Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army												Date: March 2019
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*							
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	-	0.000	128.640	192.562	-	192.562	221.875	118.051	46.720	10.918	Continuing	Continuing
FJ8: *Assured Positioning, Navigation and Timing (PNT)*	-	0.000	58.985	42.379	-	42.379	38.130	25.180	0.000	0.000	0.000	164.674
FJ9: *Dismounted A-PNT*	-	0.000	15.969	32.360	-	32.360	13.350	0.000	0.000	0.000	0.000	61.679
FK1: *Pseudolites*	-	0.000	20.776	42.452	-	42.452	79.379	24.649	0.000	0.000	0.000	167.256
FK2: *Mounted A-PNT*	-	0.000	22.788	66.471	-	66.471	82.965	61.969	44.020	10.918	Continuing	Continuing
FK3: *Anti-Jam Antenna*	-	0.000	10.122	8.900	-	8.900	8.051	6.253	2.700	0.000	0.000	36.026

A. Mission Description and Budget Item Justification

Mission Command Network Modernization Implementation Plan - Line of Effort 1, 17 Apr 2018.

Assured Positioning, Navigation and Timing (A-PNT) will provide the Army's ground maneuver forces access to trusted PNT information under conditions where space-based PNT Global Positioning System (GPS) may be limited or denied. Joint Requirements Oversight Council Memo (JROCM) 049-10, dated 05 Apr 2010, approved the Positioning, Navigation and Timing Assurance Initial Capabilities Document and designated the Army as the Lead Component for Assured PNT. The Material Development Decision (MDD) was approved on 30 Jul 2013. The Assured PNT draft Capabilities Development Document was validated by the Army Requirements Oversight Council (AROC) on 28 Jul 2014. The Assured PNT Cross Functional Team is drafting individual requirements for each product. The Mounted A-PNT System (MAPS) Directed Requirement was approved 13 Jan 2019.

Positioning, Navigation and Timing (PNT) is a critical enabler of many Army systems. The current Global Positioning System (GPS) capability is a fixed frequency system vulnerable to current and emerging threats, and field conditions (e.g. urban, dense vegetation), which means Warfighter assured access to and integrity of the PNT signal is not guaranteed. This situation degrades mission performance to an unacceptable level. Therefore, current Army systems cannot operate in an electronically contested or degraded environment at the required PNT Assurance Levels with GPS alone.

A-PNT consists of five projects; (FJ8) Assured PNT, (FJ9) Dismounted A-PNT System (DAPS), (FK1) Pseudolite, (FK2) Mounted A-PNT System (MAPS), and (FK3) Anti-Jam Antenna System (AJAS). These A-PNT projects support access to and integrity of PNT information. Project Manager (PM) PNT manages these five project (Assured PNT, DAPS, Pseudolite, MAPS, and AJAS) constructed to investigate, prototype, experiment, model, asses, develop, test, modify, field, and sustain A-PNT solutions.

Assured Positioning, Navigation and Timing (A-PNT) consists of:
(FJ8) - The Assured PNT project funding line is for: PNT System of Systems Architecture (SOSA) Testing to validate performance of end-to-end system performance; Resiliency and Software Assurance Measures (RSAM) upgrades to legacy GPS systems. In addition, this line supports the development of complementary and

adjacent A-PNT technologies as well as Enterprise Enablers including the Alternative Navigation (ALT NAV) signal Enterprise Build-out. These technologies will be integrated into future products, strategies, concepts of operation, architectures, and platforms to assure PNT.

(FJ9) - The Dismounted A-PNT System (DAPS) provides assured PNT data to Soldier borne equipment (e.g. Nett Warrior, and other Soldier architecture compliant systems). DAPS is a Size, Weight, and Power, optimized military GPS, fused with other sensors.

(FK1) - The Pseudolite project was terminated by the Army on 12 Feb 2019 after the Fiscal Year 2020 submission lock. Therefore, the Army will realign FK1 funding within the existing PE 1206120A. The requirements addressed by the Pseudolite solution are still valid capability gaps. Pseudolite funding and activities will pivot to support the broader mission of Alternative PNT & Area Protection to mitigate threats in Multi-Domain Operations (MDO). For FY21 a new project line will be established to transition the effort of Alternative PNT & Area Protection. These technologies provide agile and adaptive mechanisms for integrating sensors, signals and software to provide Radio Frequency (RF) and non-RF threat mitigation.

(FK2) - The Mounted A-PNT System (MAPS) provides assured PNT data under conditions where space-based PNT (e.g. GPS) may be limited or denied by fusing non-RF sensors with GPS. It distributes assured PNT data to tactical command, communication and control systems on Army tactical and combat vehicles.

(FK3) - The Anti-Jam Antenna System (AJAS) provides protection against jamming threats. The AJAS is tightly coupled with the MAPS to provide GPS signal protection and assured PNT in challenged environments on Army tactical and combat vehicles.

FY 2020 Base funds in the total amount of $192.562 million are provided to continue the development of the Assured PNT program. The FJ8 funding line accounts for $42.379 million for PNT System of Systems Architecture (SOSA) Testing, Resiliency and Software Assurance Modification (RSAM), ALT NAV Enterprise Build-out and continued development of Assured PNT Enterprise Enablers. The FJ9 funding line accounts for $32.360 million to continue prototype development and testing for the DAPS. The FK1 funding line accounts for $42.452 million to continue to fulfill the assured PNT information gap by pivoting to Alternative PNT & Area Protection, accelerating the Mounted A-PNT System (MAPS), and aligning to Army Modernization priorities. As a result, this funding will be realigned to FJ8 ($18.139 million) and FK2 ($24.313) million. The FK2 funding line accounts for $66.471 million to continue integration, training and Soldier assessment of MAPS on selected combat vehicles and command, control and communication systems. The FK3 funding line accounts for $8.900 million to continue integration, training and Soldier Assessment of AJAS, fielded with MAPS on selected combat vehicles and command, control, and communication systems.

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 4: *Advanced Component Development & Prototypes (ACD&P)*		R-1 Program Element (Number/Name) PE 1206120A *I Assured Positioning, Navigation and Timing (PNT)*			
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	0.000	146.300	80.864	-	80.864
Current President's Budget	0.000	128.640	192.562	-	192.562
Total Adjustments	0.000	-17.660	111.698	-	111.698
• Congressional General Reductions	-	-0.160			
• Congressional Directed Reductions	-	-17.500			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	111.698	-	111.698

Change Summary Explanation

The $111.698 million increase is primarily driven in support of the implementation of the Army's Network modernization priority. The program plans on executing and accelerating the building and delivery of Dismounted Assured Positioning, Navigation and Timing System and Mounted Assured Positioning, Navigation and Timing System prototypes, conduct laboratory testing, and conduct a series of tests and assessments.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FJ8 / *Assured Positioning, Navigation and Timing (PNT)*	

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
FJ8: *Assured Positioning, Navigation and Timing (PNT)*	-	0.000	58.985	42.379	-	42.379	38.130	25.180	0.000	0.000	0.000	164.674
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mission Command Network Modernization Implementation Plan - Line of Effort 1, 17 Apr 2018.
The Assured PNT project line is comprised of: PNT System of Systems Architecture (SOSA) Testing to validate performance of end-to-end system performance; Resiliency and Software Assurance Measures (RSAM) upgrades to legacy GPS systems. In addition, this line supports the development of complementary and adjacent Alternative PNT & Area Protection technologies that include Enterprise Enablers such as the Alternative Navigation (ALT NAV) signal Enterprise Build-out.

The Alternative PNT & Area Protection technologies will be developed in order to demonstrate ALT NAV, emerging situational awareness capabilities and net-enabled GPS solutions to provide Radio Frequency (RF) and non-RF threat mitigation. These solutions will leverage commercial capabilities, existing contracts, industry, academia, and the warfighter in an iterative process that will be integrated into future products, strategies, concepts of operation, architectures, and platforms to assure PNT.

FY 2020 base funds in the amount of $42.379 million are to support PNT System of Systems Architecture (SoSA) Testing, enhancements to Army PNT receivers and capabilities, prototype development, and support for Enterprise Enabler development. RSAM will support continued software development against emerging threats for DAGR, GB-GRAM and MicroGRAM. The PNT SoSA Testing will allow for Army systems to test developed RSAM software and enable actions to be taken to ensure full operational capability of Army Forces through RSAM fielded software. In addition, FY2020 Base funds under PE 1206120A (project FK1) in the amount of $18.139 million are to be realigned to support to Army's Modernization Enterprise Enabler priorities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: PNT System of System (SOSA) Testing and Resiliency and Software Assurance Measures (RSAM)	-	37.834	21.992	-	21.992
Description: The effort supports SOSA testing, RSAM and other Army PNT capabilities. ***FY 2019 Plans:*** FY 2019 base funds support testing and RSAM software development for Ground Based GPS Receiver Applications Module (GB-GRAM). PNT SOSA testing and RSAM will complete software development Update 1 for Defense Advanced GPS Receiver (DAGR) and continue software development for GB-GRAM/MicroGRAM, to include engineering build					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ8 / *Assured Positioning, Navigation and Timing (PNT)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
testing, formal qualification testing, and risk mitigation efforts for platforms utilizing DAGR and GB-GRAM. In addition, DAGR RSAM integration testing efforts will be performed in associated with relevant platforms. Each Army Modernization Priority has PNT dependencies. As a modernization enabler, PNT is essential to future readiness. PM PNT will address current and future development gaps in readiness within Army Modernization Priority systems. PNT gaps will be addressed to improve readiness of Army Priority Systems in a GPS challenged environment. This includes RSAM upgrades to NavStrike 3.3 software to improve performance of Long Range Precision Fires (LRPF) as the top Army Modernization Priority. ***FY 2020 Base Plans:*** FY 2020 base funds support continued Update 2 software development against emerging threats for Defense Advanced GPS Receiver (DAGR) and Ground Based GPS Receiver Application Module (GB-GRAM/ MicroGRAM). PNT Systems of Systems (SOSA) testing and Resiliency and Software Assurance Measures (RSAM) will complete software development Update 1 for GB-GRAM and continue software development for MicroGRAM, to include engineering build testing, formal qualification testing, and risk mitigation efforts for platforms utilizing Defense Advanced GPS Receiver (DAGR) and GB-GRAM. In addition, DAGR RSAM and GB-GRAM RSAM integration testing efforts will be performed in association with relevant platforms. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** SOSA Testing and RSAM decreased from $37.834M in FY 2019 to $21.992M in FY 2020 due to reduced integration requirements in FY 2020.					
Title: Assured Positioning, Navigation and Timing (PNT) Enterprise Enablers ***Description:*** Enterprise Enablers provide enhanced PNT capability across an operational enterprise. These materiel solutions may augment or replace GPS by providing complementary PNT information. As complementary PNT providers, Enterprise Enablers build resiliency and robustness by diversifying PNT sources to ensure Soldiers have the right PNT information to drive mission success. ***FY 2019 Plans:*** FY2019 Base funds will provide an Enterprise Build-out that enables Alternative Navigation (ALT NAV) capabilities which provide positioning, navigation and timing data in a denied or degraded environment.	-	21.151	20.387	-	20.387

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ8 / *Assured Positioning, Navigation and Timing (PNT)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Activities to support this effort include: network integration, installation and testing of the assured timing/location modular enterprise capability for ALT NAV. ***FY 2020 Base Plans:*** FY 2020 Base funds will continue through market research, prototyping, experimentation, and technical demonstrations of ALT NAV, emerging situational awareness capabilities and net-enabled GPS solutions. These solutions will leverage commercial capabilities, existing contracts, industry, academia, and the warfighter in an iterative process, that will be integrated into future products, strategies, concepts of operation, architectures, and platforms to assure PNT. Other efforts include the continuation of Situational Awareness development, spectrum modification for PNT solutions (Alternative PNT Banding) and modeling and simulation support for Radio Frequency (RF) signals of opportunity for PNT. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Assured PNT Enterprise Enablers slightly decreased by $0.764 million, funding remains stable.					
Accomplishments/Planned Programs Subtotals	-	58.985	42.379	-	42.379

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
• K49010: *Mounted/ Dismounted Receivers*	-	-	1.980	-	1.980	3.047	3.495	7.082	2.373	Continuing	Continuing

Remarks

K49010: Mounted/Dismounted Receivers is an OPA subset of Line Item Number 9897K49000 / Assured Positioning, Navigation and Timing.

D. Acquisition Strategy

The planned acquisition strategy for Positioning, Navigation and Timing (PNT) System of Systems Architecture (SOSA) testing and Resiliency and Software Assurance Measures (RSAM) implementation is to award sole source contracts to the original equipment manufacturers and leverage the Communications Electronics Research Development Engineering Center (CERDEC) to develop and evaluate solutions to enhance the resiliency of Global Positioning System (GPS)-dependent systems operating in evolving contested environments. PNT SOSA testing and RSAM implementation will complete software development for Defense Advanced GPS Receiver (DAGR), Ground Based GPS Receiver Applications Module (GB-GRAM), and MicroGRAM to include engineering build testing and formal qualification testing, as well as integration and integration testing, for platforms utilizing DAGR, GB-GRAM and MicroGRAM engineering builds.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ8 / *Assured Positioning, Navigation and Timing (PNT)*

The Assured PNT Enterprise Enablers project will conduct market research, prototyping, experimentation, and technical demonstrations of Alternative Navigation (ALT NAV), emerging situational awareness capabilities and net-enabled GPS solutions. These solutions will leverage commercial capabilities, existing contracts, industry, academia, and the warfighter in an iterative process, that will be integrated into future products, strategies, concepts of operation, architectures, and platforms to assure PNT.

The Assured PNT Enterprise Build-out will conduct network integration, installation and testing of the assured timing/location modular enterprise capability for ALT NAV. ALT NAV provides positioning, navigation and timing data in a denied or degraded environment. Enterprise Buildout will be completed to enable ALT NAV capabilities.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FJ8 / *Assured Positioning, Navigation and Timing (PNT)*	

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
Project Management Support	Allot	PM PNT : Various	-	-		3.549	Jan 2019	2.506	Jan 2020	-		2.506	Continuing	Continuing	-
		Subtotal	-	-		3.549		2.506		-		2.506	Continuing	Continuing	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
RSAM - DAGR Software Development	SS/CPFF	Rockwell Collins : Cedar Rapids, IA	-	-		0.590	Mar 2019	4.902	Dec 2019	-		4.902	Continuing	Continuing	-
RSAM - G-GRAM Software Development	SS/CPIF	GCC Technologies : Oakland, MD	-	-		5.114	Jun 2019	2.276	Feb 2020	-		2.276	Continuing	Continuing	-
Assured PNT Enterprise Enablers	C/FFP	Various : Various	-	-		-		20.387	Dec 2019	-		20.387	Continuing	Continuing	-
Assured PNT Enterprise Buildout	MIPR	Various : Various	-	-		19.018	Feb 2019	-		-		-	0.000	19.018	-
Army Modernization Priorities	MIPR	Various : Various	-	-		2.321	Feb 2019	-		-		-	0.000	2.321	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		2.162		-		-		-	0.000	2.162	-
		Subtotal	-	-		29.205		27.565		-		27.565	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 and Technical Contracting Services	C/FFP	DCS Corp : APG, MD	-	-		2.892	Jan 2019	2.978	Jan 2020	-		2.978	Continuing	Continuing	-
Engineering and Technical Government Services	MIPR	C4ISR : Various	-	-		0.222	Jan 2019	0.225	Jan 2020	-		0.225	Continuing	Continuing	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FJ8 / *Assured Positioning, Navigation and Timing (PNT)*	

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
Assured PNT Enterprise Enablers Contractor Engineering Support	Various	DCS Corporation : APG, MD	-	-		0.328	Feb 2019	-		-		-	0.000	0.328	-
		Subtotal	-	-		3.442		3.203		-		3.203	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
SOSA Testing/RSAM - Government Eng Support	MIPR	Various : Various	-	-		1.031	Jan 2019	2.669	Jan 2020	-		2.669	Continuing	Continuing	-
SOSA Testing/RSAM - Contractor Eng Support	C/CPFF	Various : Various	-	-		1.521	Jan 2019	1.864	Jan 2020	-		1.864	Continuing	Continuing	-
Platform Integration Testing	C/Various	Various : Various	-	-		18.874	Mar 2019	4.279	Mar 2020	-		4.279	Continuing	Continuing	-
SOSA Testing/RSAM Test Equipment	C/Various	Various : Various	-	-		0.336	Jun 2019	0.293	Jun 2020	-		0.293	Continuing	Continuing	-
Assured PNT Enterprise Buildout Test Support	C/Various	Various : Various	-	-		1.027	Feb 2019	-		-		-	0.000	1.027	-
		Subtotal	-	-		22.789		9.105		-		9.105	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	-	-		58.985		42.379		-		42.379	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ8 / *Assured Positioning, Navigation and Timing (PNT)*

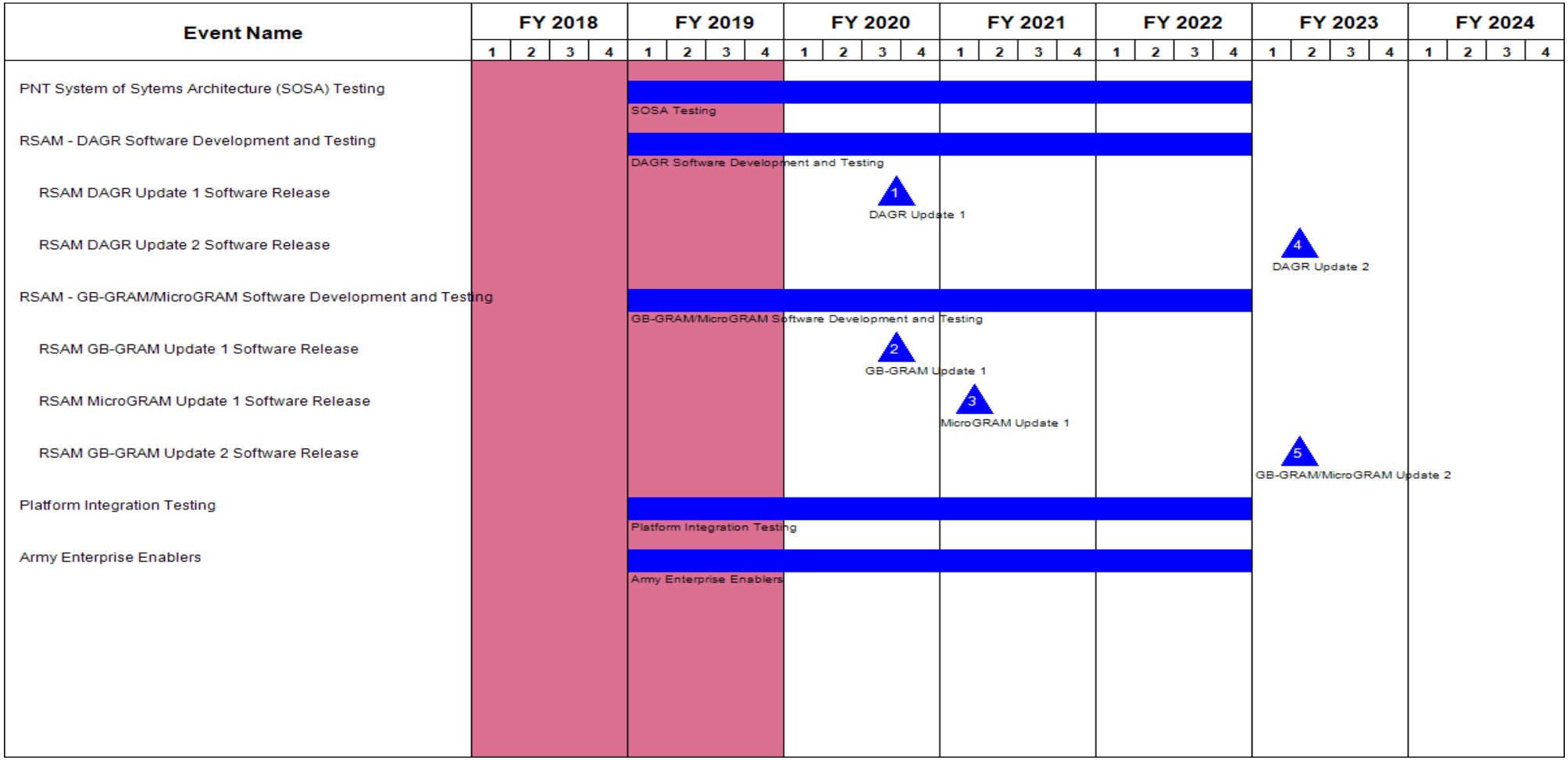

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ8 / *Assured Positioning, Navigation and Timing (PNT)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
PNT System of Sytems Architecture (SOSA) Testing	1	2019	4	2022
RSAM - DAGR Software Development and Testing	1	2019	4	2022
RSAM DAGR Update 1 Software Release	3	2020	3	2020
RSAM DAGR Update 2 Software Release	2	2023	2	2023
RSAM - GB-GRAM/MicroGRAM Software Development and Testing	1	2019	4	2022
RSAM GB-GRAM Update 1 Software Release	3	2020	3	2020
RSAM MicroGRAM Update 1 Software Release	1	2021	1	2021
RSAM GB-GRAM Update 2 Software Release	2	2023	2	2023
Platform Integration Testing	1	2019	4	2022
Army Enterprise Enablers	1	2019	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FJ9 / *Dismounted A-PNT*	

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
FJ9: *Dismounted A-PNT*	-	0.000	15.969	32.360	-	32.360	13.350	0.000	0.000	0.000	0.000	61.679
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mission Command Network Modernization Implementation Plan - Line of Effort 1, 17 Apr 2018.

The Dismounted Assured PNT (A-PNT) System (DAPS) acquires, protects, and distributes secure PNT to the Dismounted Soldier. DAPS will be used in conjunction with the PEO Soldier Nett Warrior System Ensemble (e.g., Nett Warrior and other Soldier architecture compliant systems). DAPS is planned to be a size, weight and power (SWaP) optimized form-factor that paces the threats and includes development and integration of Global Positioning System (GPS) and non-GPS sensors. DAPS includes receiver software capable of acquiring alternative PNT signals resulting in additional integrity for military GPS in denied environments and includes a Selective, Availability, Anti-Spoof module (SAASM) and or Military-Code (M-Code) receiver solution with other future technologies.

FY 2020 Base funds in the amount of $32.360 million are provided to deliver DAPS prototypes, conduct product verification testing as well as a series of testing events to include performance and reliability. In parallel to these activities, ongoing integration with the Nett Warrior End User Device will occur.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Dismounted A-PNT System (DAPS)	-	15.969	32.360	-	32.360
Description: This effort supports the development and delivery of DAPS prototypes for integration, evaluation and performance testing.					
FY 2019 Plans: FY2019 Base funds will support hardware and software prototype evaluations to include design reviews, test planning and Nett Warrior hardware and software integration. In addition, the funding will also support the development of the Dismounted system with the size, weight, and power optimized for a multi-sensor navigation prototype. Begin Integration of the Integrated Visual Augmentation System (IVAS) and Heads Up Display (HUD) 3.0 architecture.					
FY 2020 Base Plans: FY20 Base funds will deliver Dismounted A-PNT prototypes, conduct laboratory, performance and reliability tests. Safety Release and New Equipment Training will be completed. Nett Warrior Hardware and Software integration will be completed followed by final testing in FY21. Other efforts include: requirement/design trade					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ9 / *Dismounted A-PNT*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
studies and early prototyping for user demonstrations of a stand-alone Handheld variant. Integration of IVAS and HUD 3.0 architecture efforts will continue. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $16.391 million is driven in support of the implementation and acceleration of the Army Network modernization priorities.					
Accomplishments/Planned Programs Subtotals	-	15.969	32.360	-	32.360

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
• K49020: *Dismounted Hub*	-	-	2.000	-	2.000	2.000	2.000	2.000	2.000	Continuing	Continuing

Remarks

K49020 / Dismounted Hub is an OPA subset of Line Item Number 9897K49000 / Assured Positioning, Navigation and Timing.

D. Acquisition Strategy

The goal of the Dismounted A-PNT program is to provide the Soldier conducting operations outside of vehicles unhindered access to trusted PNT under conditions where space based PNT may be limited or denied, as well as a means to maintain accurate position, velocity, and time information in Global Positioning System (GPS) challenged or degraded/denied environments. The Dismounted A-PNT capability will provide improved performance and reliability, availability, and maintainability over the currently fielded Defense Advanced GPS Receiver.

The first iteration of capabilities will employ tailored processes to identify and close key technology gaps. Technologies available from Industry today will be evaluated for performance and operational suitability and equipped to select critical units. This will be implemented by utilizing competitive Other Transaction Authority (OTA)'s to obtain prototypes. The Government will conduct laboratory and performance testing. The findings from these efforts will provide technology viability and allow for the transition to limited production. Providing initial equipment to specified units will result in an assessment to determine production and fielding readiness of the capability.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FJ9 / *Dismounted A-PNT*	

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
Project Management Support - Contractor	C/CPFF	Various : Various	-	-		1.107	Dec 2018	1.530	Dec 2019	-		1.530	Continuing	Continuing	-
		Subtotal	-	-		1.107		1.530		-		1.530	Continuing	Continuing	N/A

Remarks

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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
Dismounted A-PNT Prototyping & Development Vendor 1	C/FFP	TBD : TBD	-	-		4.906	Feb 2019	2.326	Nov 2019	-		2.326	0.000	7.232	-
Dismounted A-PNT Prototyping & Development Vendor 2	C/FFP	TBD : TBD	-	-		2.906	Feb 2019	1.324	Nov 2019	-		1.324	0.000	4.230	-
Dismounted A-PNT Protoyping & Delivery	C/FFP	TBD : TBD	-	-		-		7.058	Feb 2020	-		7.058	Continuing	Continuing	-
Development of a Dismounted M-Code capable prototype	MIPR	TBD : TBD	-	-		1.800	Jun 2019	4.460	Feb 2020	-		4.460	Continuing	Continuing	-
Development of a small SWAP-C multi sensor navigation prototype	MIPR	CERDEC Command Power and Integration Directorate : APG, MD	-	-		0.896	Dec 2018	-		-		-	0.000	0.896	-
Engineering and Technical Product Development	MIPR	C5ISR : Various	-	-		0.293	Dec 2018	3.377	Dec 2019	-		3.377	Continuing	Continuing	-
Nett Warrior Integration	MIPR	TBD : TBD	-	-		0.846	Feb 2019	1.698	Feb 2020	-		1.698	Continuing	Continuing	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.584		-		-		-	0.000	0.584	-
		Subtotal	-	-		12.231		20.243		-		20.243	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FJ9 / *Dismounted A-PNT*	

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 and Technical Services - Government	Various	C5ISR : Various	-	-		0.702	Nov 2018	0.856	Nov 2019	-		0.856	Continuing	Continuing	-
Engineering and Technical Services - Contractor	C/CPFF	DCS Corporation : APG, MD	-	-		0.796	Jan 2019	0.924	Nov 2019	-		0.924	Continuing	Continuing	-
		Subtotal	-	-		1.498		1.780		-		1.780	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
Test Support	C/Various	Various : Various	-	-		1.133	Dec 2018	8.807	Dec 2019	-		8.807	Continuing	Continuing	-
		Subtotal	-	-		1.133		8.807		-		8.807	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	-	-		15.969		32.360		-		32.360	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ9 / *Dismounted A-PNT*

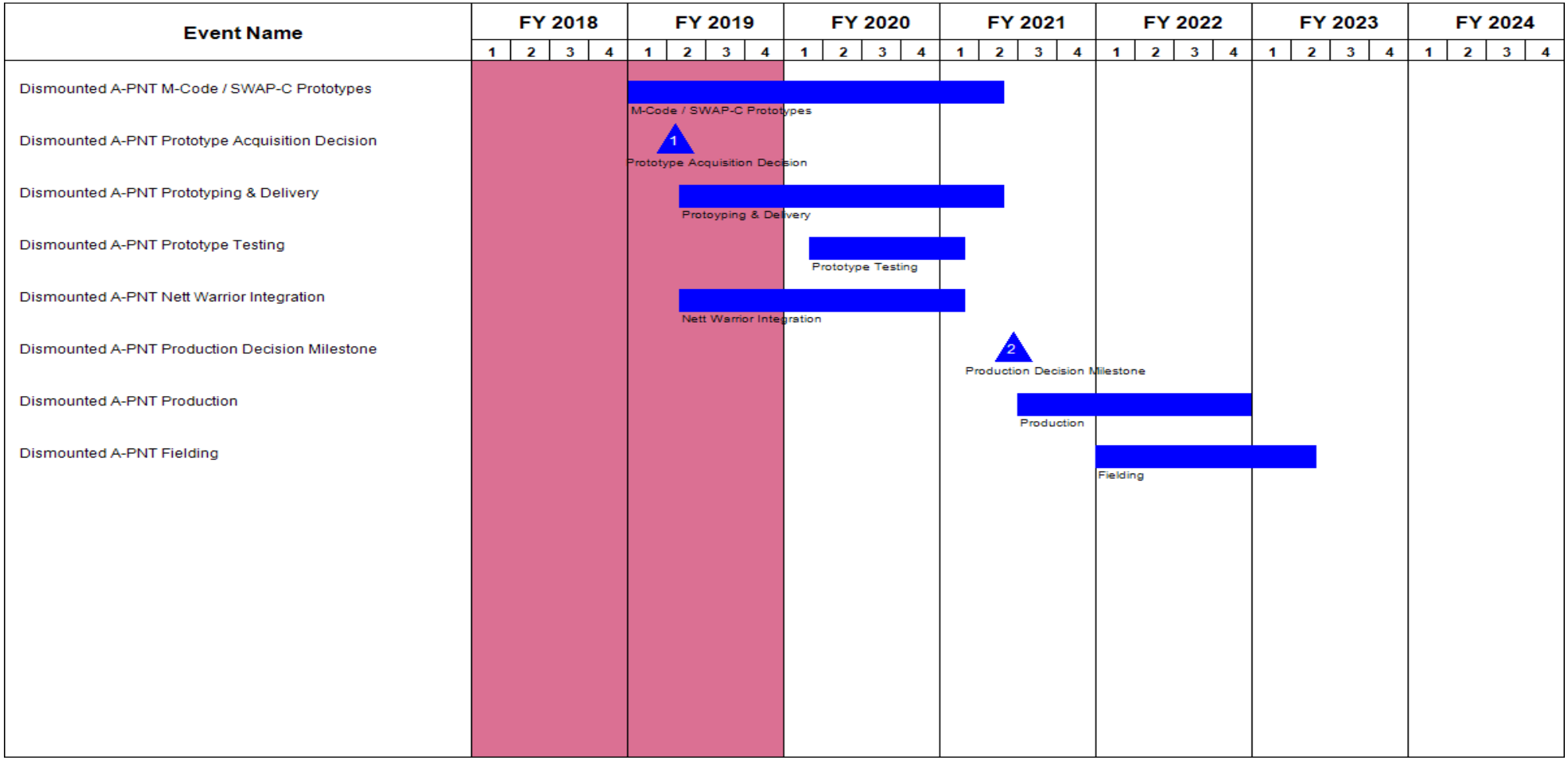

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FJ9 / *Dismounted A-PNT*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Dismounted A-PNT M-Code / SWAP-C Prototypes	1	2019	2	2021
Dismounted A-PNT Prototype Acquisition Decision	2	2019	2	2019
Dismounted A-PNT Prototyping & Delivery	2	2019	2	2021
Dismounted A-PNT Prototype Testing	1	2020	1	2021
Dismounted A-PNT Nett Warrior Integration	2	2019	1	2021
Dismounted A-PNT Production Decision Milestone	2	2021	2	2021
Dismounted A-PNT Production	3	2021	4	2022
Dismounted A-PNT Fielding	1	2022	2	2023

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FK1 / *Pseudolites*	

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
FK1: *Pseudolites*	-	0.000	20.776	42.452	-	42.452	79.379	24.649	0.000	0.000	0.000	167.256
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mission Command Network Modernization Implementation Plan - Line of Effort 1, 17 Apr 2018.

The Pseudolite project was terminated by the Army on 12 Feb 2019 after the Fiscal Year 2020 submission lock. Therefore, the Army will realign FK1 funding within the existing PE 1206120A. The requirements addressed by the Pseudolite solution are still valid capability gaps. Pseudolite funding and activities will pivot to support the broader mission of Alternative PNT & Area Protection to mitigate threats in Multi-Domain Operations (MDO). For FY21 a new project line will be established to transition the effort of Alternative PNT & Area Protection. These technologies provide agile and adaptive mechanisms for integrating sensors, signals and software to provide Radio Frequency (RF) and non-RF threat mitigation.

FY 2020 Base funds in the amount of $42.452 million will continue to fulfill the assured PNT information gap by pivoting to Alternative PNT & Area Protection, accelerating the Mounted A-PNT System (MAPS), and aligning to Army Modernization priorities. As a result, this funding will be realigned to FJ8 ($18.139 million) and FK2 ($24.313 million).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Alternative PNT & Area Protection	-	20.776	42.452	-	42.452
Description: Pseudolites transitioning to Alternative PNT & Area Protection					
FY 2019 Plans: FY 2019 Base funds will complete smart shutdown of the Pseudolite program and refocus a material solution approach for requirements associated with Alternative PNT & Area Protection. A new project line is requested to support this transition.					
FY 2020 Base Plans: FY2020 Base funds will continue to fulfill the assured PNT information gap by pivoting to Alternative PNT & Area Protection, accelerating the Mounted A-PNT System (MAPS), and aligning to Army Modernization priorities. As a result, this funding will be realigned to FJ8 ($18.139 million) and FK2 ($24.313 million).					
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 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK1 / *Pseudolites*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Increase in the amount of $21.676 million is driven in support of the implementation and acceleration of the Army Network modernization priorities.					
Accomplishments/Planned Programs Subtotals	-	20.776	42.452	-	42.452

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
• K49050: *Pseudolite Capability A-PNT*	-	-	2.000	5.439	7.439	8.558	2.000	1.912	1.945	Continuing	Continuing

Remarks

K49050 / Pseudolite Capability A-PNT is an OPA subset of Line Item Number 9897K49000 / Assured Positioning, Navigation and Timing.

D. Acquisition Strategy

The Pseudolite project was terminated by the Army on 12 Feb 2019 after the Fiscal Year 2020 submission lock. Therefore, the Army will realign FK1 funding within the existing PE 1206120A. The requirements addressed by the Pseudolite solution are still valid capability gaps. Pseudolite funding and activities will pivot to support the broader mission of Alternative PNT & Area Protection to mitigate threats in Multi-Domain Operations (MDO). For FY21 a new project line will be established to transition the effort of Alternative PNT & Area Protection. These technologies provide agile and adaptive mechanisms for integrating sensors, signals and software to provide Radio Frequency (RF) and non-RF threat mitigation.

The Project Manager, Positioning, Navigation and Timing (PM PNT) will complete smart shutdown of the Pseudolite program and refocus a material solution approach for requirements associated with Alternative PNT & Area Protection.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FK1 / *Pseudolites*	

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
Project Management Support - Contractor	C/CPFF	Various : Various	-	-		1.428	Dec 2018	-		-		-	0.000	1.428	-
		Subtotal	-	-		1.428		-		-		-	0.000	1.428	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
Engineering and Technical Product Support	MIPR	C5ISR : Various	-	-		1.804	Nov 2018	-		-		-	0.000	1.804	-
Alternative PNT & Area Protection Command & Control (C2)	C/Various	Various : Various	-	-		1.350	Jan 2019	-		-		-	0.000	1.350	-
Situational Awareness Development	C/Various	Various : Various	-	-		2.250	Feb 2019	-		-		-	0.000	2.250	-
Spectrum Modification for PNT Solutions (ALT PNT Banding)	C/Various	Various : Various	-	-		1.522	Feb 2019	-		-		-	0.000	1.522	-
RF Signals of Opportunity for PNT	C/Various	Various : Various	-	-		0.878	Feb 2019	-		-		-	0.000	0.878	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		1.263		-		-		-	0.000	1.263	-
Realignment to FK2 Client and Platform Integration	C/Various	Variuos : Various	-	-		-		24.313	Nov 2019	-		24.313	Continuing	Continuing	-
Realignment to FJ8 Alternative Navigation	C/Various	Variuos : Variuos	-	-		-		6.720	Dec 2019	-		6.720	Continuing	Continuing	-
Realignment to FJ8 Navigation Warfare (NAVWAR) & GPS	C/Various	Variuos : Variuos	-	-		-		3.373	Dec 2019	-		3.373	Continuing	Continuing	-
Realignment to FJ8 Alternative PNT Modeling & Simulation	C/Various	Variuos : Variuos	-	-		-		3.846	Dec 2019	-		3.846	Continuing	Continuing	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FK1 / *Pseudolites*	

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
		Subtotal	-	-		9.067		38.252		-		38.252	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 and Technical Services - Government	MIPR	C5ISR : Various	-	-		1.299	Nov 2018	-		-		-	0.000	1.299	-
Engineering and Technical Services - Contractor	C/CPFF	DCS Corporation : APG, MD	-	-		2.989	Jan 2019	-		-		-	0.000	2.989	-
		Subtotal	-	-		4.288		-		-		-	0.000	4.288	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
Alternative PNT & Area Protection Demonstration / Planning	MIPR	Various : Various	-	-		5.993	Mar 2019	-		-		-	0.000	5.993	-
Realignment to FJ8 Testing of Alternative PNT Technologies	C/Various	Variuos : Variuos	-	-		-		4.200	Feb 2020	-		4.200	Continuing	Continuing	-
		Subtotal	-	-		5.993		4.200		-		4.200	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	-	-		20.776		42.452		-		42.452	Continuing	Continuing	N/A

Remarks

The Mounted Client and Platform Integration is required for 81 Platforms and 27 Client PMs.

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK1 / *Pseudolites*

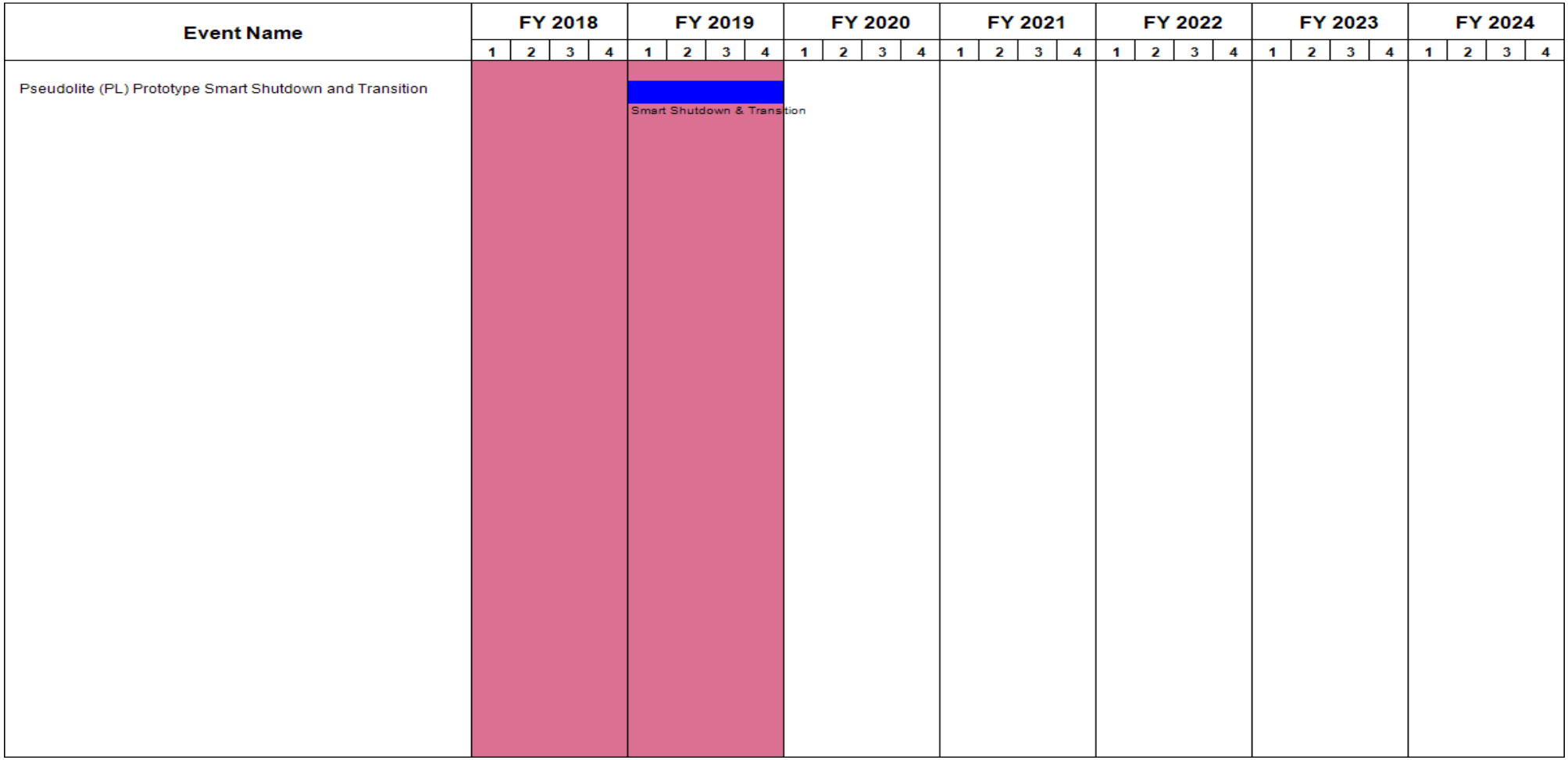

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK1 / *Pseudolites*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Pseudolite (PL) Prototype Smart Shutdown and Transition	1	2019	4	2019

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FK2 / *Mounted A-PNT*	

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
FK2: *Mounted A-PNT*	-	0.000	22.788	66.471	-	66.471	82.965	61.969	44.020	10.918	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mission Command Network Modernization Implementation Plan - Line of Effort 1, 17 Apr 2018.

The Mounted Assured Positioning, Navigation, and Timing (PNT) System (MAPS) provides assured PNT data, is a key enabler, and a cross cutting capability for Army ground maneuver forces to execute their mission in support of the Network Enabling Function. Army ground maneuver Forces require access to assured PNT under conditions where space-based PNT (e.g. Global Positioning System (GPS)) may be limited or denied by fusing non-Radio Frequency (RF) sensors with GPS. It distributes assured PNT data to tactical command, communication and control systems on Army tactical and combat vehicles. The current GPS capability is a fixed frequency system which is vulnerable to current and emerging threats and field condition.

The MAPS is a scalable, upgradable system mounted on Army ground force platforms. It fuses GPS with complimentary navigation and timing technologies to provide assured PNT to client systems and platforms. The MAPS distributes PNT data to multiple systems directly and via the network, reducing the dependency on multiple GPS receiver devices on a single platform. In order to achieve performance requirements in the highest threat level conditions, an Anti-Jam Antenna will be integrated with the MAPS. These two products each provide a degree of A-PNT protection. Integrated together, however, these two products will close the capability gap and achieve the desired performance.

FY 2020 Base funds, in the amount of $66.471 million, are provided for integration, installation, training and Soldier assessment of MAPS on selected combat vehicles and command, control and communication systems. Integration activities are required for 81 unique platforms and 27 client systems based on the current basis of issue (BOI). In addition, FY2020 Base funds under PE 1206120A (project FK1) in the amount of $24.313 million are to be realigned to support MAPS acceleration and to align MAPS to Army Modernization priorities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Mounted A-PNT System (MAPS)	-	22.788	66.471	-	66.471
Description: This effort supports the delivery of MAPS prototypes for platform integration, performance and reliability testing, technical evaluation, and operational assessment.					
FY 2019 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK2 / *Mounted A-PNT*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY2019 Base funds will complete MAPS prototyping and early client system integration efforts in the systems integration lab. The funds initiate delivery of MAPS prototypes for testing and performance characterization. ***FY 2020 Base Plans:*** FY2020 Base funds will support integration, installation, training and Soldier assessment of MAPS on selected combat vehicles and command, control and communication systems. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase in the amount of $43.683 million is driven in support of the implementation and acceleration of the Army Network modernization priorities.					
Accomplishments/Planned Programs Subtotals	-	22.788	66.471	-	66.471

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
• K49030: *Mounted Hub A-PNT*	-	-	29.950	6.339	36.289	29.946	56.621	105.364	61.222	Continuing	Continuing

Remarks

K49030 / Mounted Hub A-PNT is an OPA subset of Line Item Number 9897K49000 / Assured Positioning, Navigation and Timing

D. Acquisition Strategy

The goal of the Mounted Assured Positioning, Navigation and Timing (PNT) System (MAPS) program is to deliver distributed assured PNT capabilities to mounted platforms over time in an iterative, affordable manner that allows for future modernization. The first iteration of capabilities will employ tailored processes to identify and close key technology gaps. Technologies available from Industry today will be evaluated for performance and operational suitability and equipped to select critical units. This will be implemented by utilizing a competitive Other Transaction Agreement (OTA) to obtain prototypes. The Government will conduct Electromagnetic Interference and Environmental Testing, as well as performance testing in the System Integration Lab (SIL), anechoic chamber testing and a Military Feasibility Assessment (MFA). The findings from these tests and assessment efforts will determine whether or not to begin platform integration. Providing initial equipment to specified units will result in an assessment to determine production and fielding readiness of the capability.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FK2 / *Mounted A-PNT*	

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
Project Management Support - Contractor	C/CPFF	Various : Various	-	-		1.446	Dec 2018	2.130	Dec 2019	-		2.130	Continuing	Continuing	-
		Subtotal	-	-		1.446		2.130		-		2.130	Continuing	Continuing	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
Mounted/AJAS Prototype Development Contract	C/FFP	TBD : TBD	-	-		10.509	Jun 2019	-		-		-	0.000	10.509	-
Engineering and Technical Product Development	MIPR	C5ISR : APG, MD	-	-		1.534	Dec 2018	1.086	Dec 2019	-		1.086	Continuing	Continuing	-
Client and Platform Integration	MIPR	PEO CS&CSS : Various	-	-		-		47.425	Nov 2019	-		47.425	Continuing	Continuing	-
Client Software Development (JBCP)	MIPR	AMRDEC/S3I : APG, MD	-	-		0.967	Jan 2019	-		-		-	0.000	0.967	-
Technical Manuals & Support Equipment	MIPR	C5ISR : APG, MD	-	-		-		2.997	Dec 2019	-		2.997	0.000	2.997	-
FY2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.835		-		-		-	0.000	0.835	-
		Subtotal	-	-		13.845		51.508		-		51.508	Continuing	Continuing	N/A

Remarks

Client and Platform Integration is required for 81 Platforms and 27 Client PMs.

On schedule to award the competitive firm fixed price Mounted/AJAS prototype development contract. Expenditures for this contract will align with milestone payments to the vendor as deliverables are completed.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FK2 / *Mounted A-PNT*	

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 and Technical Services - Government	MIPR	C5ISR : Various	-	-		0.187	Dec 2018	1.038	Nov 2019	-		1.038	Continuing	Continuing	-
Engineering and Technical Services - Contractor	C/CPFF	C5ISR : Various	-	-		2.029	Dec 2018	4.729	Nov 2019	-		4.729	Continuing	Continuing	-
		Subtotal	-	-		2.216		5.767		-		5.767	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
Performance Testing	MIPR	C5ISR : Various	-	-		1.330	May 2019	2.355	Nov 2019	-		2.355	Continuing	Continuing	-
Reliability Testing	MIPR	C5ISR : Various	-	-		-		1.571	Feb 2020	-		1.571	Continuing	Continuing	-
Field Testing	MIPR	Army Test and Evaluation Command (ATEC) : White Sands Missile Range (WSMR)	-	-		0.551	Feb 2019	-		-		-	0.000	0.551	-
Military Feasibility Assessment (MFA)	MIPR	Various : TBD	-	-		-		2.355	Mar 2020	-		2.355	Continuing	Continuing	-
Systems Engineering and Integration Testing & Support	MIPR	CERDEC Command Power and Integration Directorate : APG, MD	-	-		3.400	Jan 2019	0.785	Dec 2019	-		0.785	0.000	4.185	-
		Subtotal	-	-		5.281		7.066		-		7.066	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	-	-		22.788		66.471		-		66.471	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK2 / *Mounted A-PNT*

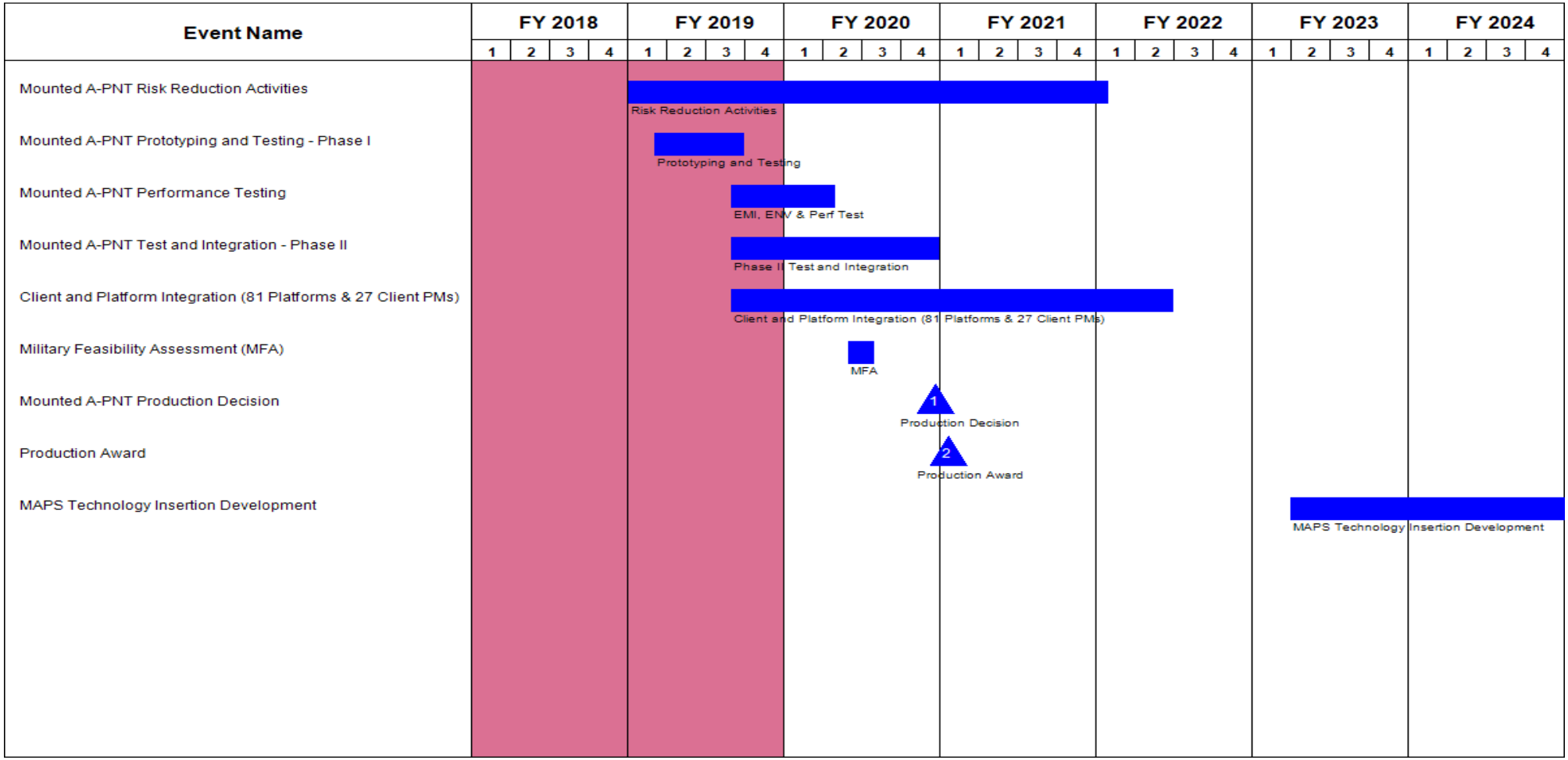

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK2 / *Mounted A-PNT*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Mounted A-PNT Risk Reduction Activities	1	2019	1	2022
Mounted A-PNT Prototyping and Testing - Phase I	1	2019	3	2019
Mounted A-PNT Performance Testing	3	2019	2	2020
Mounted A-PNT Test and Integration - Phase II	3	2019	4	2020
Client and Platform Integration (81 Platforms & 27 Client PMs)	3	2019	2	2022
Military Feasibility Assessment (MFA)	2	2020	3	2020
Mounted A-PNT Production Decision	4	2020	4	2020
Production Award	1	2021	1	2021
MAPS Technology Insertion Development	2	2023	4	2025

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FK3 / *Anti-Jam Antenna*	

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
FK3: *Anti-Jam Antenna*	-	0.000	10.122	8.900	-	8.900	8.051	6.253	2.700	0.000	0.000	36.026
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mission Command Network Modernization Implementation Plan - Line of Effort 1, 17 Apr 2018.

The Anti-Jam Antenna System (AJAS) provides point protection by steering electronic nulls at interference sources or beams at valid signal sources. This enables continuous Global Positioning System (GPS) signal acquisition and tracking in a navigation warfare (jamming) environment. The AJAS is tightly coupled with the Mounted Assured Positioning, Navigation and Timing System (MAPS) to provide GPS signal protection and assured PNT in challenged environments on Army tactical and combat vehicles. The AJAS integration with the MAPS will achieve performance requirements in the highest threat level conditions. These two products each provide a degree of A-PNT protection. Integrated together, however, these two products will close the capability gap and achieve the desired performance.

FY 2020 Base funds in the amount of $8.900 million provide integration, installation, training and Soldier assessment of AJAS fielded with MAPS on selected combat vehicles and command, control and communication systems. Integration activities are required for 81 unique platforms and 27 client systems based on the current basis of issue (BOI).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Anti-Jam Antenna System	-	10.122	8.900	-	8.900
Description: This effort supports the delivery of MAPS prototypes for platform integration, performance and reliability testing, technical evaluation, and operational assessment.					
FY 2019 Plans: FY 2019 Base funds will complete AJAS prototyping and client system integration lab (SIL) testing. Funds will initiate delivery of AJAS prototypes to be used for test and characterization, as well as continue the manufacturing and development of the AJAS prototypes.					
FY 2020 Base Plans: FY2020 Base funds will support integration, installation, training and Soldier Assessment of AJAS fielded with MAPS, on selected combat vehicles and command, control and communication systems.					
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 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK3 / *Anti-Jam Antenna*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
The Anti-Jam Antenna System (AJAS) funding line decreased from $10.122M in FY 2019 to $8.900M in FY 2020 due to the incorporation of the Anti-Jam Antenna System (AJAS) into the Mounted Assured Positioning, Navigation and Timing System (MAPS) draft Capabilities Development Document (CDD).					
Accomplishments/Planned Programs Subtotals	-	10.122	8.900	-	8.900

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
• K49040: *Anti-Jam Antenna A-PNT*	-	-	5.144	-	5.144	10.460	23.083	24.486	24.855	Continuing	Continuing

Remarks

K49040 / Anti-Jam Antenna A-PNT is an OPA subset of Line Item Number 9897K49000 / Assured Positioning, Navigation and Timing

D. Acquisition Strategy

The goal of the Anti-Jam Antenna System (AJAS) program is to deliver distributed A-PNT capabilities to mounted platforms over time in an iterative, affordable manner that allows for future modernization. The first iteration of capabilities will employ tailored processes to identify and close key technology gaps. Technologies available from Industry today will be evaluated for performance and operational suitability and equipped to select critical units. This will be implemented by utilizing a competitive Other Transaction Agreement (OTA) to obtain prototypes. The Government will conduct partial Electromagnetic Interference and Environmental Testing, as well as performance testing in the System Integration Lab (SIL), anechoic chamber testing and a Military Feasibility Assessment. The findings from these test and assessment efforts will determine whether or not to proceed to platform integration. Providing initial equipment to specified units will result in an assessment to determine production and fielding readiness of the capability.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	Project (Number/Name) FK3 / *Anti-Jam Antenna*	

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
Project Management Support - Contractor	C/CPFF	Various : Various	-	-		0.710	Oct 2018	0.285	Dec 2019	-		0.285	0.000	0.995	-
		Subtotal	-	-		0.710		0.285		-		0.285	0.000	0.995	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
Development of the Systems Engineering and Integration Lab	MIPR	CERDEC Command Power and Integration Lab : APG, MD	-	-		-		0.276	Dec 2019	-		0.276	0.000	0.276	-
Platform Integration	MIPR	PEO CS&CSS : Warren, MI	-	-		2.058	Dec 2018	-		-		-	Continuing	Continuing	-
Engineering and Technical Product Development	MIPR	C5ISR : APG,MD	-	-		0.200	Dec 2018	-		-		-	Continuing	Continuing	-
Mounted and AJAS Prototype Development Contract	C/FFP	TBD : TBD	-	-		4.098	Jun 2019	-		-		-	Continuing	Continuing	-
Client Software Development (JBCP)	MIPR	AMERDEC/S3I Directorate : APG,MD	-	-		-		3.331	Nov 2019	-		3.331	Continuing	Continuing	-
Technical Manuals & Support Equipment	MIPR	C5ISR : APG,MD	-	-		-		2.993	Dec 2019	-		2.993	0.000	2.993	-
FY2019 SBIR /STTR Transfer	TBD	TBD : TBD	-	-		0.371		-		-		-	0.000	0.371	-
		Subtotal	-	-		6.727		6.600		-		6.600	Continuing	Continuing	N/A

Remarks

Platform Integration is required for 81 Platforms and 27 Client PMs.

On schedule to award the competitive firm fixed price Mounted/AJAS prototype development contract. Expenditures for this contract will align with milestone payments to the vendor as deliverables are completed.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK3 / *Anti-Jam Antenna*

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 and Technical Services - Government	MIPR	C5ISR : Various	-	-		0.130	Oct 2018	0.130	Nov 2019	-		0.130	Continuing	Continuing	-
Engineering and Technical Services - Contractor	C/CPFF	C5ISR : Various	-	-		1.612	Oct 2018	1.885	Nov 2019	-		1.885	0.000	3.497	-
		Subtotal	-	-		1.742		2.015		-		2.015	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
Live Sky Demo and Antenna Anechoic Chamber Test	MIPR	CERDEC - Command Power and Integration Directorate : APG, MD	-	-		0.478	May 2019	-		-		-	Continuing	Continuing	-
Anti-Jam Antenna Integrity/ Performance Testing	MIPR	CERDEC STCD : APG,MD	-	-		0.337	May 2019	-		-		-	0.000	0.337	-
TNT Prototype testing	MIPR	CERDEC STCD : APG, MD	-	-		0.128	May 2019	-		-		-	0.000	0.128	-
		Subtotal	-	-		0.943		-		-		-	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	-	-		10.122		8.900		-		8.900	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK3 / *Anti-Jam Antenna*

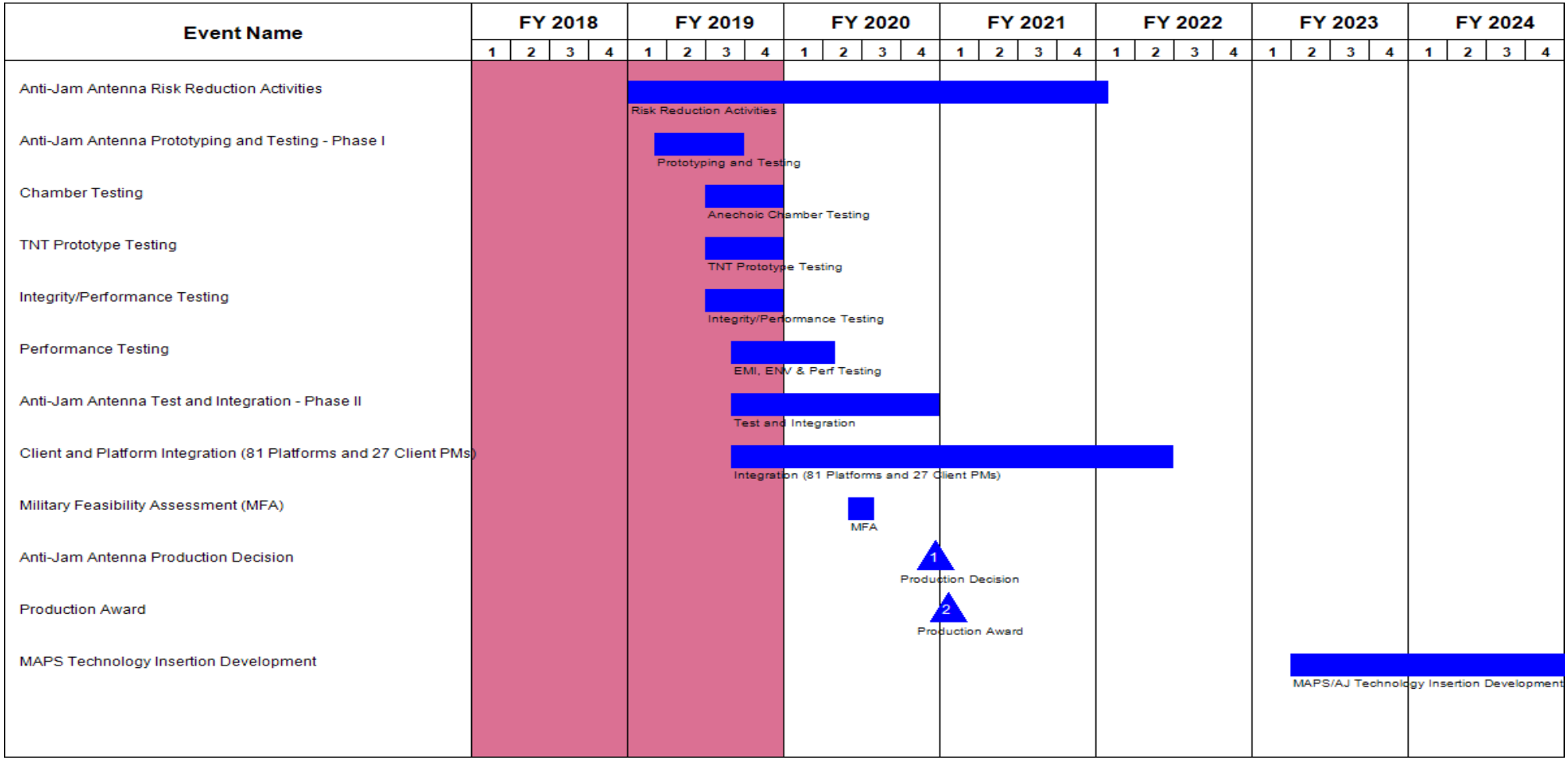

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 1206120A / *Assured Positioning, Navigation and Timing (PNT)*	**Project (Number/Name)** FK3 / *Anti-Jam Antenna*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Anti-Jam Antenna Risk Reduction Activities	1	2019	1	2022
Anti-Jam Antenna Prototyping and Testing - Phase I	1	2019	3	2019
Chamber Testing	3	2019	4	2019
TNT Prototype Testing	3	2019	4	2019
Integrity/Performance Testing	3	2019	4	2019
Performance Testing	3	2019	2	2020
Anti-Jam Antenna Test and Integration - Phase II	3	2019	4	2020
Client and Platform Integration (81 Platforms and 27 Client PMs)	3	2019	2	2022
Military Feasibility Assessment (MFA)	2	2020	3	2020
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