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 0305204A / *Tactical Unmanned Aerial Vehicles*							
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	-	16.925	6.000	5.097	34.100	39.197	39.079	4.327	4.244	4.099	0.000	113.871
11A: *Advanced Payload Develop & Spt (MIP)*	-	10.733	1.252	0.143	34.100	34.243	34.246	0.000	0.000	0.000	0.000	80.474
11B: *Tsp Development (MIP)*	-	1.480	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.480
123: *Joint Technology Center System Integration*	-	4.712	4.748	4.954	-	4.954	4.833	4.327	4.244	4.099	0.000	31.917

A. Mission Description and Budget Item Justification

Project 11A: The Advanced Payloads Development project line is a shared funding line between multiple Payload programs. These Payload programs support the Army's transformation by developing Reconnaissance, Surveillance and Target Acquisition (RSTA) and Intelligence, Surveillance and Reconnaissance (ISR) payload systems for Brigade Combat Teams, Divisions, and Corps Unmanned Aircraft Systems (UAS). This is in accordance with Headquarters Department of the Army (HQDA) and Training and Doctrine Command (TRADOC) UAS priorities. Additionally, this Program Element (PE) supports Future Advanced Payloads for Army UAS systems.

Small Tactical Radar - Lightweight (STARLite) Synthetic Aperture Radar/Moving Target Indicator (SAR/MTI)is a lightweight, high performance, all weather, multi-functional radar system for the Gray Eagle UAS. The STARLite system provides wide area, near real time Reconnaissance, Surveillance and Target Acquisition (RSTA) capabilities. It operates throughout the UAS flight mission profile in adverse weather and through battlefield obscurants. The Synthetic Aperture Radar (SAR) mode generates quality images for the battlefield commander for detection, classification and location of stationary commercial wheeled vehicle-size targets. The MTI mode detects moving ground targets, to include man-sized detection, and provides location information and performs cross-cue with the Electro-Optic/Infrared (EO/IR) sensors. STARLite is increasing its software capabilities based on Initial Operational Test and Evaluation (IOT&E) results which will increase automation and upgrade to a common Graphical User Interface (GUI) to align with the Common Operating Environment (COE) requirement to enable Sensor Processing and Exploitation (SPE). The SPE software enhancements will improve performance, reduce operator workload and enhance operator effectiveness.

Common Sensor Payload (CSP) - Electro Optical / Infrared / Laser Designator (EO/IR/LD) provides High Definition (HD) Full Motion Video (FMV) in both the Electro Optical and Mid Wave IR spectrums with day/night capability to collect and display continuous imagery and the ability to designate targets of interest for attack by laser guided precision weapons. It is the EO/IR/LD sensor for the Gray Eagle UAS which supports force applications, battlespace awareness, force protection, and net-centric operations across the battlefield to provide wide area, near real time RSTA capabilities. Current product improvements continue to focus on the development and implementation of technologies that directly support emerging requirements of the Army's Current and Future Force.

Project 11B: The Tactical Signals Intelligence (SIGINT) Payload (TSP) is a SIGINT sensor for the Gray Eagle that detects radio frequency (RF) emitters. The TSP system will provide a SIGINT capability to the tactical commander. The TSP system will be a modular, scalable payload using an architecture that is software reconfigurable to allow for growth and flexibility as technology, and as the adversaries use of technology, changes. This flexible architecture allows for third party

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 0305204A *I Tactical Unmanned Aerial Vehicles*

software applications to be integrated into the TSP system. The TSP system processing, control and data dissemination is integrated into the Distributed Common Ground System - Army (DCGS-A) via the Operational Ground Station. It supports Manned/Unmanned (MUM) teaming with Brigade Combat Team ground SIGINT Terminal Guidance (STG) teams and manned airborne assets. The TSP system improves situational awareness and shortens the targeting cycle by detecting and identifying emitters associated with high value targets (HVTs). The TSP system is capable of processing conventional signals, standard military signals, and modern signals of interest. This includes detection, recognition, identification, direction finding, and high confidence geo-location.

Project 123: The UAS Joint Technology Center/Systems Integration Laboratory (JTC/SIL) is a Joint facility that develops, integrates, and supports the enhancement of its Multiple Unified Simulation Environment (MUSE) capability for Army systems and operational concepts. The JTC/SIL conducts prototype hardware and software development, builds the UAS Institutional Mission Simulator (IMS) trainers for the Shadow, Hunter, and Gray Eagle programs, and provides modeling and simulation support. The MUSE is a real-time, operator in-the-loop simulation that may be integrated with larger simulations in support of Army and Joint training and exercises. The MUSE is also employed as a Mission Rehearsal Tool for ongoing combat operations. This project funds the management of the JTC/SIL and MUSE enhancements. This system supports the Legacy to Objective transition path of the Transformation Campaign Plan (TCP).

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	16.925	6.000	5.099	-	5.099
Current President's Budget	16.925	6.000	5.097	34.100	39.197
Total Adjustments	0.000	0.000	-0.002	34.100	34.098
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-0.002	34.100	34.098

Change Summary Explanation

The FY 2020 funding profile changes reflect OCO funding of the Target Location Accuracy (TLA) and Tactical Awareness Improvement (TAI) product improvement efforts for the Common Sensor Payload (CSP), under project 11A.

No FY 2020 budget submission STARLite Program of Record (POR).

No FY 2020 budget submission for TSP POR.

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 0305204A / *Tactical Unmanned Aerial Vehicles*	Project (Number/Name) 11A / *Advanced Payload Develop & Spt (MIP)*	

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
11A: *Advanced Payload Develop & Spt (MIP)*	-	10.733	1.252	0.143	34.100	34.243	34.246	0.000	0.000	0.000	0.000	80.474
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Advanced Payloads Development project is a shared funding line between multiple Payload programs. These Payload programs support the Army's transformation by developing Reconnaissance, Surveillance and Target Acquisition (RSTA) and Intelligence, Surveillance and Reconnaissance (ISR) payload systems for Brigade Combat Teams, Divisions, and Corps Unmanned Aircraft Systems (UAS). This is in accordance with Headquarters Department of the Army (HQDA) and Training and Doctrine Command (TRADOC) UAS priorities. Additionally, this Program Element (PE) supports Future Advanced Payloads for Army UAS systems.

Small Tactical Radar - Lightweight (STARLite) ACAT III - Synthetic Aperture Radar/Moving Target Indicator (SAR/MTI) is a lightweight, high performance, all weather, multi-functional radar system for the Gray Eagle UAS. The STARLite system provides wide area, near real time RSTA capabilities. It operates throughout the UAS flight mission profile in adverse weather and through battlefield obscurants. The Synthetic Aperture Radar (SAR) mode generates quality images for the battlefield commander for detection, classification and location of stationary commercial wheeled vehicle-size targets. The MTI mode detects moving ground targets, to include man-sized detection, and provides location information and performs cross-cue with the Electro-Optic/Infrared (EO/IR) sensors. STARLite is increasing its software capabilities based on Initial Operational Test and Evaluation (IOT&E) results which will increase automation and upgrade to a common Graphical User Interface (GUI) to align with the Common Operating Environment (COE) requirement to enable Sensor Processing and Exploitation (SPE). The SPE software enhancements will improve performance, reduce operator workload and enhance operator effectiveness.

Common Sensor Payload (CSP) - ACAT III - Electro Optical / Infrared / Laser Designator (EO/IR/LD) provides Standard Definition (SD) or High Definition (HD) Full Motion Video (FMV) in both the Electro Optical and Mid Wave IR spectrums. These systems provide day/night capability to collect and display continuous imagery and the ability to designate targets of interest for attack by laser guided precision weapons. It is the EO/IR/LD sensor for the Gray Eagle UAS which supports intelligence gathering, force applications, battlespace awareness, force protection, and net-centric operations across the battlefield to provide wide area, near real time RSTA capabilities. FY 2020 base dollars in the amount of $0.143M and OCO dollars in the amount of $34.1M will fund product improvements to enhance CSP lethality through enhanced Target Location Accuracy (TLA) and usability through Tactical Awareness Improvement (TAI). TLA provides validated, precision geolocation data for real-time targeting by coordinate-seeking weapons, reducing the kill chain timeline from minutes to seconds. TAI provides the warfighter enhanced situational awareness of the battlefield thru full spectrum imaging, aided target recognition, and simultaneous targeting.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: STARLite SPE	1.620	0.626	-	-	-
Description: Software Development to improve STARLite SPE Development, Testing and Integration.					

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 0305204A / *Tactical Unmanned Aerial Vehicles*	**Project (Number/Name)** 11A / *Advanced Payload Develop & Spt (MIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 Plans: STARLite Sensor CE Development ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Program will continue to implement transitional strategy towards full operational sustainment.					
Title: CSP Increased Usability and Lethality ***Description:*** Software and Hardware developments to increase lethality and usability of the CSP while reducing cognitive burden on the Warfighter. ***FY 2019 Plans:*** Developing Tactical Awareness Improvements for increased operator situational awareness and program office management support. ***FY 2020 Base Plans:*** Will continue to develop Tactical Awareness Improvement (TAI) for increased operator situational awareness and reduced cognitive burden. ***FY 2020 OCO Plans:*** Will continue to develop and test Target Location Accuracy (TLA) to improve lethality; Develop TAI; program office management support. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Program focus shift from TAI S&T efforts to TLA and TAI product improvement efforts.	9.113	0.626	0.143	34.100	34.243
Accomplishments/Planned Programs Subtotals	10.733	1.252	0.143	34.100	34.243

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
• A01003: *SAR/MTI (MIP)*	19.000	-	0.000	-	0.000	-	-	-	-	0.000	19.000
• A01005: *CSP FMV (MIP)*	50.010	-	0.000	-	0.000	-	-	-	-	Continuing	Continuing

Remarks

MQ-1 PAYLOAD - UAS - A00020 is a shared Aircraft Procurement, Army (APA) funding line for STARLite (A01003), Tactical Signals Intelligence (SIGINT) Payload (TSP) (A01004), and Common Sensor Payload (CSP) (A01005).

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 0305204A / *Tactical Unmanned Aerial Vehicles*	**Project (Number/Name)** 11A / *Advanced Payload Develop & Spt (MIP)*

D. Acquisition Strategy

STARLite SAR/MTI is a threshold requirement for the Gray Eagle UAS. The acquisition strategy for STARLite program was based on a full and open competition for the Army. Full Rate Production (FRP) was successfully achieved in June 2013. A follow-on production contract was awarded in April 2014 to procure all remaining STARLite Payloads required for the Gray Eagle platform. Based on Initial Operational test and Evaluation (IOT&E) results, STARLite is increasing its software capabilities to increase automation and upgrade to a common Graphical User Interface (GUI) and aligns SPE with the COE requirements. The SPE software enhancements will improve performance, reduce operator workload and enhance operator effectiveness. A competitive Research, Development, Test, and Evaluation (RDTE) funded contract was awarded to Northrop Grumman in October 2013 to perform trade studies and begin the development of the software improvements. Integration onto the Gray Eagle will be done via a sole source cost-plus fixed fee contract with the UAS prime contractor, General Atomics ASI.

Common Sensor Payload (CSP) EO/IR/LD enables the Gray Eagle to meet KPP (Key Performance Parameter) requirements. The acquisition strategy for the CSP program was based on a full and open competition for the Army. A competitive contract was awarded in November 2007 to Raytheon for the build, integration, test and delivery of the CSP. Full Rate Production (FRP) was achieved in June 2013. A three (3) year system support contract was awarded in July 2015 for sustainment and upgrade of the CSP to include retrofitting standard definition sensors with high definition sensors and to perform RDT&E activities. The Enhanced EO/IR Capability Production Document, approved 19 December 2016, defines additional KPP requirements for Full Motion Video (FMV) sensors. The first KPP increases detection, recognition, and identification requirements which can only be met with the High Definition (HD) variation of the CSP. Currently, units are being fielded HD CSPs, with additional HD CSPs in production and retrofit. The second KPP requirement is for the CSP to be a metric sensor providing rapid and enhanced Target Location Accuracy (TLA). A five (5) year follow-on production and system support contract is scheduled for award in June 2019 for integration, test, upgrade, and sustainment of these enhanced capabilities. The FY 2020 acquisition strategy for CSP includes: maturation of hardware and software product improvements, production of qualification assets and initiation of testing necessary to meet identified CSP-TLA requirements, and efforts to improve situational awareness, provide multiple fields of view, and enhance targeting capabilities as CSP-TAI transitions from an S&T effort to development.

The acquisition strategy is to complete STARLite SPE software developmental test and integration onto Gray Eagle.

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 0305204A / *Tactical Unmanned Aerial Vehicles*	Project (Number/Name) 11A / *Advanced Payload Develop & Spt (MIP)*	

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
CSP Program Management	MIPR	PM EOIR : Fort Belvoir, VA	0.190	0.632		0.100	Dec 2018	0.000		2.217	Dec 2018	2.217	Continuing	Continuing	Continuing
STARLite Program Mgmt Personnel	Various	PM SAI : Aberdeen, MD	1.150	0.617		0.227		-		-		-	Continuing	Continuing	Continuing
		Subtotal	1.340	1.249		0.327		0.000		2.217		2.217	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
CSP Development	C/CPFF	Raytheon : McKinney, TX	84.022	-		-		-		-		-	0.000	84.022	-
STARLite Sensor CE Development	SS/CPFF	General Atomics ASI : Potway, CA	1.295	1.003		0.399		-		-		-	Continuing	Continuing	Continuing
CSP HW/SW Improvements Reduce Cognitive Burden	MIPR	Night Vision Labs : Fort Belvoir, VA	2.819	1.202		0.426	Mar 2019	-		-		-	Continuing	Continuing	Continuing
CSP Target Location Accuracy (TLA)	SS/CPFF	Raytheon : McKinney, TX	-	6.187		-		0.000		8.919		8.919	Continuing	Continuing	Continuing
CSP HW/SW Improvements Reduce Cognitive Burden (TAI)	SS/CPFF	Raytheon : McKinney, TX	-	-		-		0.143		7.475		7.618	Continuing	Continuing	Continuing
CSP TLA Integration	MIPR	Various : Various	-	-		-		0.000		3.755		3.755	Continuing	Continuing	Continuing
CSP TAI Integration	MIPR	Various : Various	-	-		-		0.000		5.786		5.786	Continuing	Continuing	Continuing
		Subtotal	88.136	8.392		0.825		0.143		25.935		26.078	Continuing	Continuing	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 0305204A / *Tactical Unmanned Aerial Vehicles*	Project (Number/Name) 11A / *Advanced Payload Develop & Spt (MIP)*	

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
CSP TLA Integration (NRE)	SS/CPFF	PM MAE(General Automics) : San Diego, CA	-	0.781		-		-		-		-	Continuing	Continuing	Continuing
		Subtotal	-	0.781		-		-		-		-	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
CSP Testing	MIPR	Various : Various	17.086	-		-		-		-		-	0.000	17.086	-
CSP HW/SW Improvements Reduce Cognitive Burden	MIPR	Night Vision Labs : Fort Belvoir, VA	0.200	0.311		0.100	Mar 2019	-		-		-	Continuing	Continuing	Continuing
STARLite YTC Software Development Testing	MIPR	YPG : Yuma Proving Ground	0.910	-		-		-		-		-	Continuing	Continuing	Continuing
STARLite IGE Testing	MIPR	Various : Various	13.441	-		-		-		-		-	0.000	13.441	-
CSP Testing (TLA)	MIPR	Various : Various	-	-		-		0.000		1.732		1.732	Continuing	Continuing	Continuing
CSP Testing (TLA)	SS/CPFF	Raytheon : McKinney, TX	-	-		-		0.000		1.533		1.533	Continuing	Continuing	Continuing
CSP Testing (TAI)	MIPR	Various : Various	-	-		-		0.000		2.049		2.049	0.000	2.049	-
CSP Testing (TAI)	SS/CPFF	Raytheon : McKinney, TX	-	-		-		0.000		0.634		0.634	Continuing	Continuing	Continuing
		Subtotal	31.637	0.311		0.100		0.000		5.948		5.948	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	121.113	10.733		1.252		0.143		34.100		34.243	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 0305204A / *Tactical Unmanned Aerial Vehicles*	**Project (Number/Name)** 11A / *Advanced Payload Develop & Spt (MIP)*

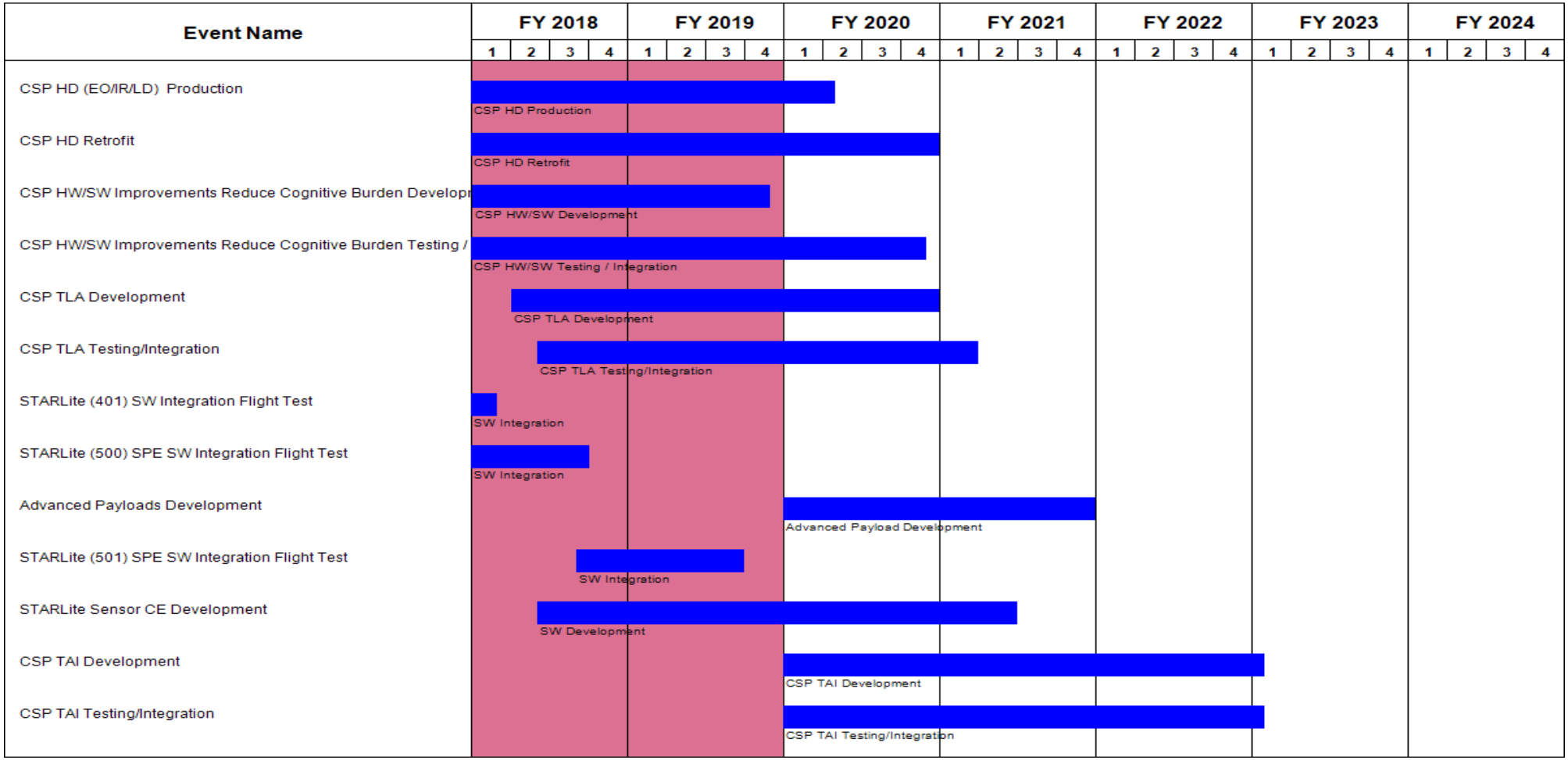

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0305204A / *Tactical Unmanned Aerial Vehicles*	**Project (Number/Name)** 11A / *Advanced Payload Develop & Spt (MIP)*

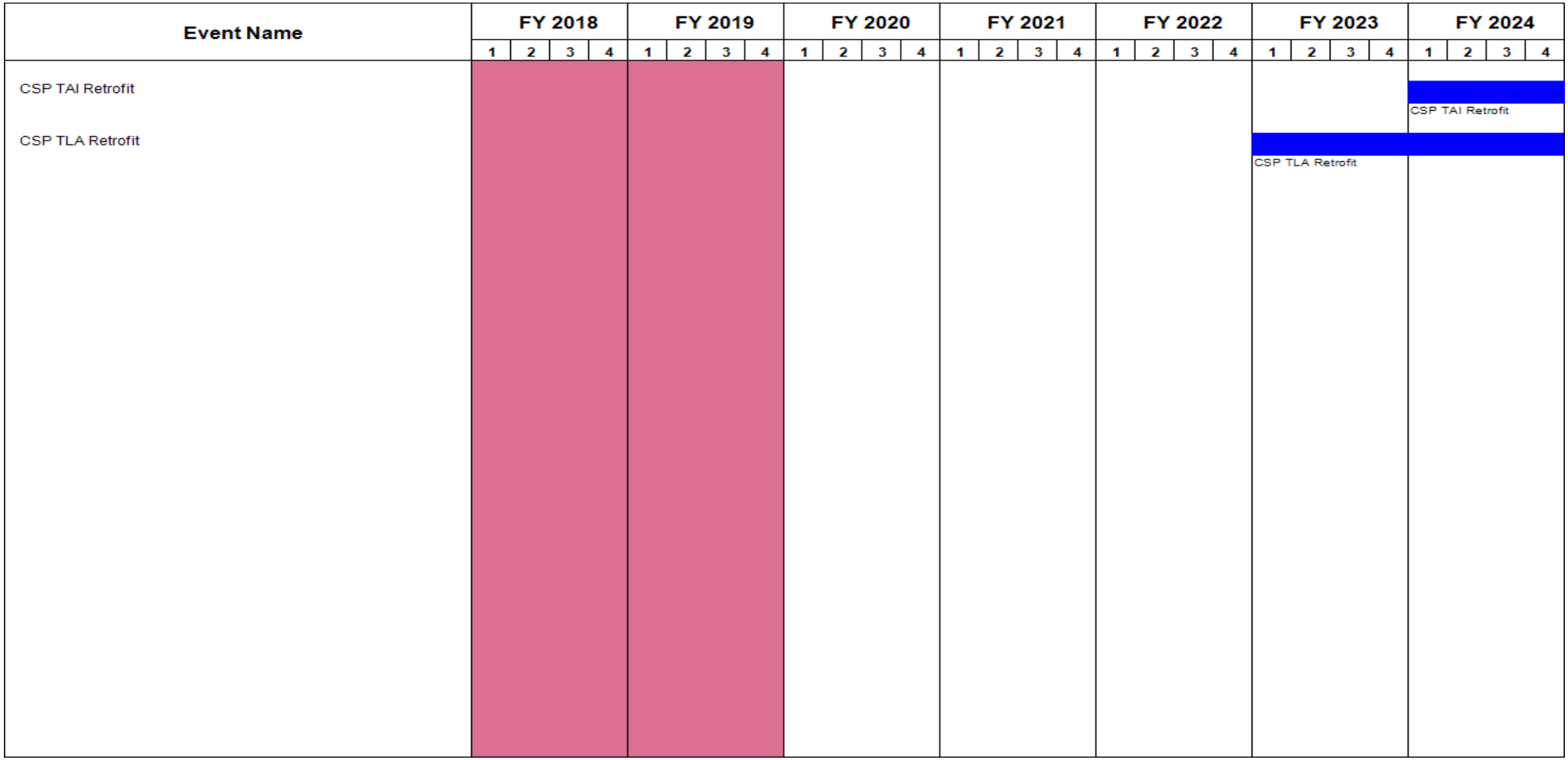

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0305204A / *Tactical Unmanned Aerial Vehicles*	**Project (Number/Name)** 11A / *Advanced Payload Develop & Spt (MIP)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
CSP HD (EO/IR/LD) Production	2	2013	2	2020
CSP HD Retrofit	4	2013	4	2020
CSP HW/SW Improvements Reduce Cognitive Burden Development	1	2016	4	2019
CSP HW/SW Improvements Reduce Cognitive Burden Testing / Integration	3	2017	4	2020
STARLite (SAR/MTI) Award	3	2008	3	2008
STARLite (SAR/MTI) Increment 1 Performance Enhancements and Testing	2	2009	2	2011
STARLite (SAR/MTI) Systems Integration for Gray Eagle UAS	3	2008	4	2012
STARLite (SAR/MTI) Testing (IOT&E)	4	2009	4	2012
STARLite (SAR/MTI) Production	3	2008	3	2016
CSP TLA Development	2	2018	4	2020
CSP TLA Testing/Integration	2	2018	1	2021
Improvements to STARLite Sensor Processing and Exploitation	1	2014	3	2016
STARLite SPE SW Developmental Test	2	2016	1	2017
STARLite (401) SW Integration Flight Test	4	2016	1	2018
STARLite (500) SPE SW Integration Flight Test	3	2017	3	2018
Advanced Payloads Development	1	2020	4	2021
STARLite (501) SPE SW Integration Flight Test	3	2018	3	2019
STARLite Sensor CE Development	2	2018	2	2021
CSP TAI Development	1	2020	1	2023
CSP TAI Testing/Integration	1	2020	1	2023
CSP TAI Retrofit	1	2024	4	2027
CSP TLA Retrofit	1	2023	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 0305204A / *Tactical Unmanned Aerial Vehicles*	Project (Number/Name) 11B / *Tsp Development (MIP)*	

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
11B: *Tsp Development (MIP)*	-	1.480	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.480
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Tactical Signals Intelligence (SIGINT) Payload (TSP) is a SIGINT sensor for the Gray Eagle that detects radio frequency (RF) emitters. The TSP system will provide a SIGINT capability to the tactical commander. The TSP system will be a modular, scalable payload using an architecture that is software reconfigured to allow for growth and flexibility as technology, and as the adversaries use of technology, changes. This flexible architecture allows for third party software applications to be integrated into the TSP system. The TSP system processing, control and data dissemination is integrated into the Distributed Common Ground System - Army (DCGS-A) via the Operational Ground Station. It supports Manned/Unmanned (MUM) teaming with Brigade Combat Team ground SIGINT Terminal Guidance (STG) teams and manned airborne assets. The TSP system improves situational awareness and shortens the targeting cycle by detecting and identifying emitters associated with high value targets (HVTs). The TSP system is capable of processing conventional signals, standard military signals, and modern signals of interest. This includes detection, recognition, identification, direction finding, and high confidence geo-location.

No Investment Funding for (FY 2019- beyond) for TSP POR.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: TSP/INSCOM ASSESSMENT ***Description:*** TSP/INSCOM Assessment for acceptance of capability, urgent materiel release, forward operational assessment, for fielding decision. In addition, any activities for TSP for ongoing system improvements.	1.480	-	-	-	-
Accomplishments/Planned Programs Subtotals	1.480	-	-	-	-

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
• A01004: *SIGINT (MIP)*	1.500	-	0.000	-	0.000	-	-	-	-	0.000	1.500
• 0605766A: *National Capabilities Integration (MIP)*	9.382	12.340	7.835	-	7.835	7.677	11.682	11.054	11.299	0.000	71.269

Remarks

MQ-1 PAYLOAD - UAS - A00020: Shared Aircraft Procurement, Army (APA) procurement funding line for CSP, STARLite, TSP, and Advanced Payloads.

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 0305204A / *Tactical Unmanned Aerial Vehicles*	**Project (Number/Name)** 11B / *Tsp Development (MIP)*

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

SIGINT (MIP) - A01004: Procurement funding line for TSP Payloads. Under Parent Line MQ-1 Payloads (MIP) - A01001.

TSP Theater Net-Centric Geolocation (TNG) - PE0605766A, Project DX9: TNG funding included in Tactical Exploitation of National Capabilities (TENCAP) funding line.

D. Acquisition Strategy

TSP is a threshold requirement for the MQ-1C Gray Eagle UAS. The TSP program completed the Engineering and Manufacturing Development (EMD) phase with a Milestone B decision in September 2011. The TSP Program EMD contract award was based on full-and-open competition with a period of performance that was completed in October 2015, and focused on integration and test onto the Gray Eagle platform, and integration and test of TSP software into the Operational Ground Station. The TSP EMD program is a derivative of systems that were fielded as a Quick Reaction Capability on the MQ-1C UAS and a variety of other manned platforms. The demonstrated scalability of these fielded materiel solutions allows the TSP EMD program to leverage effort that directly supports the TSP EMD program.

The TSP program entered the Low Rate Initial Production (LRIP) phase with a Milestone C decision that was approved on 2 May 2014. The TSP Program LRIP contract award was based on sole source selection with a period of performance that was completed on June 2016, and primarily focused on the obsolescence of the EMD phase assets via the required Engineering Change Proposals, and the first initial production of 30 TSP Payloads in support of the Gray Eagle Platform. The TSP Program ICLS contract award was a result of previous sole selection with a period of performance of 12-months with a 5 year option for total completion into August 2021. The primary focus supports fielding of system, continuous contractual support through operational and sustainment transition, engineering corrective actions, support of the MQ-1C (ER), and the conversion of the 30 LRIP TSP systems.

The TSP Block 1 is the current Program of Record capability. TSP Beyond Block 1 will address objectives and remaining deferred Block 1 threshold requirements as reflected in the approved Capability Production Document (CPD).

Improved Gray Eagle (IGE)- Program Manager Unmanned Aircraft Systems(PM UAS)received a Congressional plus up of $49M President's Budget 2015 to procure Extended Range UAS which increases the CPD objective endurance requirements for the current GE configuration to an Improved Gray Eagle (IGE).

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 0305204A / *Tactical Unmanned Aerial Vehicles*	Project (Number/Name) 11B / *Tsp Development (MIP)*	

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
Program Management-Gov	RO	PM SAI : APG	8.556	-		-		-		-		-	0.000	8.556	-
Program Management Support	MIPR	Various : APG	4.575	-		-		-		-		-	0.000	4.575	Continuing
FFRDC Support	SS/CR	MITRE : APG	2.548	0.350		-		-		-		-	0.000	2.898	-
		Subtotal	15.679	0.350		-		-		-		-	0.000	16.029	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
TSP EMD	C/CPIF	BAE Systems, : Nashua, NH	20.206	-		-		-		-		-	0.000	20.206	-
TSP Engineering Changes	SS/CPFF	BAE Systems : Nashua, NH	8.295	0.477		-		-		-		-	0.000	8.772	-
MQ-1C (ER) and OGS Integration	SS/CPFF	Various : Various	6.575	-		-		-		-		-	0.000	6.575	-
TSP System Support (Logistics, Training, & Test)	MIPR	Various : Various	11.843	-		-		-		-		-	0.000	11.843	-
Block 2	C/CPIF	To Be Determined : To Be Determined	-	0.478		-		-		-		-	0.000	0.478	-
		Subtotal	46.919	0.955		-		-		-		-	0.000	47.874	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 Support	MIPR	Various : Various	6.158	0.175		-		-		-		-	0.000	6.333	-
		Subtotal	6.158	0.175		-		-		-		-	0.000	6.333	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 0305204A / *Tactical Unmanned Aerial Vehicles*	Project (Number/Name) 11B / *Tsp Development (MIP)*	

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
Developmental Test and Activities	MIPR	ATEC/APG : Various	7.515	-		-		-		-		-	0.000	7.515	-
Inital Operational Test & Evaluation	MIPR	ATEC/Various : Various	2.372	-		-		-		-		-	0.000	2.372	-
Test Range & Aircraft Support	MIPR	CECOM Flight Activity : Lakehurst, NJ	4.268	-		-		-		-		-	0.000	4.268	-
TSP Production Qualification Test #4	MIPR	ATEC/Various : Various	5.121	-		-		-		-		-	0.000	5.121	-
		Subtotal	19.276	-		-		-		-		-	0.000	19.276	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	88.032	1.480		0.000		-		-		-	0.000	89.512	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 0305204A / *Tactical Unmanned Aerial Vehicles*	**Project (Number/Name)** 11B / *Tsp Development (MIP)*

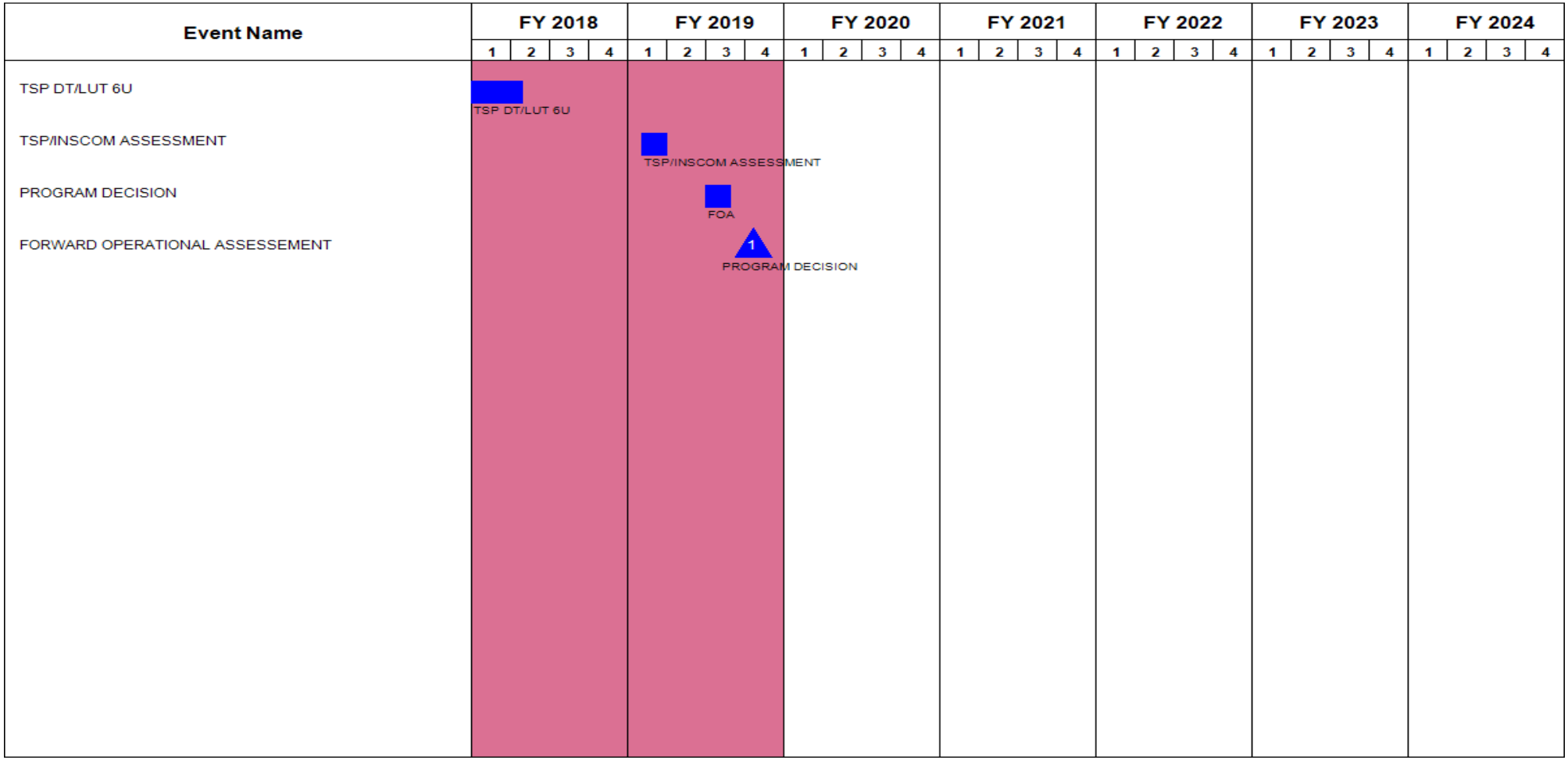

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0305204A / *Tactical Unmanned Aerial Vehicles*	**Project (Number/Name)** 11B / *Tsp Development (MIP)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
TSP DT/LUT 6U	2	2017	1	2018
TSP/INSCOM ASSESSMENT	1	2019	1	2019
PROGRAM DECISION	3	2019	3	2019
FORWARD OPERATIONAL ASSESSEMENT	4	2019	4	2019

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 0305204A / *Tactical Unmanned Aerial Vehicles*	Project (Number/Name) 123 / *Joint Technology Center System Integration*	

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
123: *Joint Technology Center System Integration*	-	4.712	4.748	4.954	-	4.954	4.833	4.327	4.244	4.099	0.000	31.917
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Unmanned Aircraft System (UAS) Joint Technology Center/System Integration Laboratory (JTC/SIL) is a Joint facility that develops, integrates, and supports the enhancement of its Multiple Unified Simulation Environment (MUSE) capability for Army systems and operational concepts. The JTC/SIL conducts prototype hardware and software development, builds the UAS Institutional Mission Simulator (IMS) trainers for the Shadow, Hunter, and Gray Eagle programs, and provides modeling and simulation support. The MUSE is a real-time, operator in-the-loop simulation that may be integrated with larger simulations in support of Army and Joint training exercises. The MUSE is also employed as a Mission Rehearsal Tool for ongoing combat operations. This project funds the management of the JTC/SIL and MUSE enhancements.

This system supports the Legacy to Objective transition path of the Transformation Campaign Plan (TCP).

Continued integration of Night Vision Image Generator (NVIG) into the Modeling & Simulation domain as it pertains to UAS simulation. Terrain, and model development for NVIG and Virtual Reality Scene Generator (VRSG) to increase fidelity. Support of theater level Exercises, Ulchi Freedom Guardian (UFG), Yama Sakura (YS) and Key Resolve (KR). Improvement of mapping capability for mission planning. Redesign of Windows Entity Server (WES) and NetLink to improve network routing, thus lessening bandwidth consumption. Incorporation of Common Image Generator Interface to provide an Image Generator (IG) agnostic solution thereby allowing for other IGs to be supported that are currently not supported. Continued implementation of tactical protocols into the simulation domain to enhance interoperability. Development of a Heads Up Display (HUD) designer application that will allow for the creation and modification of HUDs without having to touch the software baseline thereby reducing costs and increasing fidelity and speed of solution in theater. Redesign of generic 6 Degree of Freedom (DoF) application that will allow for creation of new platforms without touching code; again a reduction in costs and increased solution delivery speed.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Product Development	4.212	4.248	4.354	-	4.354
Description: Funding is provided for the following efforts. ***FY 2019 Plans:*** Continue movement towards standards based solutions, e.g. Common Image Generator Interface (CIGI), which will facilitate optimal interoperability and an IG agnostic framework with which to integrate with various IGs. Continue specific integration of Night Vision Image Generator (NVIG) and Virtual Reality Scene Generator					

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 0305204A / *Tactical Unmanned Aerial Vehicles*	**Project (Number/Name)** 123 / *Joint Technology Center System Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
(VRSG) into the Modeling & Simulation domain as it pertains to UAS simulation, terrain and model development. Continue support of annual/bi-annual theater level Exercises (Ulchi Freedom Guardian (UFG), Yama Sakura (YS) and Key Resolve (KR), Talisman Saber (TS), Pacific Sentry -2 & -3, as well as 5 other Exercises coming online, Integration Events (IEs) and Validation Events (VEs). Continue improvement of mapping capability for mission planning. Continue redesign of Windows Entity Server (WES) and NetLink to improve network routing and large PDU data feeds (i.e. ? 7 million+), thus lessening bandwidth consumption. Continue development of a Heads Up Display (HUD) designer application that will allow for the creation and modification of HUDs without having to touch the software baseline thereby reducing costs and increasing fidelity and speed of solution in theater. Continue implementation of generic 6 Degree of Freedom (DoF) application that will allow for creation of new platforms without modifying code; again a reduction in costs and increased solution delivery velocity. Continue architecture optimization, to facilitate extensibility and scalability, to maintain readiness for growth of M&S requirements coming from the Services. ***FY 2020 Base Plans:*** Will continue movement towards standards based solutions, e.g. Common Image Generator Interface (CIGI), which will facilitate optimal interoperability and an IG agnostic framework with which to integrate with various IGs. Will continue specific integration of Night Vision Image Generator (NVIG) and Virtual Reality Scene Generator (VRSG) into the Modeling & Simulation domain as it pertains to UAS simulation, terrain and model development. Will continue support of annual/bi-annual theater level Exercises (Ulchi Freedom Guardian (UFG), Yama Sakura (YS) and Key Resolve (KR), Talisman Saber (TS), Pacific Sentry -2 & -3, as well as 5 other Exercises coming online, Integration Events (IEs) and Validation Events (VEs). Will continue improvement of mapping capability for mission planning. Will continue redesign of Windows Entity Server (WES) and NetLink to improve network routing and large PDU data feeds (i.e. ? 7 million+), thus lessening bandwidth consumption. Will continue development of a Heads Up Display (HUD) designer application that will allow for the creation and modification of HUDs without having to touch the software baseline thereby reducing costs and increasing fidelity and speed of solution in theater. Will continue implementation of generic 6 Degree of Freedom (DoF) application that will allow for creation of new platforms without modifying code; again a reduction in costs and increased solution delivery velocity. Will continue architecture optimization, to facilitate extensibility and scalability, to maintain readiness for growth of M&S requirements coming from the Services. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** $106K increase for contract MUSE development support.					
Title: Management Services	0.500	0.500	0.600	-	0.600

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 0305204A / *Tactical Unmanned Aerial Vehicles*	**Project (Number/Name)** 123 / *Joint Technology Center System Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: Funding is provided for the following efforts. ***FY 2019 Plans:*** Continue coordination and oversight of MUSE product development. ***FY 2020 Base Plans:*** Will continue coordination and oversight of MUSE product development. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** $100k increase for contract MUSE development support.					
Accomplishments/Planned Programs Subtotals	4.712	4.748	4.954	-	4.954

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
• PE 0305206F Air Force: *PE 0305206F Air Force*	3.429	3.480	3.548	-	3.548	3.607	3.680	3.746	-	Continuing	Continuing

Remarks

The JTC/SIL and the MUSE receive funding from the Air Force, PE 0305206F. This effort is a continuing effort in support of Service UAS programs.

D. Acquisition Strategy

The acquisition strategy is to continue MUSE development which will be accomplished through a combination of Government in-house functional directorate support using a variety of existing contract vehicles.

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 0305204A / *Tactical Unmanned Aerial Vehicles*	Project (Number/Name) 123 / *Joint Technology Center System Integration*	

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
Program Management	MIPR	AMC, AMCOM, AMRDEC, SED : Redstone Arsenal, AL	3.019	0.500		0.520		0.600		-		0.600	Continuing	Continuing	Continuing
		Subtotal	3.019	0.500		0.520		0.600		-		0.600	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
MUSE Development	MIPR	AMC, AMCOM, AMRDEC, SED : Redstone Arsenal, AL	17.059	4.212		4.228		4.354		-		4.354	Continuing	Continuing	Continuing
		Subtotal	17.059	4.212		4.228		4.354		-		4.354	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
Interoperability Support	MIPR	AMC, RDECOM, AMRDEC : Redstone Arsenal, AL	9.460	-		-		-		-		-	0.000	9.460	-
		Subtotal	9.460	-		-		-		-		-	0.000	9.460	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	29.538	4.712		4.748		4.954		-		4.954	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 0305204A / *Tactical Unmanned Aerial Vehicles*	**Project (Number/Name)** 123 / *Joint Technology Center System Integration*

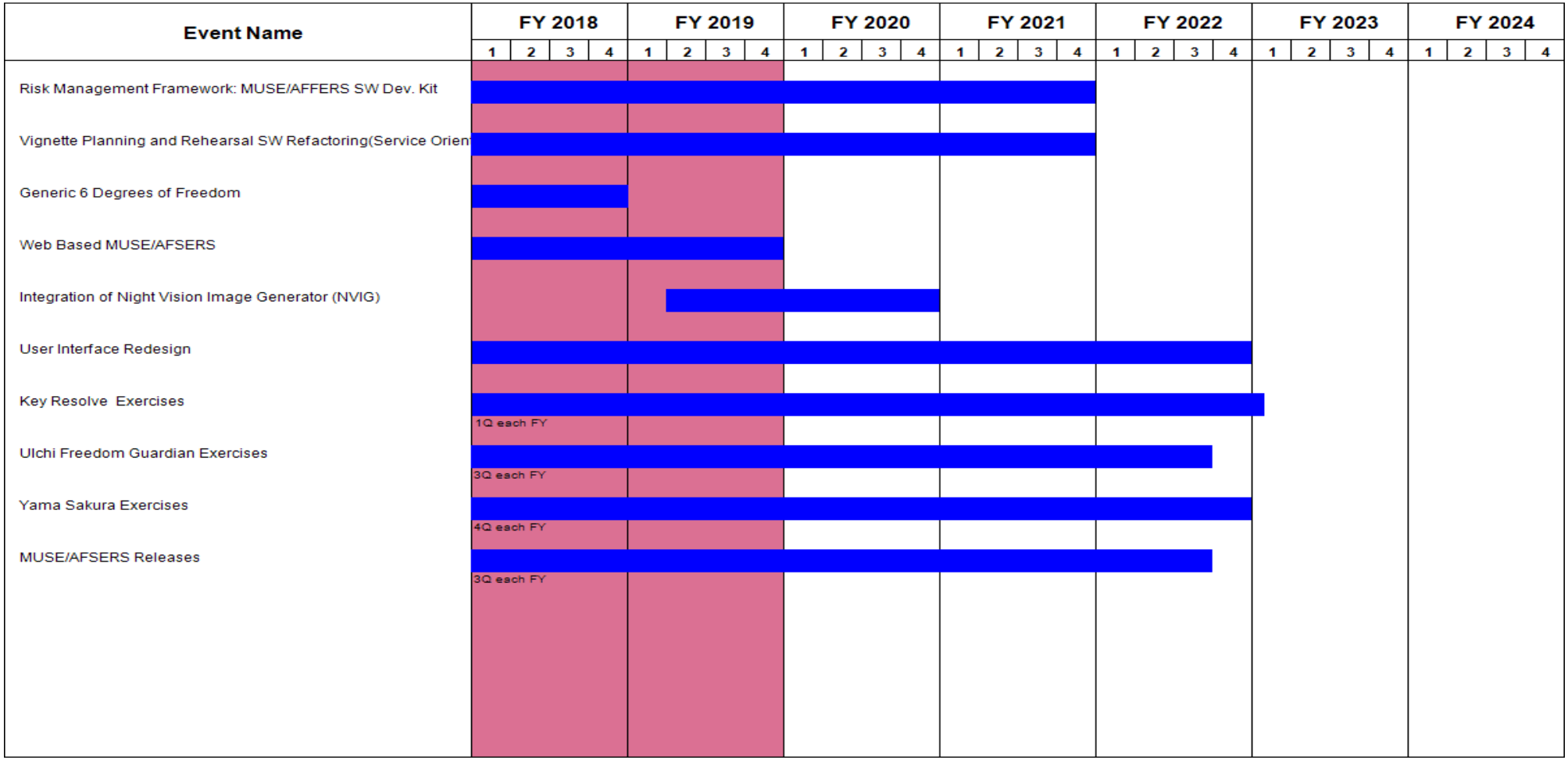

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0305204A / *Tactical Unmanned Aerial Vehicles*	**Project (Number/Name)** 123 / *Joint Technology Center System Integration*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Windows Entity Server and NetLink Redesign	1	2015	3	2016
Risk Management Framework: MUSE/AFFERS SW Dev. Kit	3	2015	4	2021
Vignette Planning and Rehearsal SW Refactoring(Service Oriented Architecture)	2	2015	4	2021
Incorporate Command and Control Using STANAG 4586	1	2016	3	2017
Generic 6 Degrees of Freedom	1	2017	4	2018
Web Based MUSE/AFSERS	1	2018	4	2019
Integration of Night Vision Image Generator (NVIG)	2	2019	4	2020
User Interface Redesign	1	2015	4	2022
Key Resolve Exercises	1	2015	1	2023
Ulchi Freedom Guardian Exercises	3	2015	3	2022
Yama Sakura Exercises	4	2015	4	2022
MUSE/AFSERS Releases	3	2015	3	2022