Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force											Date: February 2020	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 1206432F / *Polar MILSATCOM (SPACE)*							
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	349.898	25.480	412.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	787.778
654215: *EPS Recap*	0.000	0.000	412.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	412.400
657105: *Polar Satellite Communications*	349.898	25.480	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	375.378
Program MDAP/MAIS Code: 121												

Note

In FY 2020, Project 654215, EPS Recap, efforts were transferred from PE 1206434F, Midterm Polar MILSATCOM System, Project 643720, EPS Recapitalization, in order to better align with the Enhanced Polar System (EPS) program.

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206432F, Polar MILSATCOM (Space) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206432SF, Polar MILSATCOM (Space) from Appropriation 3600, Budget Activity 05 due to the creation of a new Appropriation for Space Force.

This program element acquires the Polar MILSATCOM system that provides protected communications (anti-jam and low probability of intercept and detection) for users in the North Polar Region.

In FY 2006, the DoD began funding EPS. The host spacecraft and the polar communications packages took advantage of the Advanced Extremely High Frequency (AEHF) technology including the eXtended Data Rate (XDR) waveform. The EPS Capability Development Document (CDD), approved by the Joint Requirements Oversight Council in September 2006, is based on a two-package, hosted XDR program with operational availability in CY 2015 and CY 2017. EPS is comprised of four segments: Payload, Ground Control, Gateway, and Terminal (acquired by each Service's Terminal Program Office). Milestone B review was completed April 2, 2014.

In FY 2019, the USAF and Norwegian Ministry of Defence signed the Arctic Memorandum of Agreement, which enforces the international collaboration with Norway to host two EPS-Recapitalization (EPS-R) payloads on Space Norway-procured spacecraft. Beginning FY 2020, the EPS-R effort transferred from Program Element 1206434F, Midterm Polar MILSATCOM System to Program Element 1206432F, Polar MILSATCOM (SPACE). In FY 2021, EPS-R continues to develop and acquire two Extremely High Frequency (EHF) payloads hosted on Space Norway-procured spacecraft and continues to upgrade/modify the existing EPS Ground Control and Gateway.

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

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force	Date: February 2020
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206432F / *Polar MILSATCOM (SPACE)*

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 Polar MILSATCOM weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

Funding in this exhibit was previously budgeted in PE 0605432F, Polar MILSATCOM (SPACE), and PE 1206434F, Midterm Polar MILSATCOM System.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	26.380	427.400	192.000	0.000	192.000
Current President's Budget	25.480	412.400	0.000	0.000	0.000
Total Adjustments	-0.900	-15.000	-192.000	0.000	-192.000
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-15.000			
• 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	-0.900	0.000			
• Other Adjustments	0.000	0.000	-192.000	0.000	-192.000

Change Summary Explanation

FY 2020: -$15.000M Congressional Directed Reduction for prior year carryover

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

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force			Date: February 2020
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 1206432F / *Polar MILSATCOM (SPACE)*	Project (Number/Name) 654215 / *EPS Recap*	

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
654215: *EPS Recap*	0.000	0.000	412.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	412.400
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2020, Project 654215, EPS Recap, efforts were transferred from PE 1206434F, Midterm Polar MILSATCOM System, Project 643720, EPS Recapitalization, in order to better align with the Enhanced Polar System (EPS) program.

A. Mission Description and Budget Item Justification

This program element acquires the Polar MILSATCOM system (EPS) and the continuation effort, EPS Recapitalization (EPS-R) providing protected communications (anti-jam and low probability of intercept and detection) for users in the North Polar Region and prevents a gap in Arctic MILSATCOM coverage in the mid to late 2020s.

In FY 2018, via PE 1206434F the DoD funded EPS-R to develop and acquire 1) two Extremely High Frequency (EHF) payloads, using Advanced EHF's (AEHF's) eXtended Data Rate (XDR) waveform, on hosted spacecraft, 2) upgrades/modifications to the existing EPS Control and Planning Segment (CAPS) to provide command and control and XDR mission planning capability, and 3) upgrades/ modifications to the existing EPS Gateway to provide connectivity between polar and midlatitude users through Department of Defense Information Networks (DODIN). EPS-R will host the payloads on a Space Norway-procured bus scheduled to launch in FY 2023. EPS-R will reuse EPS Gateway and ground control elements to the greatest extent feasible.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Space Segment	0.000	367.874	0.000
Description: Develop and acquire two EHF payloads, using AEHF's XDR waveform, for integration on host spacecraft.			
FY 2020 Plans: Continue development, production, and testing of the two payloads that were initiated in FY 2018. Continue developing interface documentation and integration plans with international partner, Space Norway. Continue funding USAF share of Arctic Memorandum of Agreement (MOA) collaboration costs for hosting of the EPS-R payloads. Facilitate coordination between Space Norway, space vehicle developer, and payload contractor. Provide representation, technical expertise, and assistance at Space Norway and/or space vehicle developer facilities. Continue cyber certification efforts with the National Security Agency (NSA). Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.			
FY 2021 Plans: N/A			
FY 2020 to FY 2021 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206432F / *Polar MILSATCOM (SPACE)*	**Project (Number/Name)** 654215 / *EPS Recap*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
N/A			
Title: Ground Updates ***Description:*** Modify and upgrade the existing EPS CAPS to provide command and control and XDR mission planning capability for the two new payloads. ***FY 2020 Plans:*** Continue risk reduction efforts on and upgrade EPS CAPS Segment. Conduct ground Critical Design Review. Acquire Defense Information Systems Network (DISN) lines from Schriever AFB to the Space Norway Host Ground Station to ensure out-of-command connectivity to the payload. ***FY 2021 Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** N/A	0.000	36.608	0.000
Title: Gateway Updates ***Description:*** Modify and upgrade the existing EPS Gateway to support the two new payloads. ***FY 2020 Plans:*** Continue risk reduction efforts on EPS Gateway Segment upgrades. Continue preparations for installing a second telemetry and control terminal. Purchase additional telemetry and control terminals to recapitalize equipment that is becoming obsolete. ***FY 2021 Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** N/A	0.000	7.918	0.000
Accomplishments/Planned Programs Subtotals	0.000	412.400	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	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
• RDTE 04 1206434F: *Midterm Polar MILSATCOM System*	370.353	-	-	-	-	-	-	-	-	0.000	370.353

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206432F / *Polar MILSATCOM (SPACE)*	**Project (Number/Name)** 654215 / *EPS Recap*

D. Acquisition Strategy

Awarded payloads contract to Northrop Grumman Aerospace Systems (NGAS) and initiated fabrication of two EPS functional equivalent payloads in FY 2018 (PE 1206434F). In FY 2019, the USAF and Norwegian Ministry of Defence signed the Arctic Memorandum of Agreement, which enforces the international collaboration with Norway to host the two EPS-Recapitalization (EPS-R) payloads on the Space Norway-procured spacecraft. Conducted market research to identify industry capabilities and acquisition concepts. Awarded CAPS contract for EPS ground upgrade. Gateway updates will be accomplished by Naval Information Warfare Center Pacific, the EPS Gateway Segment developer. The program office initiates the procurement of a replacement terminal for the Telemetry and Command Terminal. This acquisition strategy updates the EPS Ground Segment to accommodate the EPS functional equivalent payloads and extend operations and sustainment beyond 2028. The U.S. Government will retain the system integrator role, as it was for EPS program of record.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force			Date: February 2020
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 1206432F / *Polar MILSATCOM (SPACE)*	Project (Number/Name) 654215 / *EPS Recap*	

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
EPS-R Tactical Payloads 1-2	SS/CPIF	NGAS : Redondo Beach, CA	0.000	-		327.100	Nov 2019	-		-		-	0.000	327.100	409.958
Control and Planning Segment Upgrades	SS/CPIF	NGMS : Redondo Beach, CA	0.000	-		32.550	Dec 2019	-		-		-	0.000	32.550	82.320
Gateway Upgrades	Various	Various : Various, CA	0.000	-		7.040	Jan 2020	-		-		-	0.000	7.040	68.895
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	0.000	-		8.851	Dec 2019	-		-		-	0.000	8.851	-
Enterprise SE&I	C/CPAF	LinQuest : Los Angeles, CA	0.000	-		24.823	Jan 2020	-		-		-	0.000	24.823	-
		Subtotal	0.000	-		400.364		-		-		-	0.000	400.364	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	0.000	-		2.338	Jan 2020	-		-		-	0.000	2.338	-
A&AS	Various	Various : Various	0.000	-		9.548	Jan 2020	-		-		-	0.000	9.548	-
Other Support	Various	Various : Various	0.000	-		0.150	Oct 2019	-		-		-	0.000	0.150	-
		Subtotal	0.000	-		12.036		-		-		-	0.000	12.036	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	-		412.400		-		-		-	0.000	412.400	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206432F / *Polar MILSATCOM (SPACE)*	**Project (Number/Name)** 654215 / *EPS Recap*

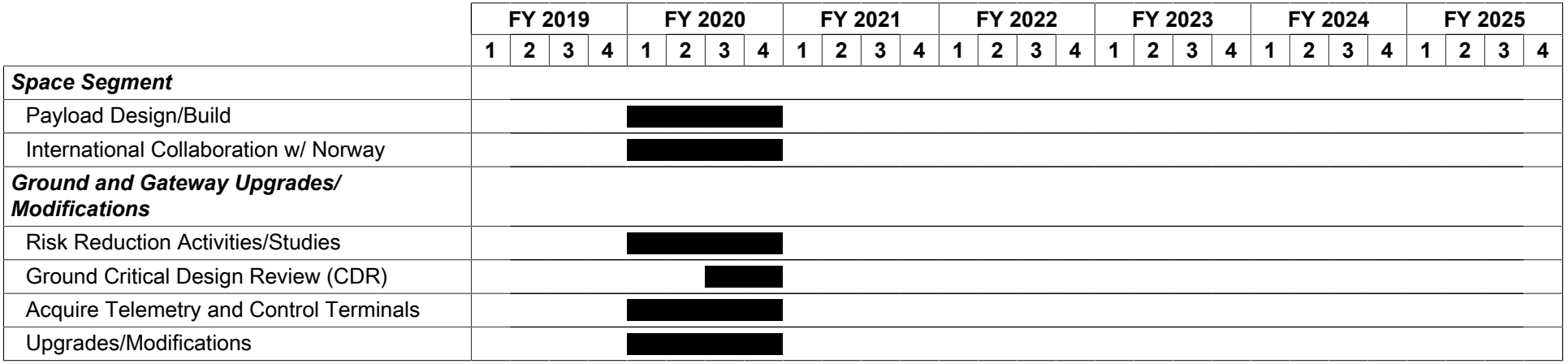

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206432F / *Polar MILSATCOM (SPACE)*	**Project (Number/Name)** 654215 / *EPS Recap*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Space Segment				
Payload Design/Build	1	2020	4	2020
International Collaboration w/ Norway	1	2020	4	2020
Ground and Gateway Upgrades/Modifications				
Risk Reduction Activities/Studies	1	2020	4	2020
Ground Critical Design Review (CDR)	3	2020	4	2020
Acquire Telemetry and Control Terminals	1	2020	4	2020
Upgrades/Modifications	1	2020	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force			Date: February 2020
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 1206432F / *Polar MILSATCOM (SPACE)*	Project (Number/Name) 657105 / *Polar Satellite Communications*	

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
657105: *Polar Satellite Communications*	349.898	25.480	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	375.378
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program element acquires the Polar MILSATCOM system that provides protected communications (anti-jam and low probability of intercept and detection) for users in the North Polar Region.

In FY 2006, the DoD began funding EPS. The host spacecraft and the polar communications packages took advantage of the Advanced Extremely High Frequency (AEHF) technology including the eXtended Data Rate (XDR) waveform. The EPS Capability Development Document (CDD), approved by the Joint Requirements Oversight Council in September 2006, is based on a two-package, hosted XDR program with operational availability in CY 2015 and CY 2017. EPS is comprised of four segments: Payload, Ground Control, Gateway, and Terminal (acquired by each Service's Terminal Program Office). Milestone B review was completed 2 April 2014.

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: EPS	25.480	0.000	0.000
Description: Develop and acquire EPS MILSATCOM which consists of: 1) two Extremely High Frequency payloads, using AEHF's XDR waveform, on hosted spacecraft; 2) a standalone Control and Planning Segment (CAPS) to provide command and control and XDR mission planning capability; and 3) one gateway to provide connectivity between polar and mid-latitude users through the Global Information Grid. ***FY 2020 Plans:*** N/A. ***FY 2021 Plans:*** N/A			
Accomplishments/Planned Programs Subtotals	25.480	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206432F / *Polar MILSATCOM (SPACE)*	**Project (Number/Name)** 657105 / *Polar Satellite Communications*

D. Acquisition Strategy

The EPS is the follow-on to the currently operational IPS and is a component of the Extremely High Frequency SATCOM architecture providing secure, protected communications to worldwide users. The EPS consists of four segments (Payload, Ground Control, Gateway, and Terminal) acquired by separate procurement actions. Each EPS payload and its integration onto classified host satellites was funded by the EPS program while the development and integration was performed by the host organization. The MILSATCOM Systems Directorate procured the Ground Control and Planning Segment. The Ground Gateway segment, funded by the EPS program, was organically developed by the Navy's Naval Information Warfare Center Pacific, San Diego, CA. The U.S. Air Force is the prime systems integrator for the EPS payload, ground control, and gateway segments. The Terminals that use EPS are acquired by each Service's Terminal Program Office.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force			Date: February 2020
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 1206432F / *Polar MILSATCOM (SPACE)*	Project (Number/Name) 657105 / *Polar Satellite Communications*	

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
Control and Planning Segment	C/CPIF	NGMS : Redondo Beach, CA	168.519	9.868	Oct 2018	-		-		-		-	0.000	178.387	148.600
Gateway architecture development	MIPR	Space and Naval Warfare Systems Command (SPAWAR) Systems Center - Pacific : San Diego, CA	53.758	5.637	Dec 2018	-		-		-		-	0.000	59.395	75.454
EPS Design/Development Contract	SS/CPAF	NGAS : Redondo Beach, CA	11.279	3.100	Feb 2019	-		-		-		-	0.000	14.379	606.693
T&C-T Development	MIPR	Lincoln Labs : Boston, MA	11.412	1.600	Dec 2018	-		-		-		-	0.000	13.012	-
Technical Mission Analysis	Various	Various : Various	17.208	1.215	Apr 2019	-		-		-		-	0.000	18.423	-
Enterprise SE&I	Various	Various : Various	38.399	2.463	Jan 2019	-		-		-		-	0.000	40.862	-
		Subtotal	300.575	23.883		-		-		-		-	0.000	324.458	N/A

Test and Evaluation ($ 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
Planning/Management Support for T&E	MIPR	Various : Various	1.279	-		-		-		-		-	0.000	1.279	-
		Subtotal	1.279	-		-		-		-		-	0.000	1.279	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	Various	Various : Various	19.367	0.122	Apr 2019	-		-		-		-	0.000	19.489	-
A&AS	Various	Various : Various	27.597	1.375	Jan 2019	-		-		-		-	0.000	28.972	-
Other Support	Various	Various : Various	1.080	0.100	Oct 2018	-		-		-		-	0.000	1.180	-
		Subtotal	48.044	1.597		-		-		-		-	0.000	49.641	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force			Date: February 2020
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 1206432F / *Polar MILSATCOM (SPACE)*	Project (Number/Name) 657105 / *Polar Satellite Communications*	

	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	349.898	25.480		0.000		-		-		-	0.000	375.378	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206432F / *Polar MILSATCOM (SPACE)*	**Project (Number/Name)** 657105 / *Polar Satellite Communications*

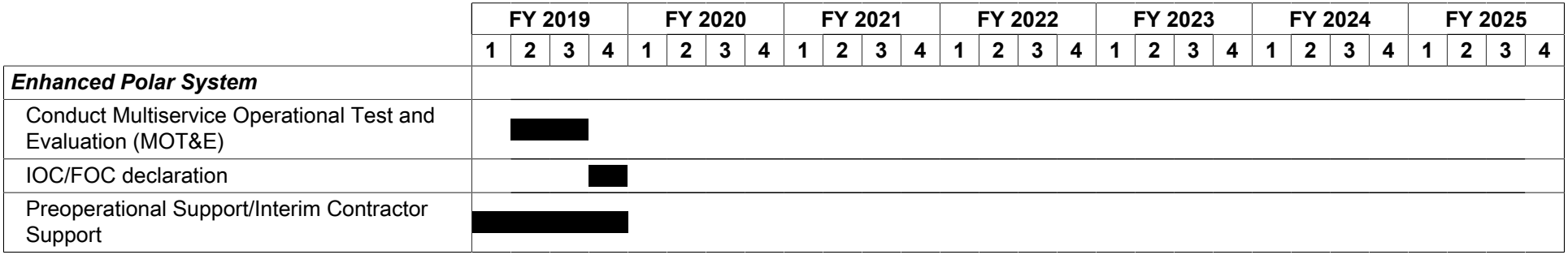

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206432F / *Polar MILSATCOM (SPACE)*	**Project (Number/Name)** 657105 / *Polar Satellite Communications*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Enhanced Polar System				
Conduct Multiservice Operational Test and Evaluation (MOT&E)	2	2019	3	2019
IOC/FOC declaration	4	2019	4	2019
Preoperational Support/Interim Contractor Support	1	2019	4	2019