	Nov 2018	1.678	Nov 2019	-		1.678	Continuing	Continuing	-
Other Support	Various	Various : Various	0.000	0.126	Dec 2017	0.200	Nov 2018	0.200	Nov 2019	-		0.200	Continuing	Continuing	-
A&AS	Various	Various : Various	0.000	2.287	Nov 2017	3.472	Nov 2018	2.376	Nov 2019	-		2.376	0.000	8.135	-
		Subtotal	0.000	5.639		5.918		4.254		-		4.254	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	134.775		144.753		117.290		-		117.290	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206431F / *Advanced EHF MILSATCOM (SPACE)*	**Project (Number/Name)** 657104 / *MILSATCOM Space Modernization Initiative (SMI)*

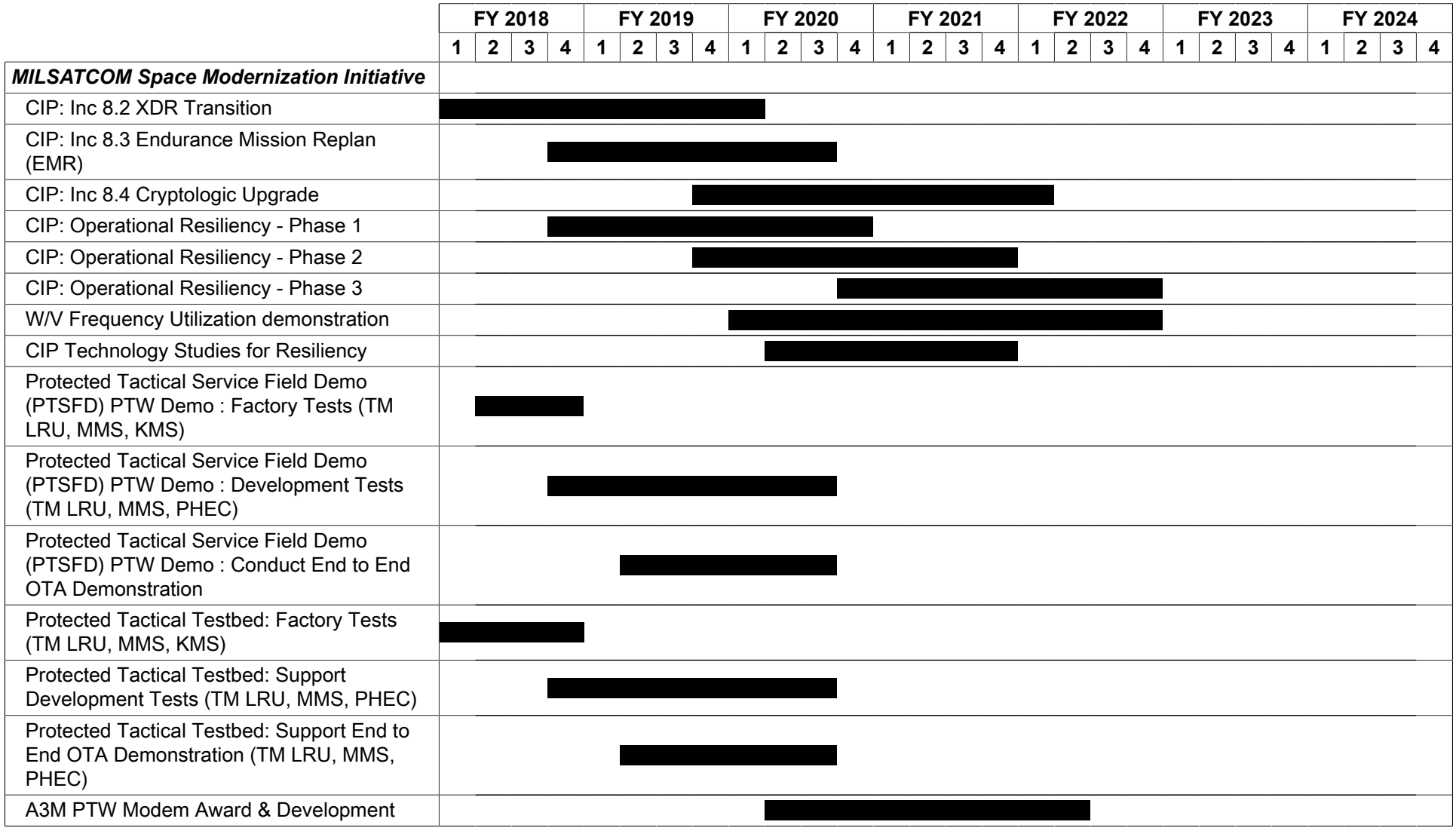

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206431F / *Advanced EHF MILSATCOM (SPACE)*	**Project (Number/Name)** 657104 / *MILSATCOM Space Modernization Initiative (SMI)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
MILSATCOM Space Modernization Initiative				
CIP: Inc 8.2 XDR Transition	1	2018	1	2020
CIP: Inc 8.3 Endurance Mission Replan (EMR)	4	2018	3	2020
CIP: Inc 8.4 Cryptologic Upgrade	4	2019	1	2022
CIP: Operational Resiliency - Phase 1	4	2018	4	2020
CIP: Operational Resiliency - Phase 2	4	2019	4	2021
CIP: Operational Resiliency - Phase 3	4	2020	4	2022
W/V Frequency Utilization demonstration	1	2020	4	2022
CIP Technology Studies for Resiliency	2	2020	4	2021
Protected Tactical Service Field Demo (PTSFD) PTW Demo : Factory Tests (TM LRU, MMS, KMS)	2	2018	4	2018
Protected Tactical Service Field Demo (PTSFD) PTW Demo : Development Tests (TM LRU, MMS, PHEC)	4	2018	3	2020
Protected Tactical Service Field Demo (PTSFD) PTW Demo : Conduct End to End OTA Demonstration	2	2019	3	2020
Protected Tactical Testbed: Factory Tests (TM LRU, MMS, KMS)	1	2018	4	2018
Protected Tactical Testbed: Support Development Tests (TM LRU, MMS, PHEC)	4	2018	3	2020
Protected Tactical Testbed: Support End to End OTA Demonstration (TM LRU, MMS, PHEC)	2	2019	3	2020
A3M PTW Modem Award & Development	2	2020	2	2022