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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force										Date: February 2019		
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)					PE 1206761F I Protected Tactical Service (PTS)							
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	-	23.404	29.626	173.694	0.000	173.694	253.392	263.096	461.058	842.500	Continuing	Continuing
643728: Protected Tactical SATCOM	-	23.404	29.626	173.694	0.000	173.694	253.392	263.096	461.058	842.500	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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 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.

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

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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.							
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 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	
Previous President's Budget		24.201	29.776	173.694	0.000	173.694	
Current President's Budget		23.404	29.626	173.694	0.000	173.694	
Total Adjustments		-0.797	-0.150	0.000	0.000	0.000	
• Congressional General Reductions		0.000	-0.150				
• 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		-0.797	0.000				
• Other Adjustments		0.000	0.000	0.000	0.000	0.000	
Change Summary Explanation							
In the FY 2019 budget, PTS received a Congressional rescission of \$5.000 million. The correct total for FY 2018 is \$18.404 million.							
C. Accomplishments/Planned Programs (\$ in Millions)					FY 2018	FY 2019	FY 2020
Title: Acquisition Strategy Development & Source Selection					7.896	6.315	1.927
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 2018	FY 2019	FY 2020
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 2019 Plans: Continue to develop documentation necessary to support rapid prototyping activities. Complete acquisition strategy approval. Release a prototype proposal to industry. Begin source selection for a competitive rapid prototyping effort with multiple vendors.				
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 2019 to FY 2020 Increase/Decrease Statement: FY2020 decreased compared to FY 2019 by \$4.388M. Justification for this decrease is described in plans above.				
Title: Technical Baseline Management and Risk Reduction		15.508	23.311	46.044
Description: This major thrust was formerly known as Technical Baseline and Architectural Engineering. Mature technical baseline and interface requirements. Conduct architectural engineering, risk reduction, prototype concept development, and associated system engineering trades required for the PTS space, ground, and gateway segments. Refine technical baseline, interface requirements, and concept of operations during rapid prototyping and fielding.				
FY 2019 Plans: Continue studies for constellation architectural design. Continue to develop and mature system requirements. Continue analyses on system design/trade-offs and affordability trades. Continue to develop technical baseline products, including system engineering and integration plans. Leverage Other Transaction Agreements (OTAs) such as the Space Enterprise Consortium (SpEC) to release a request for proposal and award a contract for the End-Cryptographic Unit (ECU). Prepare for award and execution of Rapid Prototyping Phase. 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: 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 End-Cryptographic Unit (ECU).				
FY 2019 to FY 2020 Increase/Decrease Statement:				

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
FY 2020 increased compared to FY 2019 by \$22.733M. Justification for this increase is described in plans above.				
Title: PTS Rapid Prototype Design and Development		0.000	0.000	125.723
Description: Previously included in the Technical Baseline and Architectural Engineering major thrust. 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. Continues the prototyping and risk reduction efforts as previously described under FY 2019 President's Budget "Technical Baseline and Architectural Engineering major thrust."				
FY 2019 Plans: PTS Rapid Prototype Design and Development effort was previously included in the "Technical Baseline and Architectural Engineering" major thrust.				
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 prototype 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, test plans, and integration plans. Initiate planning and design of Space Segment interfaces between the Ground and Gateway Segments of the PTS System. Begin development of Ground and Gateway Segments. 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 \$125.723M. Justification for this increase is described in plans above.				
Accomplishments/Planned Programs Subtotals		23.404	29.626	173.694
D. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
In the FY 2019 budget, PTS received a Congressional rescission of \$5.000 million. The correct total for FY 2018 is \$18.404 million.				

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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.		
F. 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.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force												Date: February 2019			
Appropriation/Budget Activity 3600 / 4						R-1 Program Element (Number/Name) PE 1206761F / Protected Tactical Service (PTS)				Project (Number/Name) 643728 / Protected Tactical SATCOM					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Risk Reduction and Concept Development Prototyping	C/Various	Various : Various	-	5.921	Jan 2018	-		-		-		-	0.000	5.921	-
Space Hub End Cryptographic Unit (ECU)	C/TBD	Various : Various	-	0.000		10.932	Jun 2019	25.685	Jan 2020	-		25.685	Continuing	Continuing	-
Protected Tactical SATCOM Rapid Prototyping (up to four contractors)	C/TBD	Various : Various	-	-		-		111.828	Jan 2020	-		111.828	Continuing	Continuing	-
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	3.955	Jan 2018	3.727	Nov 2018	6.759	Nov 2019	-		6.759	Continuing	Continuing	-
Enterprise SE&I	Various	Various : Various	-	6.291	Jan 2018	10.116	Jan 2019	13.600	Jan 2020	-		13.600	Continuing	Continuing	-
FY 2018 Congressional rescission	Various	Not specified. : TBD	-	5.000		-		-		-		-	0.000	5.000	-
Subtotal			-	21.167		24.775		157.872		-		157.872	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	MIPR	Aerospace : El Segundo, CA	-	1.695	Jan 2018	1.367	Nov 2018	1.267	Nov 2019	-		1.267	Continuing	Continuing	-
Other Support	Various	Various : Various	-	0.050	Jan 2018	0.050	Nov 2018	0.100	Nov 2019	-		0.100	Continuing	Continuing	-
A&AS	Various	Various : Various	-	0.492	Jan 2018	3.434	Jan 2019	14.455	Nov 2019	-		14.455	Continuing	Continuing	-
Subtotal			-	2.237		4.851		15.822		-		15.822	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			-	23.404		29.626		173.694		-		173.694	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force			Date: February 2019		
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>

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Hostable Protected Tactical PL																												
Technical Baseline Management and Risk Reduction																												
Acquisition Strategy Development and Source Selection																												
Risk Reduction and Prototyping Concept Development (Includes SpEC OT)																												
Acquisition Strategy Approval (Air Force Review Board)																												
Space Hub End Cryptographic Unit (ECU)																												
Rapid Prototyping Spiral Contract/Agreement Award (up to four contractors)																												
Rapid Prototyping Spiral PTS System Prototype Design & Development																												
Development Spiral Decision (Air Force Review Board)																												
Development Spiral ATP																												
Development Spiral PTS System Prototype Design & Development																												
PTS Prototype Payload Available for Launch																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force			Date: February 2019
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 Risk Reduction	1	2018	4	2024
Acquisition Strategy Development and Source Selection	1	2018	2	2020
Risk Reduction and Prototyping Concept Development (Includes SpEC OT)	3	2018	2	2020
Acquisition Strategy Approval (Air Force Review Board)	1	2019	1	2019
Space Hub End Cryptographic Unit (ECU)	3	2019	3	2022
Rapid Prototyping Spiral Contract/Agreement Award (up to four contractors)	2	2020	2	2020
Rapid Prototyping Spiral PTS System Prototype Design & Development	2	2020	4	2023
Development Spiral Decision (Air Force Review Board)	2	2022	2	2022
Development Spiral ATP	4	2022	4	2022
Development Spiral PTS System Prototype Design & Development	4	2022	4	2024
PTS Prototype Payload Available for Launch	4	2024	4	2024