Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203142A / *SATCOM Ground Environment (SPACE)*							
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	-	9.945	12.105	34.169	-	34.169	18.702	21.728	16.983	22.885	Continuing	Continuing
FE1: *Dscs-Dcs (Phase II)*	-	6.530	4.229	4.260	-	4.260	4.376	4.499	4.560	13.158	Continuing	Continuing
FE2: *MILSATCOM System Engineering*	-	2.455	4.387	4.357	-	4.357	4.364	4.379	4.914	3.703	Continuing	Continuing
FE4: *Enroute Mission Command*	-	0.960	3.489	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.449
FI8: *Protected Anti-JAM Tactical SATCOM*	-	0.000	0.000	25.552	-	25.552	9.962	12.850	7.509	6.024	Continuing	Continuing

A. Mission Description and Budget Item Justification

The SATCOM Ground Environment (SPACE) funding line supports the Army's Network Modernization Strategy Line Of Effort (LOE) 1: Unified Network.

FE1: Defense Satellite Communications System (DSCS)/Digital Communications System (DCS) (Phase II):
This project develops Satellite Communication (SATCOM) ground subsystem equipment and software in support of Joint Chiefs of Staff (JCS) validated Mission Command Network and Systems (MCNS) requirements for the worldwide Defense Enterprise Wideband SATCOM System (DEWSS). DEWSS is composed of the Super High Frequency (SHF) Defense Satellite Communications System (DSCS) and Wideband Global SATCOM (WGS) programs, which are required to support legacy, interim and emerging communication space architectures and future Force requirements. Expansion of the WGS constellation and upgrades to both DSCS and WGS are vital to support the Army's emerging power projection and rapid deployment role. DSCS and WGS provide multiple channels of tactical end-to-end connectivity and interoperability with strategic networks and national decision-makers, satisfying JCS network operations.

FE2: Military Satellite Communications (MILSATCOM)System Engineering (SE):
Military Satellite Communications (MILSATCOM) System Engineering (SE) assures that tactical Army Satellite Communications (SATCOM) and SATCOM On-The-Move (SOTM) systems are engineered to legally and efficiently operate worldwide. MILSATCOM SE shapes Joint SATCOM systems' design efforts, standards development and planning processes. MILSATCOM SE represents the Army's tactical interests within DoD, Commercial & International forums to ensure affordable and scalable future SATCOM capabilities for maneuver forces. These efforts ensure that the Army continues to evaluate evolving technologies for the planning and designing of SATCOM solutions that reduce technical and programmatic impacts.

FE4 / Enroute Mission Command:
Mission Description and Budget Item Justification:
Enroute Mission Command (EMC) supports the Global Response Force (GRF) and other Army units with the requirement to conduct Airborne forced entry operations with the ability to conduct mission command, to include mission planning and rehearsal, while enroute on board US Air Force Air Mobility Command (AMC) aircraft. EMC provides a modernization to enroute communications to enable broadband reach-back data capability utilizing military or commercial networks with adequate bandwidth support required by Mission Command and Intelligence applications. EMC will provide commanders with the ability to obtain and share near real-time information

regarding intelligence, situational awareness and command and control information while enroute to their objective. The ability to adjust plans and strategize utilizing the latest Intel data will give the GRF the information dominance needed to execute their mission once they arrive at their objective.

Due to rephasing of FY 2017 OPA funding into FY 2018/2019, program was restructured in Dec 2015. MDA addressed schedule issues (Oct 2016) by authorizing to field a Ku FISA FOC (4QFY17) and complete a Modification Word Order (MWO), adding Ka FISA capability, post Ku FISA FOC.

FI8: Protected Anti-JAM Tactical SATCOM (Protected SATCOM) provides for a critical protected communications gap in anti-jam SATCOM capability across the Army with the denigration of the current protected terminal. It provides the ability for the tactical Army to be resilient in a contested environment and protect against potentially catastrophic loss of situational awareness and command and control during critical battle movement. It will offer the Tactical Army protection against interference that is either intentional or unintentional. The effort includes development of a critical Protected Tactical Waveform (PTW) modem which will be integrated into Army tactical SATCOM terminals to provide higher throughputs, protection (anti-jam) against Electronic Warfare (EW), and resiliency in a contested environment; development of a dual small form factor modem that can run the PTW and the current Network Centric Waveform (NCW) to Army Expeditionary Signal Battalions (ESBs) and eventually Army Corps, Division, and Brigade Combat Teams; and development, testing and certification of prototype Advanced Extremely High Frequency (AEHF) protected SATCOM terminals which will augment existing AEHF terminals. The PTW efforts are linked to the Air Force and DoD's plans for PTW on Wideband Global SATCOM (WGS) and its follow-on satellite constellation.

In FY2020, a new start development of Advanced Extremely High Frequency (AEHF) protected SATCOM terminal prototype. The new terminal will augment the existing capability of the Secure, Mobile, Anti-Jam, Reliable, Tactical Terminal (SMART-T) AEHF terminal, with the intent to backfill decreasing SMART-T numbers post FY2025. This ensures the Army's ability to meet increasing EW threat requirements. It will provide AEHF protected SATCOM capability in a modular, more transportable, vehicle agnostic form factor, providing greater flexibility on the battlefield. The terminal will be built with the intent to migrate from the AEHF constellation to the PTS constellation.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	11.959	12.119	8.644	-	8.644
Current President's Budget	9.945	12.105	34.169	-	34.169
Total Adjustments	-2.014	-0.014	25.525	-	25.525
• Congressional General Reductions	-0.009	-0.014			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-1.600	-			
• SBIR/STTR Transfer	-0.405	-			
• Adjustments to Budget Years	-	-	25.525	-	25.525

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203142A *I SATCOM Ground Environment (SPACE)*

Change Summary Explanation

Increase in Project FI8 for Protected Anti-Jam Tactical SATCOM.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 1203142A / *SATCOM Ground Environment (SPACE)*	Project (Number/Name) FE1 / *Dscs-Dcs (Phase II)*	

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
FE1: *Dscs-Dcs (Phase II)*	-	6.530	4.229	4.260	-	4.260	4.376	4.499	4.560	13.158	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project FE1, Defense Satellite Communications System - Digital Communications System (DSCS-DCS) supports the Army's Network Modernization Strategy Line Of Effort (LOE) 1 - Unified Network.

This project develops Satellite Communication (SATCOM) ground subsystem equipment and software in support of Joint Chiefs of Staff (JCS) validated Mission Command Network and Systems requirements for the worldwide Defense Enterprise Wideband SATCOM System (DEWSS). DEWSS is composed of the Super High Frequency (SHF) Defense Satellite Communications System (DSCS) and Wideband Global SATCOM (WGS) programs, which are required to support legacy, interim and emerging communication space architectures and future force requirements. Expansion of the WGS constellation and upgrades to both DSCS and WGS are vital to support the Army's emerging power projection and rapid deployment role. DSCS and WGS provide multiple channels of tactical end-to-end connectivity and interoperability with strategic networks and national decision-makers, satisfying JCS network operations in support of the President, JCS, combatant commanders, military departments, Department of State and other government departments and agencies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: SATCOM Terminal Digital Intermediate Frequency (IF) Implementation Analysis	3.605	2.854	2.614
Description: SATCOM Terminal Digital Intermediate Frequency (IF) implementation analysis aimed at improving bandwidth efficiency of gateway terminals while providing an additional layer of resiliency through terminal redundancy. These analyses include various evaluations for digital terminal components to replace current, less efficient, analog components. These analyses also include assessment of terrestrial connectivity among SATCOM terminals to enable Continuity Of Operations (COOP) and failover scenarios required for resiliency.			
FY 2019 Plans: Assess various vendor implementations for compliance with Digital IF standard. Perform multi-vendor interoperability analysis to ensure maximum vendor participation in future Digital IF technology and foster competition.			
FY 2020 Plans: Demonstrate SATCOM Gateway resiliency through path diversity; use SATCOM terminals at different geographical locations to support any SATCOM mission.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 1203142A / *SATCOM Ground Environment (SPACE)*	**Project (Number/Name)** FE1 / *Dscs-Dcs (Phase II)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Decrease is due to delay in requirement for air time for demonstration purposes.			
Title: Electromagnetic Interference Mitigation Analysis ***Description:*** Assess multiple interference mitigation/cancellation technologies for effectiveness in improving reliability/resiliency of strategic and tactical communications. Mature technology to software/firmware that will improve protected SATCOM modem/terminal performance in a electro-magnetic interference contested environment. Technology will also improve terminal performance against adversary and friendly satellite link jamming resources. ***FY 2019 Plans:*** Mature Interference Mitigation / Cancellation technology to software/firmware that can be incorporated in SATCOM modem/ terminal. Integrate solutions into DoD gateway satellite communications architecture. ***FY 2020 Plans:*** Transition performance specifications to be implemented into next generation SATCOM modem. Mature and demonstrate gateway resiliency by using satellite links and terrestrial connectivity simultaneously to support SATCOM missions. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase in funds is due to exploring diversity through terrestrial and SATCOM networks simultaneously.	2.925	1.220	1.646
Title: FY 2019 SBIR / STTR Transfer ***Description:*** FY 2019 SBIR / STTR Transfer ***FY 2019 Plans:*** FY 2019 SBIR / STTR Transfer ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 SBIR / STTR Transfer	-	0.155	-
Accomplishments/Planned Programs Subtotals	6.530	4.229	4.260

C. Other Program Funding Summary ($ in Millions)

Line Item	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
• BB8500: *Defense Enterprise Wideband Satcom Systems*	155.551	97.633	101.189	-	101.189	99.102	108.642	112.177	112.505	Continuing	Continuing

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 1203142A / *SATCOM Ground Environment (SPACE)*	**Project (Number/Name)** FE1 / *Dscs-Dcs (Phase II)*

D. Acquisition Strategy

This finances Project Manager, Defense Communications and Army Transmission Systems (PM DCATS) netcentric systems engineering, modem risk mitigation, and risk management framework support. Funding provides for SATCOM terminal upgrades, enhancement of baseband throughput capabilities, technology insertion and upgrades which improves SATCOM gateway resiliency while allowing for full utilization of Wideband Global SATCOM (WGS) capabilities. Both the Wideband SATCOM Operational Management System (WSOMS) and the Enterprise Wideband SATCOM Terminal System (EWSTS) Capability Production Documents (CPDs) contain Netcentric-Ready Key Performance Parameters (NR-KPPs) as required by CJCSI 6212.01C. Netcentric efforts are required to facilitate the migration from the current trunk-based communications systems to Internet Protocol (IP) based systems and to engineer, test and integrate IP based capabilities into WSOMS and EWSTS systems. Studies, risk mitigation, system integration and advanced demonstrations for Netcentric baseband and policy based control will accommodate technology insertion, data sharing, remote operations, architecture efforts and use of commercial technology, thus ensuring the life of the Defense Enterprise Wideband Satellite System (DEWSS) terminal family beyond 2025 and reducing lifecycle costs and enterprise requirements on the WGS and Defense Satellite Communication System (DSCS) satellites in the future. Contracting approach for new technology is through the use of Broad Agency Announcements (BAA) and Other Transaction Authority (OTA) contracts.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 1203142A / *SATCOM Ground Environment (SPACE)*	Project (Number/Name) FE1 / *Dscs-Dcs (Phase II)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SATCOM Terminal Digital IF Implementation Analysis	MIPR	TBD : APG, MD	-	2.709		2.023	Jan 2019	1.504		-		1.504	Continuing	Continuing	Continuing
Electromagnetic Interference Mitigation Analysis	MIPR	TBD : APG, MD	-	2.167		1.035	Jan 2019	1.625		-		1.625	Continuing	Continuing	Continuing
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.155		-		-		-	0.000	0.155	-
		Subtotal	-	4.876		3.213		3.129		-		3.129	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
In-house Support	Allot	PdM WESS : Ft. Belvoir, VA	-	1.121		0.689		0.671		-		0.671	Continuing	Continuing	Continuing
Contractor Support	C/CPFF	ACC, MD : APG, MD	-	0.533	Dec 2018	0.327	Jan 2019	0.460	Jan 2020	-		0.460	Continuing	Continuing	Continuing
		Subtotal	-	1.654		1.016		1.131		-		1.131	Continuing	Continuing	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	6.530		4.229		4.260		-		4.260	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 1203142A / *SATCOM Ground Environment (SPACE)*	**Project (Number/Name)** FE1 / *Dscs-Dcs (Phase II)*

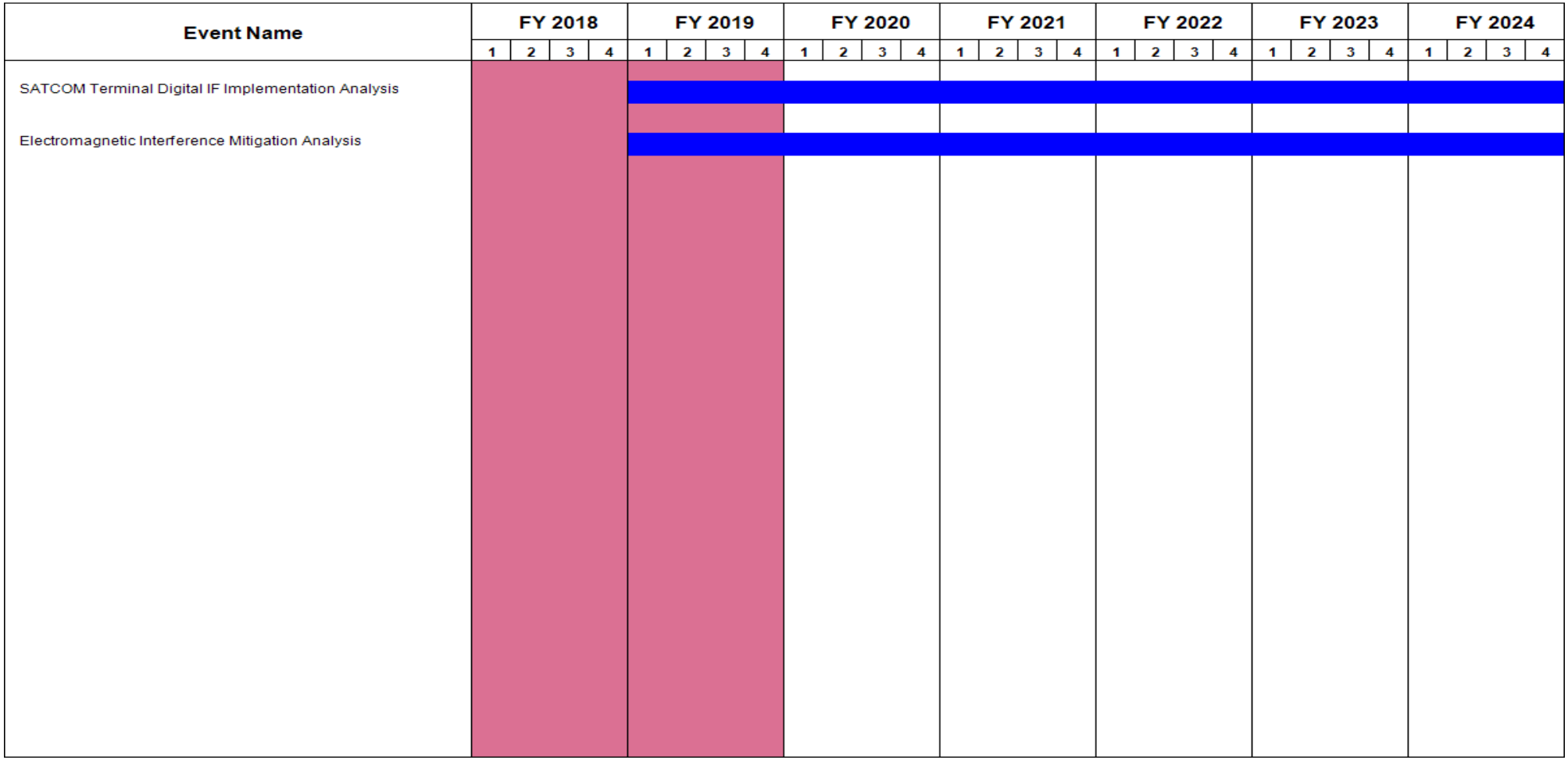

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 1203142A / *SATCOM Ground Environment (SPACE)*	**Project (Number/Name)** FE1 / *Dscs-Dcs (Phase II)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
SATCOM Terminal Digital IF Implementation Analysis	1	2019	4	2024
Electromagnetic Interference Mitigation Analysis	1	2019	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 1203142A / *SATCOM Ground Environment (SPACE)*	Project (Number/Name) FE2 / *MILSATCOM System Engineering*	

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
FE2: *MILSATCOM System Engineering*	-	2.455	4.387	4.357	-	4.357	4.364	4.379	4.914	3.703	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project FE2, MILSATCOM System Engineering supports the Army's Network Modernization Line of Effort (LOE) #1, Unified Network.

FE2: Military Satellite Communications (MILSATCOM) System Engineering (SE) assures that tactical Army Satellite Communications (SATCOM) and SATCOM On-The-Move (SOTM) systems are engineered to legally and efficiently operate worldwide. MILSATCOM SE shapes Joint SATCOM systems' design efforts, standards development and planning processes. MILSATCOM SE represents the Army's tactical interests within DoD, Commercial & International forums to ensure affordable and scalable future SATCOM capabilities for maneuver forces. These efforts ensure that the Army continues to evaluate evolving technologies for the planning and designing of SATCOM solutions that reduce technical and programmatic impacts.

FY 2020 funds the systems engineering required to support technology maturation, systems analysis, and planning associated with joint SATCOM development efforts including complying with the outcome of the Protected SATCOM Communications Systems (PSCS) Analysis of Alternatives (AoA). This line continues to fund the systems architecture and analysis for current and future SATCOM efforts in both wideband and protected satellite communications. This effort includes collaborative work with the Air Force on the prototype Protected Tactical Service Field Demo (PTSFD) development and associated modem testing.

In addition, FY 2020 funding covers the Narrowband Mobile User Objective System (MUOS) Analysis of Alternatives (AoA), Network Centric Waveform Tool (NCWT) Development and Testing and other efforts that have impact on tactical Army use of military and commercial satellite constellations. These efforts have a direct impact in reducing technical and programmatic risk for the acquisition efforts for tactical Army SATCOM systems using these constellations.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Protected Communications System Engineering and WGS Communications	0.662	1.140	1.176
Description: Systems engineering support relating to the technology maturation, development and planning associated with joint SATCOM development efforts including Network Centric Waveform Tool (NCWT), Protected Tactical Service Field Demo (PTSFD) and the outcome of the Protected SATCOM Communications Systems (PSCS) Analysis of Alternatives (AoA).			
FY 2019 Plans: Will continue systems engineering and analysis for the Protected Communications and WGS Communications as well as development and technology maturation on the NCW Tool.			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 1203142A / *SATCOM Ground Environment (SPACE)*	**Project (Number/Name)** FE2 / *MILSATCOM System Engineering*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Will continue systems engineering and analysis for the Protected Communications and WGS Communications as well as development and technology maturation on the NCW Tool. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Program funds increased $36K from $1.14M in FY 2019 to $1.176M in FY 2020 to support increased systems engineering support of product development and planning.			
Title: Systems Architecture and Analysis Support ***Description:*** Systems engineering support relating to the architecture and analysis of the Network Centric Waveform Tool (NCWT) and the collaborative SATCOM development Protected Tactical Service Field Demo (PTSFD) effort as well as other efforts, such as Analysis of Alternatives, that have impact on tactical Army use of military and commercial satellite constellations. These efforts have a direct impact in reducing technical and programmatic risk for the acquisition efforts for tactical Army SATCOM systems using the WGS and Protected constellations. ***FY 2019 Plans:*** Will continue in house Engineering Support, Contractor Support and System Architecture & Analysis ***FY 2020 Plans:*** Will continue in house Engineering Support, Contractor Support and System Architecture & Analysis. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Program funds increased $79K from $2.544M in FY 2019 to $2.623M in FY 2020 to support increased systems engineering support of related to the joint Protected programs and on-going Analysis of Alternatives.	1.478	2.544	2.623
Title: Testing and certification of critical SATCOM and Satellite-On-The-Move (SOTM) communication and network technologies ***Description:*** Testing and certification of the prototype Protected Tactical Service Field Demo modem. ***FY 2019 Plans:*** Will continue testing and certification of critical SATCOM and SOTM communication and network technologies. ***FY 2020 Plans:*** Will continue testing and certification of critical SATCOM and SOTM communication and network technologies. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Program funds increased $0.016M from $0.542M in FY 2019 to $0.558M in FY 2020 to support increased testing and certification of critical SATCOM and SOTM communication and network technologies.	0.315	0.542	0.558
Title: FY 2019 SBIR / STTR Transfer	-	0.161	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 1203142A / *SATCOM Ground Environment (SPACE)*	**Project (Number/Name)** FE2 / *MILSATCOM System Engineering*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Description: FY 2019 SBIR / STTR Transfer ***FY 2019 Plans:*** FY 2019 SBIR / STTR Transfer ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 SBIR / STTR Transfer			
Accomplishments/Planned Programs Subtotals	2.455	4.387	4.357

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

FY 2017 and prior funding was aligned to 0303142A/456.

D. Acquisition Strategy

This project funds advanced systems engineering, research, development, test and evaluation of new and emerging technologies to optimize terminal performance and communications control. Once the technologies are mature and deemed feasible, funding and management responsibility for implementation of the technology will transition to PM Tactical Network and related programs of record.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 1203142A / *SATCOM Ground Environment (SPACE)*	Project (Number/Name) FE2 / *MILSATCOM System Engineering*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Protected Communications and WGS Communications SE	TBD	Various : APG, MD	-	0.662	Sep 2018	1.140	Feb 2019	1.176	Jan 2020	-		1.176	Continuing	Continuing	Continuing
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.161		-		-		-	0.000	0.161	-
		Subtotal	-	0.662		1.301		1.176		-		1.176	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering (In House)	MIPR	PM WIN-T : APG, MD	-	0.679	Sep 2018	1.168	Sep 2019	1.204	Sep 2020	-		1.204	Continuing	Continuing	-
Engineering Contractors Support	C/CPFF	PM WIN-T : APG, MD	-	0.671	Mar 2018	1.155	Sep 2019	1.190	Mar 2020	-		1.190	Continuing	Continuing	-
System Architecture & Analysis	Various	CERDEC : APG, MD	-	0.128	Apr 2018	0.221	Apr 2019	0.228	Apr 2020	-		0.228	Continuing	Continuing	-
		Subtotal	-	1.478		2.544		2.622		-		2.622	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Terminal Testing and Evaluation System Engineering	FFRDC	PEO C3T : TBD	-	0.112	Sep 2018	0.192	Jan 2019	0.198	Dec 2019	-		0.198	0.000	0.502	-
Test Support	MIPR	Matrix : APG, MD	-	0.091	Apr 2018	0.157	Apr 2019	0.162	Apr 2020	-		0.162	0.000	0.410	-
Testing, Certification	MIPR	TBD : APG, MD	-	0.112	Jul 2018	0.193	Jul 2019	0.199	Jul 2020	-		0.199	0.000	0.504	-
		Subtotal	-	0.315		0.542		0.559		-		0.559	0.000	1.416	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 1203142A / *SATCOM Ground Environment (SPACE)*	Project (Number/Name) FE2 / *MILSATCOM System Engineering*	

	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	-	2.455		4.387		4.357		-		4.357	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 1203142A / *SATCOM Ground Environment (SPACE)*	**Project (Number/Name)** FE2 / *MILSATCOM System Engineering*

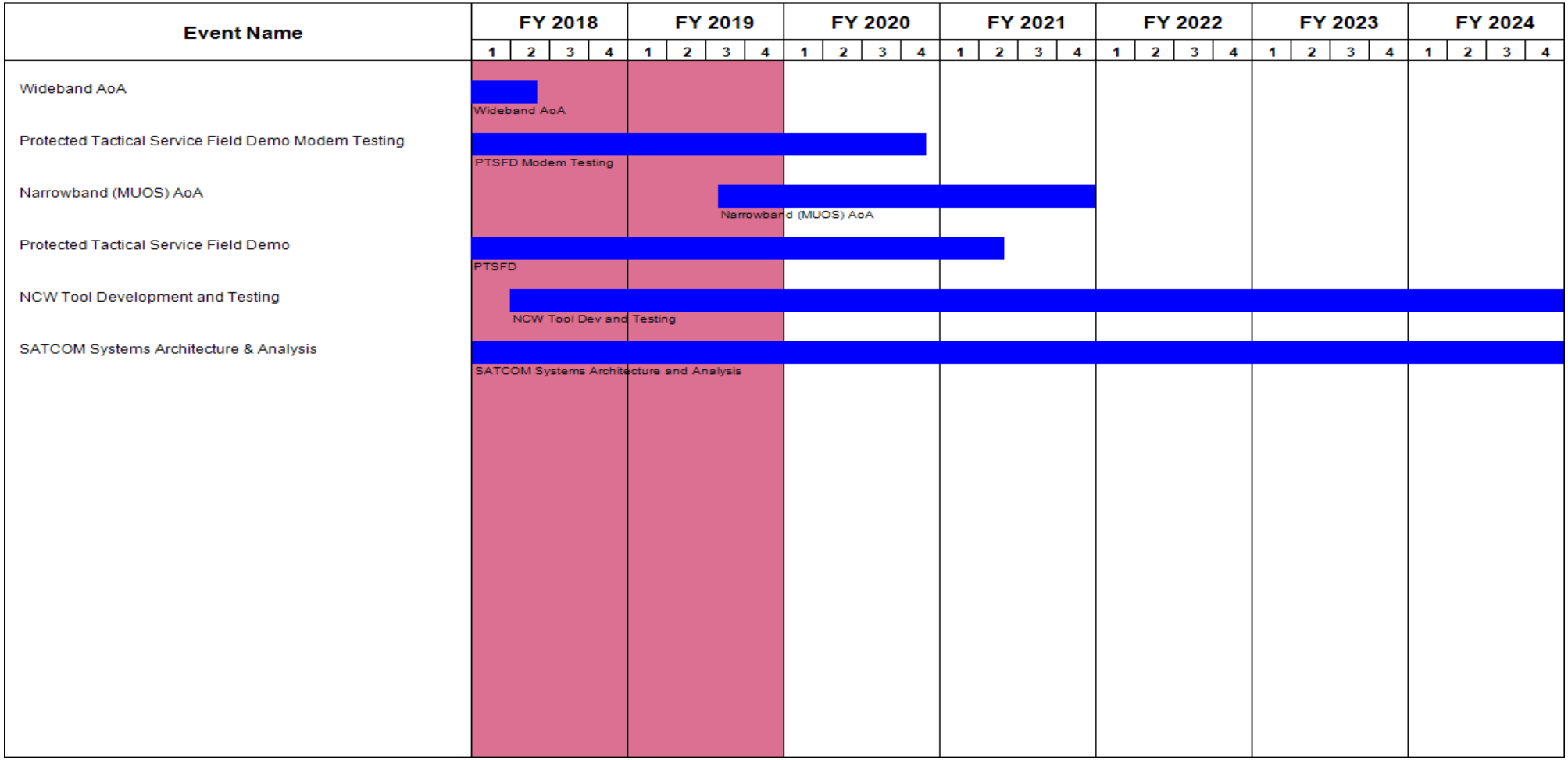

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 1203142A / *SATCOM Ground Environment (SPACE)*	**Project (Number/Name)** FE2 / *MILSATCOM System Engineering*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Wideband AoA	4	2016	2	2018
Protected Tactical Service Field Demo Modem Testing	1	2018	4	2020
Narrowband (MUOS) AoA	3	2019	4	2021
Protected Tactical Service Field Demo	4	2015	2	2021
NCW Tool Development and Testing	1	2015	4	2024
SATCOM Systems Architecture & Analysis	1	2018	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 1203142A / *SATCOM Ground Environment (SPACE)*	Project (Number/Name) FE4 / *Enroute Mission Command*	

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
FE4: *Enroute Mission Command*	-	0.960	3.489	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.449
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Enroute Mission Command supports the Army's Network Modernization Strategy Line Of Effort (LOE) 1 - Unified Network.

Enroute Mission Command (EMC) supports the Global Response Force (GRF) and other Army units with the requirement to conduct Airborne forced entry operations with the ability to conduct mission command, to include mission planning and rehearsal, while enroute on board US Air Force Air Mobility Command (AMC) aircraft. EMC provides a modernization to enroute communications to enable broadband reach-back data capability utilizing military or commercial networks with adequate bandwidth support required by Mission Command and Intelligence applications. EMC will provide commanders with the ability to obtain and share near real-time information regarding intelligence, situational awareness and command and control information while enroute to their objective. The ability to adjust plans and strategize utilizing the latest Intel data will give the GRF the information dominance needed to execute their mission once they arrive at their objective.

Ku FOC was achieved in September 2017 as directed by MDA due to rephasing of FY 2017 OPA funding into FY 2018/2019 and program was restructure in Dec 2015. A Modification Work Order (MWO), adding Ka Fixed Installed Satellite Antenna (FISA) capability began in FY18.

FY 2019 funding supports the Post Deployment Assessment (PDA) requirement which will validate the EMC capability for warfighters to conduct mission command utilizing the Key Leader Enroute Node (KEN), Dependent Airborne Node (DAN) and Command and Staff Palletized Airborne Node (CASPAN) on the C17 aircraft.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: EMC Testing	0.960	3.377	-
Description: Post Deployment Assessment (PDA)			
FY 2019 Plans: Post Deployment Assessment (PDA)			
FY 2019 to FY 2020 Increase/Decrease Statement: No FY20 RDTE required			
Title: FY 2019 SBIR / STTR Transfer	-	0.112	-
Description: FY 2019 SBIR / STTR Transfer			
FY 2019 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
FY 2019 SBIR / STTR Transfer			
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer			
Accomplishments/Planned Programs Subtotals	0.960	3.489	-

C. Other Program Funding Summary ($ in Millions)

Line Item	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
• B00015: *Enroute Mission Command (EMC)*	21.067	37.401	8.609	-	8.609	-	-	-	-	0.000	67.077

Remarks

B08400: OPA funding line for EMC

D. Acquisition Strategy

The continued procurement of the EMC full operational capability follows DoDI 5000.02, 7 Jan 2015, Enclosure 13, Rapid Fielding of Capabilities. The Milestone Decision Authority (MDA) and project manager will tailor and streamline program strategy based on the required timelines to meet urgent need capability requirements. The Army Executive Agent signed an Acquisition Decision Memorandum (ADM) on 27 April 2015 delegating MDA to PEO C3T. The MDA signed an ADM on 11 May 2015 selecting the KuKa Antenna and Radome for the Full Operational Capability (FOC). An ADM was signed on 20 May 2015 granting approval to enter into production and deployment phase.

Ku FOC was achieved in September 2017 as directed by MDA due to rephasing of FY 2017 OPA funding into FY 2018/2019 and program was restructured in Dec 2015. A Modification Work Order (MWO), adding Ka Fixed Installed Satellite Antenna (FISA) capability began in FY18.

FY 2019 funding (173142 FE4) supports the Post Deployment Assessment (PDA) requirement which will validate the EMC capability for warfighters to conduct mission command utilizing the Key Leader Enroute Node (KEN), Dependent Airborne Node (DAN) and Command and Staff Palletized Airborne Node (CASPAN) on the C17 aircraft.

Initial Operational Capability met in May 2015 with modification of five C-17s with satellite antennae and installation kits, and roll-on/roll-off, battalion level, Key Leader Node (KEN). FOC is 35 C-17s, eight Key Leader Enroute Node (KEN), and 24 company level Dependent Airborne Nodes (DAN), and a Command and Staff Palletized Airborne Node (CASPAN).

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 1203142A / *SATCOM Ground Environment (SPACE)*	Project (Number/Name) FE4 / *Enroute Mission Command*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Post Deployment Assessment (PDA)	MIPR	Air Mobility Command (AMC) : Ft Bragg, NC	-	-		3.377	May 2019	-		-		-	0.000	3.377	-
		Subtotal	-	-		3.377		-		-		-	0.000	3.377	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NRE for Baseband Redesign	MIPR	CERDEC CP&I : APG, MD	-	0.960	Apr 2018	-		-		-		-	0.000	0.960	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.112		-		-		-	0.000	0.112	-
		Subtotal	-	0.960		0.112		-		-		-	0.000	1.072	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	-	0.960		3.489		-		-		-	0.000	4.449	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 1203142A / *SATCOM Ground Environment (SPACE)*	**Project (Number/Name)** FE4 / *Enroute Mission Command*

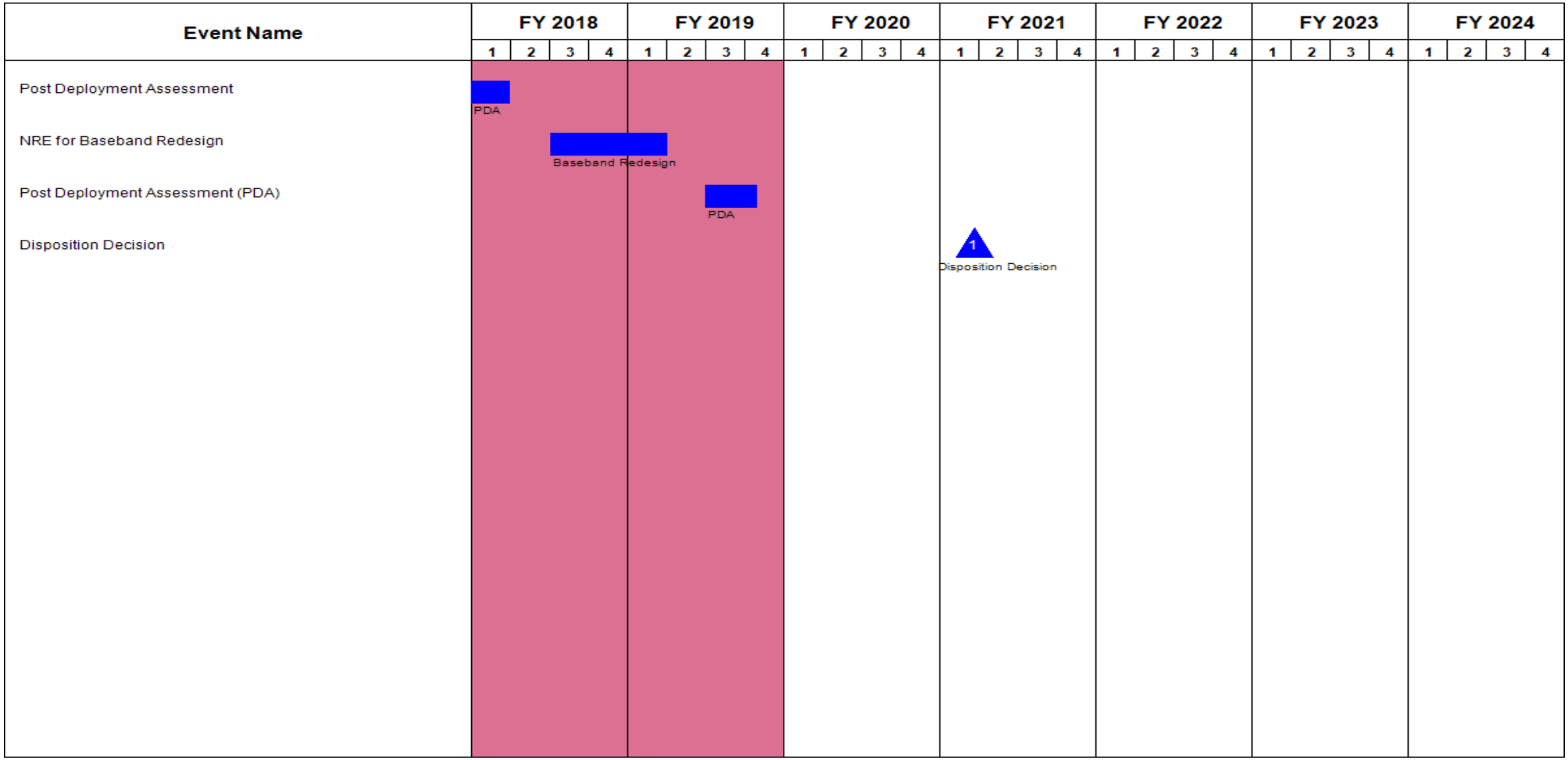

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 1203142A / *SATCOM Ground Environment (SPACE)*	**Project (Number/Name)** FE4 / *Enroute Mission Command*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
EMI/EMC Test	4	2016	1	2017
Triband Radome Certification Flight Test	1	2017	2	2017
CASPAN Safe to Fly Test	4	2017	4	2017
Post Deployment Assessment	1	2018	1	2018
NRE for Baseband Redesign	3	2018	1	2019
Post Deployment Assessment (PDA)	3	2019	4	2019
Disposition Decision	1	2021	1	2021

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040 / 7					R-1 Program Element (Number/Name) PE 1203142A / *SATCOM Ground Environment (SPACE)*				Project (Number/Name) FI8 / *Protected Anti-JAM Tactical SATCOM*			
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**
FI8: *Protected Anti-JAM Tactical SATCOM*	-	0.000	0.000	25.552	-	25.552	9.962	12.850	7.509	6.024	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Protected Anti-Jam Tactical SATCOM (1203142A/FI8) is a continuation of efforts previously funded by the Army under PE 1203142A- SATCOM Ground Environment (SPACE) - MILSATCOM Systems Engineering (FE2). The Protected SATCOM (1203142A/FI8) funding also includes a new start effort to test commercial Advanced Extremely High Frequency (AEHF) protected SATCOM terminal prototype to meet recently identified critical capability gaps for anti-jam SATCOM.

A. Mission Description and Budget Item Justification

Project FI8, Protected Anti-JAM Tactical SATCOM supports the Army's Network Modernization Strategy Line of Effort #1, Unified Network.

FI8: Protected Anti-JAM Tactical SATCOM (Protected SATCOM) provides for a critical protected communications gap in anti-jam SATCOM capability across the Army. It provides the ability for the tactical Army to be resilient in a contested environment and protect against potentially catastrophic loss of situational awareness and command and control during critical battle movement. It will offer the Tactical Army protection against interference that is either intentional or unintentional. The effort includes development of a critical Protected Tactical Waveform (PTW) modem which will be integrated into Army tactical SATCOM terminals to provide higher throughputs, protection (anti-jam) against Electronic Warfare (EW), and resiliency in a contested environment; development of a dual small form factor modem that can run the PTW and the current Network Centric Waveform (NCW) to Army Expeditionary Signal Battalions (ESBs) and eventually Army Corps, Division, and Brigade Combat Teams; and development, testing and certification of prototype Advanced Extremely High Frequency (AEHF) protected SATCOM terminals which will augment existing AEHF terminals. The PTW efforts are linked to the Air Force and DoD's plans for PTW on Wideband Global SATCOM (WGS) and its follow-on satellite constellation.

FY2020 funds will continue collaborative development, testing and certification with the US Air Force and Navy of a PTW modem and a Protected Tactical Satellite (PTS). The prototype of a protected modem and protected satellite were previously funded under the FE2 MILSATCOM Systems Engineering during the Protected Tactical Service Field Demo (PTSFD). The PTW modem and the accompanying satellite constellation continue the spiral development of critical protected communications capabilities. The funding on FI8 Protected SATCOM incorporates the Army specific requirements to be included in these efforts.

FY2020 funds will start efforts to test commercial Advanced Extremely High Frequency (AEHF) protected SATCOM terminal prototypes to meet recently identified critical capability gaps for anti-jam SATCOM. The new terminal will augment the existing capability of the Secure, Mobile, Anti-Jam, Reliable, Tactical Terminal (SMART-T) AEHF terminal, with the intent to backfill decreasing SMART-T numbers due to obsolescence. This ensures the Army's ability to meet increasing EW threat requirements.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Protected Tactical Waveform Modem Development ***Description:*** Development of Protected Tactical Waveform modem incorporating tactical Army specific requirements. ***FY 2020 Plans:*** Development and engineering of Army specific requirements for the Protected Tactical Waveform Modem that will be utilized for protected communications. Activities are part of joint effort with the US Air Force and Navy. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase in FY20 establishes a separate funding line for continuation of efforts previously funded under MILSATCOM Systems Engineering (FE2).	-	-	11.000
Title: Protected Tactical Satellite Development ***Description:*** Tactical Army requirement inserted during development of future Protected Tactical SATCOM satellite. Activities are part of joint effort with Air Force and Navy. ***FY 2020 Plans:*** Research, development and engineering for the Protected Tactical Satellite incorporating Army specific requirements to be included on the satellite. Activities are part of joint effort led by the Air Force, to include Army and Navy. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase in FY20 establishes a separate funding line for continuation of efforts previously funded under MILSATCOM Systems Engineering (FE2).	-	-	3.952
Title: AEHF Protected SATCOM Terminal Prototype Development ***Description:*** Research, development and testing of prototype AEHF Protected SATCOM terminals. ***FY 2020 Plans:*** Initial research, development and testing of prototype AEHF Protected SATCOM terminals. ***FY 2019 to FY 2020 Increase/Decrease Statement:***	-	-	10.600

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Increase in FY20 establishes funding to support new prototype development for a protected terminal to mitigate critical capability gap.			
Accomplishments/Planned Programs Subtotals	-	-	25.552

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

This project funds advanced systems engineering, research, development, test and evaluation of emerging protected Satellite Communications technologies to provide resilience and anti-jam protection against Electronic Warfare (EW). The program will leverage contracts established by the Air Force for the development of Protected Tactical Waveform (PTW) modems, including development of a dual small form factor modem capable of running the PTW and Network Centric Waveform - Resilient (NCW-R), beginning in FY2020. Production and Fielding of the PTW modems will begin in FY2023 under the Protected Anti-JAM Tactical SATCOM procurement line (B34002).

This project also funds the research, development and testing of an Advanced Extremely High Frequency (AEHF) protected SATCOM terminal prototype to aid in filling the identified critical protected communications. This terminal is a direct follow-on effort to the Secure, Mobile, Anti-Jam, Reliable, Tactical Terminal (SMART-T). The Program Office is working closely with the US Air Force on scheduling insertion of the terminal into the satellite Mission Planner as well as working with NSA to develop a timely path to certification. The terminal research and development effort will be awarded in FY2020; a developmental test combined with a robust Military utility user assessment will inform an FY2022 decision point on the path forward for the terminal.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Protected Tactical Waveform Modem Development	TBD	To Be Determined : To Be Determined	-	-		-		11.000	Jan 2020	-		11.000	0.000	11.000	Continuing
Protected Tactical Satellite Development	TBD	To Be Determined : To Be Determined	-	-		-		3.952	Jan 2020	-		3.952	0.000	3.952	Continuing
AEHF Protected SATCOM Terminal Prototype Development	TBD	To Be Determined : To Be Determined	-	-		-		10.600	Apr 2020	-		10.600	0.000	10.600	Continuing
		Subtotal	-	-		-		25.552		-		25.552	0.000	25.552	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	-	-		0.000		25.552		-		25.552	0.000	25.552	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 1203142A / *SATCOM Ground Environment (SPACE)*	**Project (Number/Name)** FI8 / *Protected Anti-JAM Tactical SATCOM*

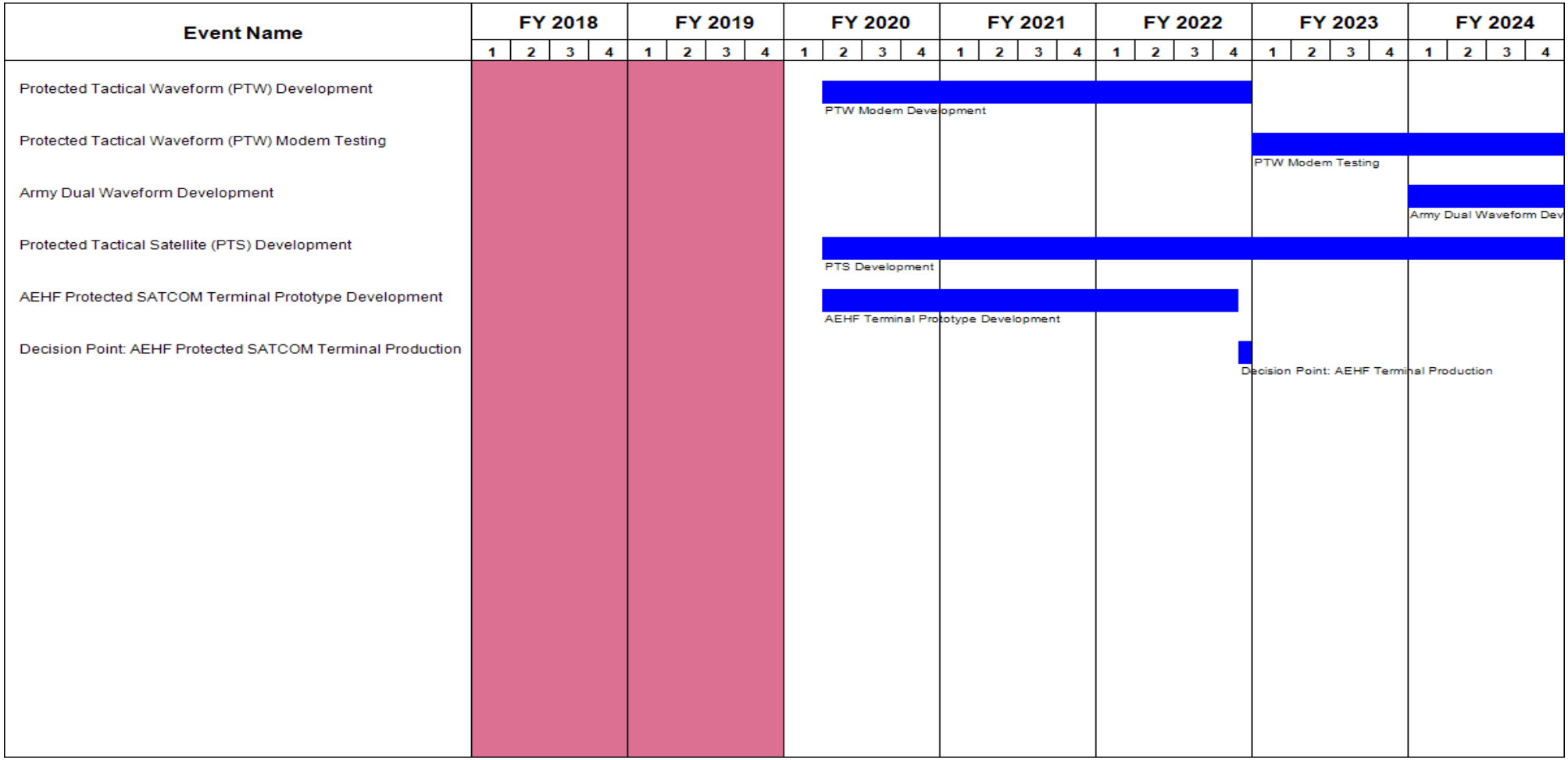

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 1203142A / *SATCOM Ground Environment (SPACE)*	**Project (Number/Name)** FI8 / *Protected Anti-JAM Tactical SATCOM*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Protected Tactical Waveform (PTW) Development	2	2020	4	2022
Protected Tactical Waveform (PTW) Modem Testing	1	2023	4	2025
Army Dual Waveform Development	1	2024	4	2025
Protected Tactical Satellite (PTS) Development	2	2020	4	2025
AEHF Protected SATCOM Terminal Prototype Development	2	2020	4	2022
Decision Point: AEHF Protected SATCOM Terminal Production	4	2022	4	2022