Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force	Date: March 2023
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
Total Program Element	-	96.942	110.801	76.554	0.000	76.554	88.871	38.525	36.177	87.552	0.000	535.422
643726: *PTES*	-	96.942	110.801	45.917	0.000	45.917	33.562	13.360	5.949	6.867	0.000	313.398
643733: *PTW Over Commercial*	-	0.000	0.000	30.637	0.000	30.637	55.309	25.165	30.228	80.685	0.000	222.024

A. Mission Description and Budget Item Justification

New Project 643733 was created starting in FY 2024 for Protected Tactical Waveform (PTW) Over Commercial to develop an anti-jam (AJ) communications capability via PTW Over Commercial constellations for tactical users in all Services and International Partners (IP). This is a continuation of efforts that began in the Protected Tactical Enterprise Service (PTES) Project 643726 to enable multi-domain operations for tactical warfighters in congested and contested environments using various orbits.

The global threat of electronic warfare attacks against space systems will expand in the coming years in both number and types of weapons. Threat development will very likely focus on jamming capabilities against dedicated military satellite communications (MILSATCOM). To address this critical threat, and in pursuit of more precise solutions for disaggregated strategic and tactical SATCOM, U.S Strategic Command (USSTRATCOM) and Air Force Space Command (AFSPC) initiated the Protected Anti-jam Tactical SATCOM (PATS) family-of-systems incremental approach, including PTES and Protected Tactical SATCOM (PTS), to mitigate adversarial jamming effects by using the PTW. The United States Space Force (USSF) is developing PTES to establish the foundational ground system that will enable PTW-based protected communications of PATS. PTES is a software intensive program needed to achieve the PATS architecture by developing the critical ground infrastructure to operationalize the PTW via military and commercial satellite systems for tactical users in all Services. As part of the PATS integrated, incremental approach, PTES ground system development will initially enable PTW over the Wideband Global Satellite Communications (WGS) system to provide an operational AJ communications capability. PTES will extend PATS development to provide PTW service using commercial satellites in various orbits and purpose-built PTS system with onboard PTW processing. The ability to securely access both military and commercial capabilities in multiple orbits will provide tactical warfighters alternate protected SATCOM paths for greater network resiliency.

The PTES program is developing a Mission Management System (MMS), a Key Management System (KMS), and Joint Hub Variants (JHs) to enable PTW via transponded WGS satellites, and to commercial SATCOM with JH Variants (JHVs). The systems will be extensible to support commercial and military SATCOM systems in the future. The user equipment will consist of existing wideband terminals with upgraded PTW modems. Production-representative PTW modems for user terminals were developed by the Protected Tactical Service Field Demonstration (PTSFD) and separately acquired by each Service and by IPs. The Navy Wideband Anti-Jam Modem System (WAMS), the Air Force-Army Anti-Jam Modem (A3M), and other stakeholders rely on PTES to provide PTW ground infrastructure. A3M provides the Air Force and Army with a secure, wideband, AJ SATCOM terminal modem for tactical SATCOM operations. The WAMS modem is the Navy's next generation software-defined wideband modem for both transponded and processed satellite. The user terminal segment, not included in this acquisition, utilizing low-cost PTW modem upgrades enabled by the A3M and WAMS programs are designed to become an integral part of the growing PATS enterprise.

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force	Date: March 2023
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206760SF *I Protected Tactical Enterprise Service (PTES)*

The PTES Prototype Development was designated as a Rapid Prototype (RP) in June 2018 from the National Defense Authorization Act (NDAA) for Fiscal Year 2016 (Public Law 114-92) under Middle Tier of Acquisitions (MTA) for Rapid Prototyping/Rapid Fielding (Section 804) to operationalize the PTW intially with WGS. A new Project, 643733 PTW Over Commercial, was created in this Program Element in FY 2024 to segregate funding allocated to develop the capability to deliver PTW to the warfighter by leveraging commercial satellites. This continues efforts begun in FY 2023 under Project 643726, PTES Prototype Development. 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 and PATS systems and segments.

For the PATS WGS capability, the PTES system addresses an operational need in the Pacific region by achieving Initial Operational Capability (IOC) in FY 2024. IOC provides ground elements for PTW over WGS and consists of PTES installation at two WGS DoD SATCOM Teleport sites utilizing one WGS satellite. At Full Operational Capability (FOC) in FY 2026, PTES will provide worldwide PTW operations using up to all WGS satellites. For the PTW Over Commercial, the PTES system will achieve IOC providing resilient commercial capacity and path diversity across ground elements for PTW over commercial architectures in CY 2026. PTES will reach FOC in CY 2028 providing robust PTW operations using commercial satellites in various orbits. The PTES team will execute additional studies and proof of concept demonstrations to inform commercial requirements and MMS, KMS development.

Space acquisition must respond with speed and agility to pacing and emerging adversary threats. Space Systems Command (SSC) 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, SSC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver 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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force					Date: March 2023
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 1206760SF *I Protected Tactical Enterprise Service (PTES)*		
B. Program Change Summary ($ in Millions)	**FY 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**
Previous President's Budget	100.320	121.069	91.814	0.000	91.814
Current President's Budget	96.942	110.801	76.554	0.000	76.554
Total Adjustments	-3.378	-10.268	-15.260	0.000	-15.260
• Congressional General Reductions	0.000	-0.350			
• Congressional Directed Reductions	0.000	-9.918			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-3.378	0.000			
• Other Adjustments	0.000	0.000	-15.260	0.000	-15.260

Change Summary Explanation

FY 2023: -9.918M Congressional mark

FY 2023: -0.350M Congressional General Reduction

FY 2024: -0.603M; to realign funding to APPN 3410, PE 1207804SF (SAG 13C), for fiscal policy compliance as Space Systems Command (SSC) establishes Headquarters functions and a Chief Information Office (CIO) for integrated cybersecurity.

FY 2024: -15.000M; to realign resilient architecture funding to Air Force Research Laboratory (AFRL), APPN 3620, PE 1206458SF, Tech Transition (Space).

FY 2024: +0.343M; inflation adjustment

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	Project (Number/Name) 643726 / *PTES*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
643726: *PTES*	-	96.942	110.801	45.917	0.000	45.917	33.562	13.360	5.949	6.867	0.000	313.398
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

PTES will deliver a software-intensive ground system to provide worldwide, AJ protected communications to warfighters who are currently unable to operate through interference by using the PTW. PTES delivers the foundational ground system to enable PTW-based protected communications for all PATS capabilities in a incremental approach by operationalizing the PTW over WGS and later for PTW Over Commercial and the future PTS system. In this Project, the PTES ground system will provide an operational AJ communications capability using PTW service over the existing WGS system. This effort also includes the development of PTES program elements such as the MMS, a KMS, and JHs, which will be extensible to PTW via transponded commercial satellites. This effort informs, supports, and reduces risk to future PATS development that will provide the PTW service using commercial satellites and purpose-built PTS with onboard PTW processing. The development for PTW over WGS in this Project, 643726, segregates efforts established in FY 2024 as a new Project, 643733, for the PTW Over Commercial increment of PTES. This new Project continues FY 2023 efforts begun in Project 643726 for the next instantiation of the PATS architecture to enable PTW service through commercial satellites with processing that will occur on the ground.

PTES will develop the MMS and KMS software, and the JH hardware. A JH is the unmanned computing and communications hardware located at a SATCOM Gateway which will provide the PTW signal processing, reachback network connectivity, and near-real-time networked control to direct the connected terminals. The JHs will require installation at large SATCOM Gateways and the system will be integrated and tested with PTW-capable modems that will be separately procured by the Navy, Air Force, and Army. In addition, the KMS and JH End Cryptographic Units (ECU) must be certified by the National Security Administration (NSA). The ECUs are required to generate transmission security (TRANSEC) and cover for all channels/data flows, encrypt/decrypt waveform messages, securely receive/store key material from NSA's Key Management Infrastructure, as well as to synchronize and process key streams for hundreds of simultaneous users.

Driven by emerging threats in the Pacific theater, PTES will complete the MTA RP effort with an operational demonstration of an AJ tactical communications capability using user-provided terminals in support of any Service or formation in Indo-Pacific Command (INDOPACOM) or any operationally-relevant environment in FY 2023. A future acquisition pathway will continue PTES development to reach IOC for an early operational prototype over WGS in FY 2024 and FOC in FY 2026 for worldwide PTW operations using up to all WGS satellites.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: PTES Prototype Ground and Software Development	96.942	110.801	31.370
Description: This Major Thrust, previously titled "PTES Prototype Development", has been segregated into another Major Thrust and new Project in FY 2024 to differentiate efforts between the PTES development contractor and the PTW Over Commercial effort. Develop and field the ground system for enabling capabilities of adaptive, AJ, wideband SATCOM under the PATS effort. Utilize Agile software development to deliver a prototype consisting of three PTES segments: MMS, KMS and JHs, to include			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643726 / *PTES*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
ECUs, integrated into existing SATCOM Gateways to enable the PTW AJ communications capability via transponded WGS satellites for tactical users currently unable to operate through interference. Support the build, test, and installation of hardware required to prototype a tactical, AJ communications capability demonstrated in an operationally relevant environment and to operate the system at IOC and FOC. Efforts include performing and assisting the PTES team in system integration and conducting contractor-led factory tests, including risk reduction and end-to-end tests of the complete PTES prototype. ***FY 2023 Plans:*** Conduct Risk Reduction Test 4 upon completion of Software Build 4 of the PTES Prototype Development. Complete Software Build 5 and commence Software Build 6. Conduct key developmental and operational tests, conducted by the 45th Test Squadron and STAR Delta 12 / 4th Test and Evaluation Squadron, which will support two SATCOM gateways leading up to IOC in FY 2024. 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 Core Data Center operational environment. The FY 2023 funding achieves PTES functionality and early operational automation on-time for IOC that was traded in the interest of achieving a mean product during the rapid prototyping phase. 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 2024 Plans:*** Continue FY 2023 plans for agile process prototyping, including automation for global coverage, new theaters, and PTS integration for FY 2024. Achieve IOC in an operational environment that builds upon the operational demonstration in FY 2023 (MTA completion). Complete the development of Software Build 6 and commence Software Build 7 focused on continuously delivering increased cloud-hosted MMS and KMS functionality needed for FOC. Continuously test deployed software before being promoted to operations. Perform additional testing and integration activities with other PTW-capable modems necessary to expand PTW capability to other services and user groups. Rapidly respond to implement system resiliency and situational awareness as 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 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 decreased due to completion of initial PTW operational capability deliveries, achieving IOC, and transferring activity out from this Major Thrust into the PTES System Development, Baseline, Integration and Test Major Thrust and into Project 643733 for PTW Over Commercial.			
Title: PTES System Development Baseline, Integration, and Test	-	0.000	14.547
Description: This is not a New Start as this activity was previously included in the PTES Prototype Development Major Thrust. The PTES team will support integration of all PTES segments, including government-led end-to end tests of the complete PTES			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643726 / *PTES*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
system. Lead key Development Test/Operational Test (DT/OT), conducted by the 45th Test Squadron (TS) and STAR Delta 12 / 4th Test and Evaluation Squadron, which will support two SATCOM gateways leading up to IOC in FY 2024. Manage the PTES technical baseline through acquiring, designing, testing, and integrating key system segments as well as external interfaces as part of the larger SATCOM enterprise. Witness PTES contractor-led tests and execute government-led testing continuing until FOC. Support the Joint Satellite Engineering Center (JSEC) and Joint Interoperability Command (JITC) to ensure risk-reduction is demonstrated, system interfaces are validated, and data needed to support cybersecurity system authorization and interoperability certifications will be obtained. Manage system capability development hand-in-hand with operator involvement to provide information for technical, integration, and programmatic decisions. The PTES team will execute additional studies and proof of concept demonstrations to inform commercial requirements, build out needed improvements to the MMS, and establish needed interoperability with commercial systems required to support Joint Force needs. Tobyhanna Army Depot is part of the PTES System Development Baseline, Integration and Test Major Thrust, and will be responsible for key loading and initialization of PTW capable modems. ***FY 2023 Plans:*** FY 2023 plans were previously included in PTES Prototype Development Major Thrust. ***FY 2024 Plans:*** Conduct Government prioritized software development, software build testing and integration activities for IOC and FOC fielding. Lead DT/OT evaluation for PTES hardware and software ground elements enabling FOC for PTW over WGS and to inform evaluations extending to PTW over commercial architectures. Witness PTES contractor-led factory tests focusing on PTES specification requirements. Support cyber efforts, such as those required to obtain Interim Approval to Test (IATT) and Approvals to Operate (ATO), software qualification testing, regression testing, capability demonstrations, and risk reduction tests. Build-out and support cloud-hosted software on a Government approved Core Data Center that leverages existing secure resources. Complete DT/OT test events for IOC build and begin DT/OT test events for FOC build. Support pre-operational checkout phase. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased to support evolving ground and software development required for full IOC and FOC capabilities. FY 2024 also increased due to transferring government test and integration activities previously included in the PTES Prototype Development Major Thrust.			
Accomplishments/Planned Programs Subtotals	96.942	110.801	45.917

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643726 / *PTES*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
• SPSF 01 BA01 PTES00: *PTES HUB*	7.406	42.464	56.482	-	56.482	56.052	11.846	0.000	0.000	0.000	174.250

Remarks

D. Acquisition Strategy

USSF is developing PATS in an evolutionary manner to introduce PTW capabilities providing anti-jam (AJ) communications via military and commercial satellite systems for tactical users in all Services, initially providing service over the existing military WGS satellite system and then adding commercial and purpose-built AJ PTS satellites. The PTES Prototype Development was designated as a RP in June 2018 from the NDAA for Fiscal Year 2016 (Public Law 114-92) under MTA for Rapid Prototyping/ Rapid Fielding (Section 804) to kick off the design, development, integration and testing with PTW service via WGS. Following an operational demonstration of the MTA RP capability within five years from the development, contracts and agreements will continue these efforts utilizing a future acquisition pathway into production of the capability to achieve FOS with WGS and to extend the PTW to commercial satellites. The PTES program competitively awarded a single Cost-Plus Incentive Fee (CPIF) contract to Boeing on 26 November 2018 to develop and field the PTES, through declaration of FOC planned for 1QFY2026. The MTA-RP effort consists of the initial deployment of the PTES ground system supporting the PATS WGS Phase with PTW leveraging codified MTA authorities and Agile software development practices to rapidly field an operational leave-behind AJ capability via WGS using PTW ahead of IOC. Boeing and sub-contractors will be responsible for developing all PTES segments (MMS, KMS, and JH) and performing all system integration, including end-to-end tests of the complete PTES prototype. Raytheon is the major sub-contractor to develop the ECU. The program office will secure Cloud and Infrastructure services from approved and secure Government sources. Tobyhanna Army Depot will be responsible for key loading and initialization of PTW capable modems. The 45th TS (PTES DT), STAR Delta 12 / 4th Test and Evaluation Squadron (PTES OT), JSEC, and JITC support test events. This effort will also be leveraged by the commercial satellite and the future PTS efforts to use the PTW. Acquisition plans are in development/pending approval to transition the MTA from a RP capability towards providing a PTW worldwide capability through FOC utilizing the Software Acquisition Pathway (SWP) in FY 2023.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643726 / *PTES*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2022 Cost	FY 2022 Award Date	FY 2023 Cost	FY 2023 Award Date	FY 2024 Base Cost	FY 2024 Base Award Date	FY 2024 OCO Cost	FY 2024 OCO Award Date	FY 2024 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PTES Prototype Ground and Software Development	C/CPIF	Boeing : El Segundo, CA	-	74.316	Dec 2021	87.650	Oct 2022	31.370	Oct 2023	-		31.370	0.000	193.336	-
PTES System Development Baseline, Integration and Test	Various	Various : Various	-	-		-		3.085	Nov 2023	-		3.085	0.000	3.085	-
Tobyhanna Army Depot	MIPR	Tobyhanna Army Depot : Tobyhanna, PA	-	-		-		1.145	Mar 2024	-		1.145	0.000	1.145	-
Technical Mission Analysis	RO	Aerospace : El Segundo, CA	-	5.810	Nov 2021	4.350	Jan 2023	2.250	Jan 2024	-		2.250	0.000	12.410	-
Enterprise SE&I	Various	Various : Various	-	10.040	Dec 2021	10.570	Nov 2022	2.833	Oct 2023	-		2.833	0.000	23.443	-
SBIR/STTR	Allot	Not specified. : TBD	-	-		-		1.607		-		1.607	0.000	1.607	-
		Subtotal	-	90.166		102.570		42.290		-		42.290	0.000	235.026	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2022 Cost	FY 2022 Award Date	FY 2023 Cost	FY 2023 Award Date	FY 2024 Base Cost	FY 2024 Base Award Date	FY 2024 OCO Cost	FY 2024 OCO Award Date	FY 2024 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test Planning & Execution DT/OT	Various	Various : Various	-	4.490	Dec 2021	5.600	Nov 2022	1.810	Nov 2023	-		1.810	0.000	11.900	-
		Subtotal	-	4.490		5.600		1.810		-		1.810	0.000	11.900	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2022 Cost	FY 2022 Award Date	FY 2023 Cost	FY 2023 Award Date	FY 2024 Base Cost	FY 2024 Base Award Date	FY 2024 OCO Cost	FY 2024 OCO Award Date	FY 2024 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	RO	Aerospace : El Segundo, CA	-	0.160	Nov 2021	0.120	Jan 2023	0.120	Jan 2024	-		0.120	0.000	0.400	-
A&AS	Various	Various : Various	-	2.006	Nov 2021	2.421	Jan 2023	1.607	Jan 2024	-		1.607	0.000	6.034	-
Other Support	Various	Various : Various	-	0.120	Nov 2021	0.090	Oct 2022	0.090	Oct 2023	-		0.090	0.000	0.300	-
		Subtotal	-	2.286		2.631		1.817		-		1.817	0.000	6.734	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643726 / *PTES*	

	Prior Years	FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	96.942		110.801		45.917		-		45.917	0.000	253.660	N/A

Remarks

FY 2023 funds previously included for PTW Over Commercial effort will transfer to Project 643733 (new) in this Program Element starting in FY 2024 to segregate funding allocated to develop the capability to deliver PTW to the warfighter by leveraging commercial satellites. Tobyhanna Army is an effort included in the PTES System Development Baseline, Integration & Test Support Major Thrust, and will be responsible for key loading and initialization of PTW capable modems.

Exhibit R-4, RDT&E Schedule Profile: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643726 / *PTES*

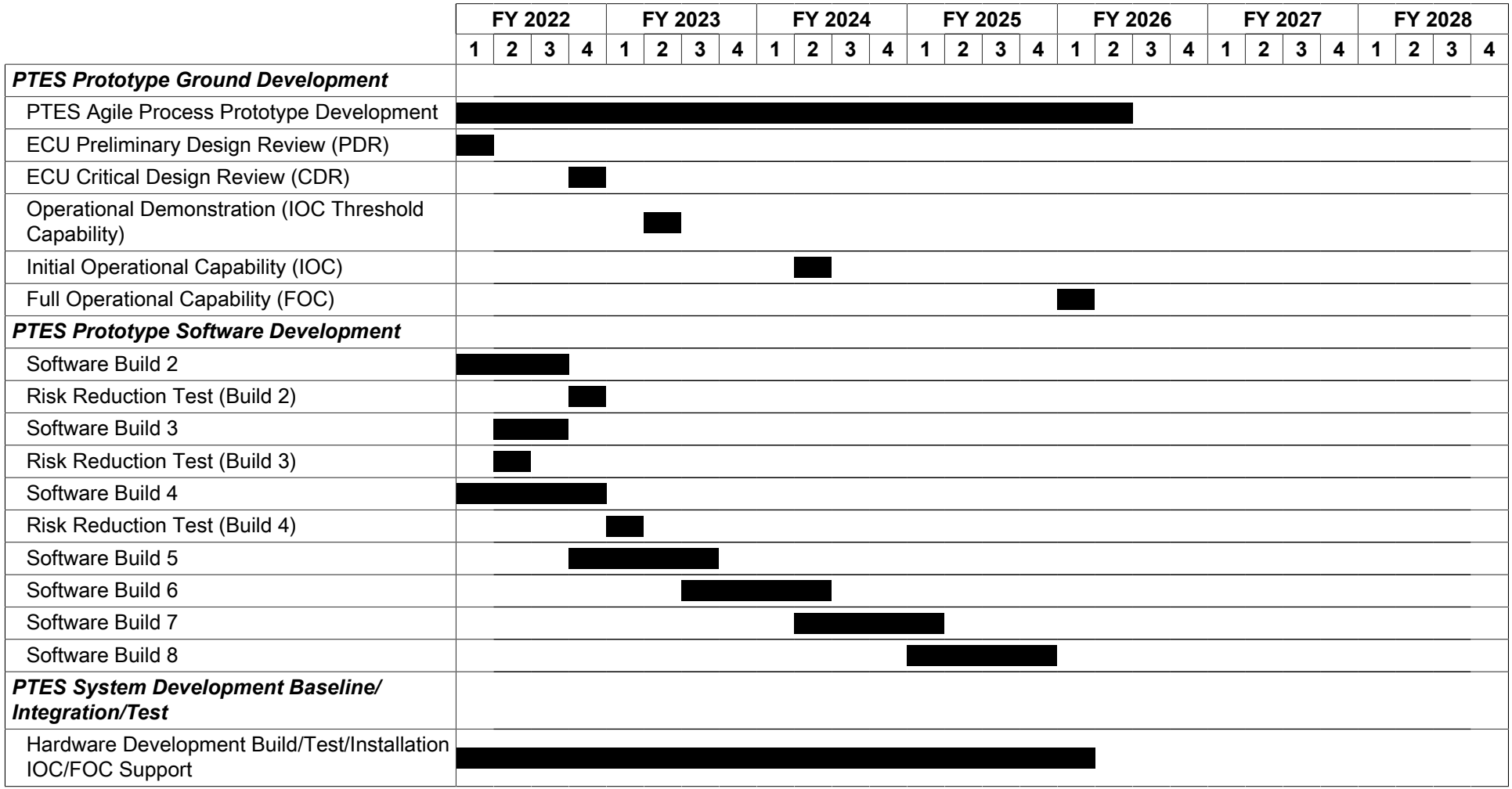

Exhibit R-4A, RDT&E Schedule Details: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643726 / *PTES*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
PTES Prototype Ground Development				
PTES Agile Process Prototype Development	1	2022	2	2026
ECU Preliminary Design Review (PDR)	1	2022	1	2022
ECU Critical Design Review (CDR)	4	2022	4	2022
Operational Demonstration (IOC Threshold Capability)	2	2023	2	2023
Initial Operational Capability (IOC)	2	2024	2	2024
Full Operational Capability (FOC)	1	2026	1	2026
PTES Prototype Software Development				
Software Build 2	1	2022	3	2022
Risk Reduction Test (Build 2)	4	2022	4	2022
Software Build 3	2	2022	3	2022
Risk Reduction Test (Build 3)	2	2022	2	2022
Software Build 4	1	2022	4	2022
Risk Reduction Test (Build 4)	1	2023	1	2023
Software Build 5	4	2022	3	2023
Software Build 6	3	2023	2	2024
Software Build 7	2	2024	1	2025
Software Build 8	1	2025	4	2025
PTES System Development Baseline/Integration/Test				
Hardware Development Build/Test/Installation IOC/FOC Support	1	2022	1	2026

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	Project (Number/Name) 643733 / *PTW Over Commercial*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
643733: *PTW Over Commercial*	-	0.000	0.000	30.637	0.000	30.637	55.309	25.165	30.228	80.685	0.000	222.024
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 643733 was created starting in FY 2024 for PTW Over Commercial to deliver PTW to the warfighter in various orbits utilizing commercial (to include international) SATCOM constellations enabling more resilient by design architectures. This is not a New Start and is a continuation of efforts that began in the PTES Project 643726 in FY 2023 to build upon efforts to operationalize PTW over WGS. This Project reflects the next instantiation of the PATS architecture's integrated, incremental approach to enable PTW service through commercial satellites with processing that will occur on the ground. This Project will expand the development of PTES program elements to include requirement, architecture, and interface development to leverage PTES MMS/KMS systems and JH Variants (JHVs) to enable PTW via transponded commercial satellites. In FY 2024, resilient architecture funding to support this development was realigned to AFRL to improve theater allied and commercial integration for increased SATCOM flexibility for the warfighter.

The objective of PTW Over Commercial is to upgrade the established PTES ground system to provide an operational AJ capability in various orbits including Geosynchronous Orbit (GEO) and Medium Earth Orbit (MEO) by utilizing emerging satellite technologies. Leverages PTES development to design, build, integrate, and test an AJ communications capability for a PTW utility over commercial SATCOM constellations to support filling critical tactical SATCOM gaps and improve overall theater warfighting SATCOM flexibility and resiliency. To do this, this Project will also leverage and build on emerging commercial satellite technologies through assessment, experimentation, and development efforts. The PTW Over Commercial effort will execute studies, proof of concept demonstrations, and tests to inform commercial requirements, build out needed improvements to the PTES ground system, and establish needed interoperability with commercial and international systems required to support Joint Force needs.

The PATS Commercial capability of the PTES system will achieve IOC by FY 2026 providing resilient commercial capacity and path diversity across ground elements for PTW over commercial SATCOM architectures. For IOC, PATS users are planned and managed using the PTES MMS/KMS and operate for at least one month using a JH or JHV beyond the baseline PTES JH inventory to provide SATCOM using the PTW over one commercial or IP SATCOM satellite. PTES will provide robust PTW operations using multiple commercial satellites at FOC by FY 2028.

Collective and complimentary efforts will work to solve complex problems of interoperability, key management, and data sharing that drive the affordability, scalability and performance of USSF's future hybrid architecture.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: PTW Over Commercial - Studies/Demonstrations	0.000	0.000	3.250
Description: This is not a New Start as this activity was previously included in the PTES Prototype Development Major Thrust. Assess emerging commercial SATCOM technologies in multiple orbits for tactical applications and PTES integration. Execute			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643733 / *PTW Over Commercial*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
additional studies and proof of concept demonstrations to inform commercial requirements and MMS, KMS development for PTES integration with commercial GEO and MEO SATCOM technologies. Conduct three studies, including tests and demonstrations, to prepare and reduce risk for the PTW Over Commercial effort. Analyze, integrate, and test PTES system with small satellites (small sats) to evaluate the PTES architecture for GEO small sat applications. Perform a risk reduction study to evaluate PTW applications over the mPower constellation in MEO and demonstrate integration of PTES system with mPower satellites using the PTW. Perform a study to refine requirements for the JHV to understand the specific upgrades needed to implement PTW over commercial satellites using PTES JHVs in GEO and MEO constellations. ***FY 2023 Plans:*** FY 2023 plans were previously included in PTES Prototype Development Major Thrust. ***FY 2024 Plans:*** Continues FY 2023 efforts that began in the PTES Prototype Development, Project 643726. Execute and complete three studies/ demonstrations awarded in FY 2023 for: integrating/testing the PTES system with small sats to define tasks to integrate, test, and demonstrate emerging GEO communications small sats for protected tactical SATCOM applications; demonstrating MEO capabilities with a live PTW demonstration with initial mPower satellites without data loss, and service management concepts to burn down technical risks for PTW over mPower; and analyzing requirements for software upgrades, and potential Hardware upgrades required to implement PTW over commercial satellites in MEO and GEO. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased due to transferring scope from PTES Project 643726.			
Title: PTW Over Commercial - mPower ***Description:*** This is not a New Start as this activity was previously included in the PTES Prototype Development Major Thrust. Implement and operationalize PTW on commercial SATCOM systems in MEO. Procure all associated equipment to enable non-PTW and PTW communications across the mPower MEO commercial constellation as platforms transition to non-GEO SATCOM and PTW capability to address the emerging threat environment. Procure mPower terminal systems dedicated for DoD use and install at six different DoD SATCOM Ground Entry Point (GEP) sites to enable dedicated DoD connectivity to the SES mPower MEO commercial SATCOM constellation. Installations include demonstrations of AJ communications and resilience through the hybrid SATCOM architecture of commercial, international, and sovereign systems in support of USSF future space architecture. ***FY 2023 Plans:*** FY 2023 plans were previously included in PTES Prototype Development Major Thrust. ***FY 2024 Plans:***	0.000	0.000	10.000

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643733 / *PTW Over Commercial*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Continues efforts that began in the PTES Prototype Development, Project 643726. Develop PTES system firmware/software changes to enable operations over MEO constellation of mPower commercial satellites. Procure mPower terminal systems to support one GEP site installation in FY 2024, including install for the terminal systems. Support site preparation for hardware delivery and installation and test/checkout activities for site acceptance, including demonstrating anti-jam communications through the hybrid SATCOM architecture. Support current DoD O3b Enterprise users, migrate that service to mPower. Coordinate with industry, FFRDC, and IPs to execute studies, proof-of-concept demonstrations, and prototype development, that will result in delivery of an operational capability. Activities include, but are not limited to, requirement definition studies, capability demonstrations, testbed integration and end-to-end testing. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased due to mPower terminal system procurement and installation at one DoD SATCOM GEP sites, to include test/checkout activities for site acceptance. FY 2024 also increased due to transferring scope from PTES Project 643726.			
Title: PTW Over Commercial - PTES Upgrades	-	0.000	17.387
Description: This is not a New Start as this activity was previously included in the PTES Prototype Development Major Thrust. Builds upon PTES system development, which will enable the PTW and provide AJ communications capability over Commercial constellations for tactical users in all Services and IPs. Procure and install additional PTES JHV at DoD SATCOM GEP and apply software changes to MMS to support PTW over Commercial in various orbits. Utilize other established elements of the PTES ground system and leverage ongoing development to design, build, integrate, and test end-to-end system capabilities. Includes requirement, architecture and interface development to leverage, modify and enhance PTES MMS and JHV system elements to plan and operate over a variety of terminals. ***FY 2023 Plans:*** FY 2023 plans were included in PTES Prototype Development Major Thrust. ***FY 2024 Plans:*** Continues efforts that began in the PTES Prototype Development Project 643726. Continue development to transition from a prototype capability towards providing a PTW capability through IOC and FOC, to include development of mission planning functionality over commercial GEO and MEO constellations. Develop PTES JHV and make the necessary MMS software changes to support PTW over commercial in various orbits based upon comprehensive study results. Finalize characterization of Doppler impacts to PTW for full implementation into PTES system in MEO constellations. Demonstrate production software and integrate into PTES baseline system. Conduct analysis and perform integration and compatibility testing with terminals capable of handling GEO and MEO constellations. Coordinate with industry, FFRDC, and IPs to execute prototype development, that will result in			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643733 / *PTW Over Commercial*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
delivery of an operational capability. Activities include, but are not limited to, software upgrades, capability demonstrations, testbed integration, prototype development, and end-to-end testing. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased due to purchase of additional PTES hub/modem and software modifications supporting USSF priority to improve theater SATCOM resiliency for the warfighter. FY 2024 also increased due to transferring scope from PTES Project 643726.			
Accomplishments/Planned Programs Subtotals	0.000	0.000	30.637

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
• SPSF 01 PTES00: *PTES HUB*	7.406	42.464	56.482	-	56.482	56.052	11.846	0.000	0.000	0.000	174.250

Remarks

D. Acquisition Strategy

The PTW Over Commercial acquisition strategy strives to provide SATCOM enterprise resiliency enhancements by efficiently using existing designs with reduced nonrecurring engineering by leveraging, where possible, existing contracts and government relationships, to include but not limited to the USSF, US Army, Air Force Research Laboratory (AFRL), Space Warfighting Analysis Center (SWAC), USSF Commercial Satellite Communications Office (CSCO), and the Defense Information Systems Agency (DISA). PTES plans to coordinate with industry, FFRDC, and IPs to execute three studies/demonstrations that will inform delivering an operational capability in this Commercial instantiation of PATS. A Firm Fixed Price (FFP) contract was awarded to Astranis on 27 September 2023 to evaluate PTW SATCOM applications for GEO small sats within PTES architecture. To inform and develop PTW capability in MEO, PTES plans for Massachusetts Institute of Technology/Lincoln Labs (MIT/LL) to conduct a demonstration of PTW implemented over initial mPower commercial MEO satellites, the first allied hybrid government/commercial SATCOM solution. For the acquisition/integration of PTES with the mPower constellation, PTES will procure mPower gateways via CSCO's contract with NATO Support and Procurement Agency (NSPA), which funds mPower bandwidth capacity in the COMSATCOM PE 1206445SF, Project 650140. Plans and execution activities will remain tightly coordinated with SSC International Affairs (IA). The Commercial PTW-PTES acquisition approach plans to leverage the PTES RP MTA acquisition strategy and existing CPIF development contract vehicle with Boeing to award a study to analyze PTW over commercial hardware and software requirements for MEO/GEO constellations and to modify JHVs. A Boeing contract modification will also be awarded to develop the Commercial PTW capability by upgrading existing software that was developed under the PTES RP MTA to enable AJ communications capability over commercial constellations in various orbits. This effort supports the acquisition of gateways by upgrading the PTES system to integrate JHV with mPower terminals. This collective strategy will be done in full cooperation with SSC, early adopters, and other stakeholders to build the forward on-ramps for acquisition.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	Project (Number/Name) 643733 / *PTW Over Commercial*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2022 Cost	FY 2022 Award Date	FY 2023 Cost	FY 2023 Award Date	FY 2024 Base Cost	FY 2024 Base Award Date	FY 2024 OCO Cost	FY 2024 OCO Award Date	FY 2024 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PTW Over Commercial - Studies/Demos (Small Sats)	SS/FFP	Astranis : San Francisco, CA	-	-		-		1.990	Nov 2023	-		1.990	0.000	1.990	-
PTW Over Commercial - Studies/Demos (MEO)	TBD	MIT/LL : Boston, MA	-	-		-		1.200	Oct 2023	-		1.200	0.000	1.200	-
PTW Over Commercial - Studies/Demos (JHVs)	SS/CPIF	Boeing : El Segundo, CA	-	-		-		0.060	Oct 2023	-		0.060	0.000	0.060	-
PTW Over Commercial - mPower	MIPR	CSCO : Ft Meade, MD	-	-		-		10.000	Jan 2024	-		10.000	0.000	10.000	-
PTW Over Commercial - PTES Upgrades	SS/CPIF	Boeing : El Segundo, CA	-	-		-		14.733	Apr 2024	-		14.733	0.000	14.733	-
SBIR/STTR	Allot	TBD : TBD	-	-		-		1.072	Mar 2024	-		1.072	0.000	1.072	-
		Subtotal	-	-		-		29.055		-		29.055	0.000	29.055	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2022 Cost	FY 2022 Award Date	FY 2023 Cost	FY 2023 Award Date	FY 2024 Base Cost	FY 2024 Base Award Date	FY 2024 OCO Cost	FY 2024 OCO Award Date	FY 2024 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	SS/TBD	MITRE : Hanscom AFB, MA	-	-		-		0.050	Nov 2023	-		0.050	0.000	0.050	-
A&AS	Various	Various : Various	-	-		-		1.532	Nov 2023	-		1.532	0.000	1.532	-
		Subtotal	-	-		-		1.582		-		1.582	0.000	1.582	N/A

	Prior Years	FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		-		30.637		-		30.637	0.000	30.637	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643733 / *PTW Over Commercial*

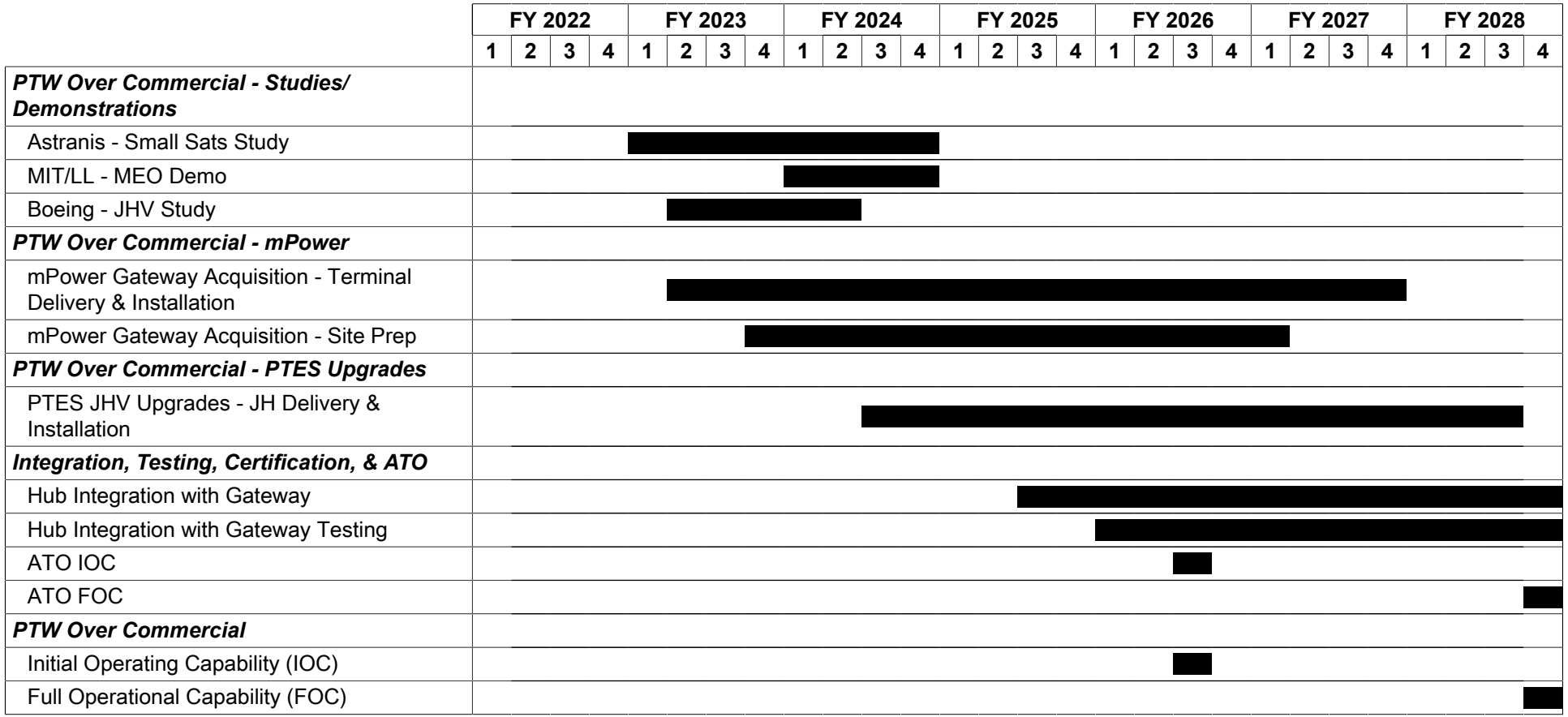

Exhibit R-4A, RDT&E Schedule Details: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643733 / *PTW Over Commercial*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
PTW Over Commercial - Studies/Demonstrations				
Astranis - Small Sats Study	1	2023	4	2024
MIT/LL - MEO Demo	1	2024	4	2024
Boeing - JHV Study	2	2023	2	2024
PTW Over Commercial - mPower				
mPower Gateway Acquisition - Terminal Delivery & Installation	2	2023	4	2027
mPower Gateway Acquisition - Site Prep	4	2023	1	2027
PTW Over Commercial - PTES Upgrades				
PTES JHV Upgrades - JH Delivery & Installation	3	2024	3	2028
Integration, Testing, Certification, & ATO				
Hub Integration with Gateway	3	2025	4	2028
Hub Integration with Gateway Testing	1	2026	4	2028
ATO IOC	3	2026	3	2026
ATO FOC	4	2028	4	2028
PTW Over Commercial				
Initial Operating Capability (IOC)	3	2026	3	2026
Full Operational Capability (FOC)	4	2028	4	2028

Note

All schedule events continue efforts begun in FY 2023, included in Project 643726 PTES Prototype Development funding/schedule line items in FY 2023.