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 1206761SF / *Protected Tactical Service (PTS)*							
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: *Protected Tactical SATCOM*	-	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.

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 1206761SF *I Protected Tactical Service (PTS)*

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.			

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 1206761SF *I Protected Tactical Service (PTS)*

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

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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 1206761SF *I Protected Tactical Service (PTS)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
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. ***FY 2020 Plans:*** N/A ***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. ***FY 2020 to FY 2021 Increase/Decrease Statement:*** N/A			
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.

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)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
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)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
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

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 / *Protected Tactical Service (PTS)*	**Project (Number/Name)** 643728 / *Protected Tactical SATCOM*

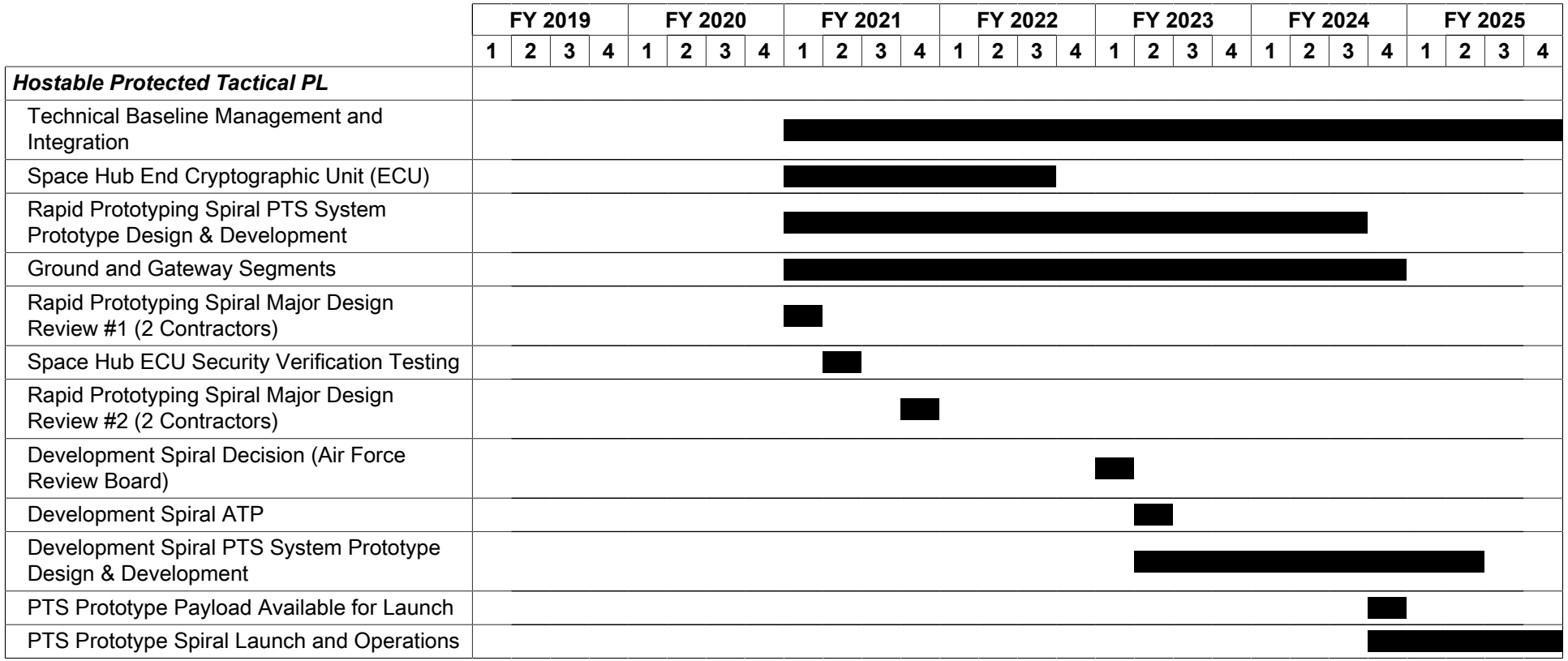

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206761SF / *Protected Tactical Service (PTS)*	**Project (Number/Name)** 643728 / *Protected Tactical SATCOM*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Hostable Protected Tactical PL				
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