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

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>					PE 1206761F / <i>Protected Tactical Service (PTS)</i>							
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	28.754	163.694	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	192.448
643728: <i>Protected Tactical SATCOM</i>	-	28.754	163.694	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	192.448
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 system 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 Air Force Space Command's on-going resilience initiatives and Enterprise Ground Services (EGS); thereby enhancing mission assurance, resiliency, and interoperability.

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

UNCLASSIFIED

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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 1206392F and 1206398F.

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	29.626	173.694	253.392	0.000	253.392
Current President's Budget	28.754	163.694	0.000	0.000	0.000
Total Adjustments	-0.872	-10.000	-253.392	0.000	-253.392
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-10.000			
• 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	-0.872	0.000			
• Other Adjustments	0.000	0.000	-253.392	0.000	-253.392

Change Summary Explanation

FY 2020: -\$10.0M Congressional Directed Reduction for unjustified growth.

FY 2021: Funds were transferred from RDT&E, Air Force to RDT&E, Space Force.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Title: Acquisition Strategy Development & Source Selection	4.711	1.927	0.000
Description: Develop and refine the PTS acquisition strategy for rapid prototyping and fielding of hostable payloads with rideshare opportunities, free-flyer satellite bus configurations, and other potential solutions. This includes developing the request for prototype proposals to enable competitive selection of up to four payload prime contractors. In parallel to preparing for the			

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
competitive selection, the Air Force is developing strategies for the acquisition of commodity buses, ground segment software and hardware, gateway segment terminals and equipment, risk reduction projects, and other supporting activities.				
FY 2020 Plans: Complete source selection for PTS rapid prototyping efforts. Competitively award rapid prototyping contracts for hosted payloads to up to four contractors. Develop and mature strategies for the acquisition of a bus or host provider, gateway terminals, and ground segment.				
FY 2021 Plans: N/A				
FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: Technical Baseline Management and System Integration		24.043	29.269	0.000
Description: Perform Government as system integrator function through acquiring, designing, testing, and integrating key prototype 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. Manage the PTS open system architecture, refine interface requirements, and validate concept of operations through integrated system performance demonstrations. Beginning in FY 2021, the Space Hub End Cryptographic Unit (ECU) will be a separate thrust as a key risk mitigation project.				
FY 2020 Plans: Mature interface requirements for PTS space, ground, and gateway segments. Continue maturation and refinement of the technical baseline, system architecture, systems engineering trades and analyses. Continue risk reduction activities, prototype concept development, and initiate design and development of key system components such as the ECU.				
FY 2021 Plans: N/A				
FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: PTS Rapid Prototype Design and Development		0.000	132.498	0.000
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				

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>hosted or free-flyer configurations. Demonstrate prototype payload performance on-orbit. Evaluate PTS concept of operations with user participation and enable potential residual operational capability. Mature and validate user requirements. Continue prototyping and risk reduction efforts.</p> <p>FY 2020 Plans: Award up to four competitive prototyping contracts or agreements to ensure robust competition from SATCOM providers for the rapid prototyping of the PTS System. Work with up to four contractors to begin prototyping of the PTS Space Segment. Conduct design work and reviews in support of prototype development. Begin system software development. Develop engineering design models. Develop and purchase hardware to support demonstration of early prototype deliveries. Conduct sub-system prototyping such as antenna suites and space processor. Model system architectures and conduct trade studies. Develop and mature system requirements. Initiate planning and design of Space Segment interfaces between the Ground and Gateway Segments of the PTS System. Begin development of the Ground and Gateway Segment. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.</p> <p>FY 2021 Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
Accomplishments/Planned Programs Subtotals		28.754	163.694	0.000
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.				

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

Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 1206761F / <i>Protected Tactical Service (PTS)</i>	Project (Number/Name) 643728 / <i>Protected Tactical SATCOM</i>
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Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Protected Tactical SATCOM Rapid Prototyping (up to four contractors)	C/TBD	TBD : TBD	-	-		113.959	Nov 2019	0.000		-		0.000	0.000	113.959	-
Space Hub End Cryptographic Unit (ECU)	C/CPIF	L3Harris East : Camden, NJ	-	10.911	Jun 2019	21.020	Jan 2020	0.000		-		0.000	0.000	31.931	-
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	3.782	Nov 2018	6.759	Nov 2019	0.000		-		0.000	0.000	10.541	-
Enterprise SE&I	Various	Various : Various	-	11.007	Jan 2019	9.930	Jan 2020	0.000		-		0.000	0.000	20.937	-
Subtotal			-	25.700		151.668		0.000		-		0.000	0.000	177.368	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
FFRDC	MIPR	Aerospace : El Segundo, CA	-	1.387	Nov 2018	1.267	Nov 2019	0.000		-		0.000	0.000	2.654	-
Other Support	Various	Various : Various	-	0.061	Nov 2018	0.100	Nov 2019	0.000		-		0.000	0.000	0.161	-
A&AS	Various	Various : Various	-	1.606	Jan 2019	10.659	Nov 2019	0.000		-		0.000	0.000	12.265	-
Subtotal			-	3.054		12.026		0.000		-		0.000	0.000	15.080	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		-	28.754	163.694	0.000	0.000	0.000	192.448	N/A

Remarks

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 1206761F / <i>Protected Tactical Service (PTS)</i>	Project (Number/Name) 643728 / <i>Protected Tactical SATCOM</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Hostable Protected Tactical PL</i>				
Technical Baseline Management and Integration	1	2019	4	2020
Acquisition Strategy Development and Source Selection	1	2019	2	2020
Risk Reduction and Prototyping Concept Development (Includes SpEC OT)	1	2019	2	2020
Space Hub End Cryptographic Unit (ECU)	3	2019	4	2020
Space Hub ECU System Functional Requirements Review	4	2019	4	2019
Rapid Prototyping Spiral Contract/Agreement Award (up to four contractors)	1	2020	1	2020
Space Hub ECU Preliminary Design Review (PDR)	2	2020	2	2020
Rapid Prototyping Spiral PTS System Prototype Design & Development	1	2020	4	2020
Ground and Gateway Segments	2	2020	4	2020
Gateway Segment Authority to Proceed	3	2020	3	2020
Space Hub ECU Critical Design Review (CDR)	3	2020	3	2020

Note

SpEC OT: Space Enterprise Consortium Other Transaction