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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0305204A / <i>Tactical Unmanned Aerial Vehicles</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	6.000	22.147	4.051	34.100	38.151	4.323	4.240	4.095	0.000	0.000	78.956
11A: <i>Advanced Payload Develop & Spt (MIP)</i>	-	1.252	17.193	0.146	34.100	34.246	0.000	0.000	0.000	0.000	0.000	52.691
123: <i>Joint Technology Center System Integration</i>	-	4.748	4.954	3.905	-	3.905	4.323	4.240	4.095	0.000	0.000	26.265

A. Mission Description and Budget Item Justification

Project 11A Advanced Payload Develop & Spt (MIP): 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.

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 Target Location Accuracy (TLA) and Tactical Awareness Improvement (TAI) capabilities that directly support emerging requirements of the Army's Current and Future Force.

Small TActical Radar - Lightweight (STARLite) provides the Gray Eagle UAS with multi-functional SAR/MTI and Electro-Optic/Infrared (EO/IR) cross-cueing capabilities for the detection, classification and location of stationary and moving vehicle and man-sized targets.

Project 11B: Tactical Signals Intelligence (SIGINT) Payload (TSP) provides the Gray Eagle UAS with radio frequency (RF) emitter detection, recognition, and geo-location capabilities.

Project 123 Joint Technology Center System Integration: 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).

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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0305204A / <i>Tactical Unmanned Aerial Vehicles</i>
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B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	6.000	39.197	39.079	-	39.079
Current President's Budget	6.000	22.147	4.051	34.100	38.151
Total Adjustments	0.000	-17.050	-35.028	34.100	-0.928
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-17.050			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-35.028	34.100	-0.928

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army										Date: February 2020		
Appropriation/Budget Activity 2040 / 7					R-1 Program Element (Number/Name) PE 0305204A / <i>Tactical Unmanned Aerial Vehicles</i>				Project (Number/Name) 11A / <i>Advanced Payload Develop & Spt (MIP)</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
11A: <i>Advanced Payload Develop & Spt (MIP)</i>	-	1.252	17.193	0.146	34.100	34.246	0.000	0.000	0.000	0.000	0.000	52.691
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.

Common Sensor Payload (CSP) - Acquisition Category (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. Fiscal Year (FY) 2021 base dollars in the amount of \$0.146 million and Overseas Contingency Operations (OCO) dollars in the amount of \$34.1 million 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.

Small Tactical Radar - Lightweight (STARLite) provides Gray Eagle UAS multi-functional SAR/MTI and EO/IR cross-cueing capabilities for the detection, classification and location of stationary and moving vehicle and man-sized targets.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: STARLite Sensor Processing and Exploitation (SPE)	0.626	-	-	-	-
Description: Software Development to improve STARLite SPE Development, Testing and Integration.					
Title: CSP Increased Usability and Lethality	0.626	17.193	0.146	34.100	34.246
Description: Software and Hardware developments to increase lethality and usability of the CSP while reducing cognitive burden on the Warfighter.					

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
<p>FY 2020 Plans: Continued TLA development</p> <p>FY 2021 Base Plans: Will continue Night Vision Electronic Sensor Division Lab support for continued technological support to the CSP program.</p> <p>FY 2021 OCO Plans: Will complete TLA developmental and operational testing. Will begin TAI design efforts.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increases Base funding from \$0.143 million to \$0.146 million to adjust for inflation.</p>					
Accomplishments/Planned Programs Subtotals	1.252	17.193	0.146	34.100	34.246

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• A01005: <i>CSP FMV (MIP)</i>	-	-	0.000	5.968	5.968	-	-	-	-	0.000	5.968

Remarks
Funds in the MQ-1 PAYLOAD - UAS - A00020 Aircraft Procurement, Army (APA) funding line were realigned beginning in FY 2015 into a new shared parent, MQ-1 Payloads (MIP) (SSN A01001). The MQ-1 Payloads (MIP) (SSN A01001) includes the MQ-1 sensor payloads: Synthetic Aperture Radar/Moving Target Indicator (SAR/MTI) (SSN A01003), Signals Intelligence (SIGINT) (SSN A01004), and Common Sensor Payload Full Motion Video (CSP FMV) (A01005).

D. Acquisition Strategy
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 Research Development Technology & Evaluation (RDT&E) activities. The Enhanced EO/IR Capability Production Document, approved 19 December 2016, defines additional KPP requirements for FMV sensors. The first KPP increases detection, recognition, and identification requirements which can only be met with the 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 TLA. A five (5) year follow-on production and system support contract was awarded in 2019 for integration, test, upgrade, and sustainment of these enhanced capabilities. The FY 2021

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acquisition strategy for CSP includes the continuation of developmental and operational testing supporting CSP-TLA requirements and the maturation of hardware and software product improvements and prototype development supporting CSP-TAI requirements.

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. 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. STARLite updated its software capabilities based on Initial Operational Test and Evaluation (IOT&E) results. This software update maximized user efficiency through automation of common tasks and upgraded 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 simplified user interface, reduced operator workload, and enhanced operator effectiveness. A competitive RDT&E funded contract was awarded to Northrop Grumman in October 2013 to perform trade studies and began the development of the software improvements. Integration onto the Gray Eagle was done via a sole source cost-plus fixed fee contract with the UAS prime contractor, General Atomics ASI.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0305204A / <i>Tactical Unmanned Aerial Vehicles</i>	Project (Number/Name) 11A / <i>Advanced Payload Develop & Spt (MIP)</i>
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Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
CSP Program Management	MIPR	PM EOIR : Fort Belvoir, VA	0.822	0.100	Dec 2018	2.217	Dec 2018	0.000		2.261	Dec 2020	2.261	Continuing	Continuing	Continuing
STARLite Program Management	Various	PM SAI : Aberdeen, MD	1.767	0.626	Feb 2019	-		-		-		-	0.000	2.393	-
Subtotal			2.589	0.726		2.217		0.000		2.261		2.261	Continuing	Continuing	N/A

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
CSP Development	C/CPFF	Raytheon : McKinney, TX	84.022	-		-		-		-		-	0.000	84.022	-
STARLite Sensor CE Development	SS/CPFF	General Atomics ASI : Poway, CA	2.298	-		-		-		-		-	0.000	2.298	-
CSP HW/SW Improvements Reduce Cognitive Burden	MIPR	Night Vision Labs : Fort Belvoir, VA	4.021	0.426	Mar 2019	-		0.146	Dec 2020	-		0.146	Continuing	Continuing	Continuing
CSP Target Location Accuracy (TLA)	SS/CPFF	Raytheon : McKinney, TX	6.187	-		8.919		0.000		4.718	Dec 2020	4.718	Continuing	Continuing	Continuing
CSP Tactical Awareness Improvement (TAI)	SS/CPFF	Raytheon : McKinney, TX	-	-		-		0.000		11.335	Dec 2020	11.335	Continuing	Continuing	Continuing
CSP TLA Integration	MIPR	Various : Various	-	-		3.755		0.000		1.021	Dec 2020	1.021	Continuing	Continuing	Continuing
CSP TAI Integration	MIPR	Various : Various	-	-		-		0.000		2.292	Dec 2020	2.292	Continuing	Continuing	Continuing
Subtotal			96.528	0.426		12.674		0.146		19.366		19.512	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 7				PE 0305204A / Tactical Unmanned Aerial Vehicles				11A / Advanced Payload Develop & Spt (MIP)							
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
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)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
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	0.511	0.100	Mar 2019	-		-		-		-	Continuing	Continuing	Continuing
STARLite YTC Software Development Testing	MIPR	YPG : Yuma Proving Ground	0.910	-		-		-		-		-	0.000	0.910	4.498
STARLite IGE Testing	MIPR	Various : Various	13.441	-		-		-		-		-	0.000	13.441	-
CSP Testing (TLA)	MIPR	Various : Various	-	-		1.732		0.000		6.195	Dec 2020	6.195	Continuing	Continuing	Continuing
CSP Testing (TLA)	SS/CPFF	Raytheon : McKinney, TX	-	-		0.570		0.000		4.450	Dec 2020	4.450	Continuing	Continuing	Continuing
CSP Testing (TAI)	MIPR	Various : Various	-	-		-		0.000		0.914	Dec 2020	0.914	Continuing	Continuing	Continuing
CSP Testing (TAI)	SS/CPFF	Raytheon : McKinney, TX	-	-		-		0.000		0.914	Dec 2020	0.914	Continuing	Continuing	Continuing
Subtotal			31.948	0.100		2.302		0.000		12.473		12.473	Continuing	Continuing	N/A
Project Cost Totals			131.846	1.252		17.193		0.146		34.100		34.246	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0305204A / <i>Tactical Unmanned Aerial Vehicles</i>	Project (Number/Name) 11A / <i>Advanced Payload Develop & Spt (MIP)</i>

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
CSP HD (EO/IR/LD) Production	[Bar]				[Bar]																							
CSP HD Retrofit (Proc)	[Bar]				[Bar]																							
CSP HW/SW Improvements Reduce Cognitive Burden Develop	[Bar]				[Bar]																							
CSP HW/SW Improvements Reduce Cognitive Burden Testing /	[Bar]				[Bar]																							
CSP TLA Development	[Bar]				[Bar]																							
CSP TLA PDR/CDR								[Bar]																				
CSP TLA Test Readiness Review								[Bar]																				
CSP TLA DT/OT												[Bar]																
CSP TLA Production Readiness Review																[Bar]												
CSP TLA Retrofit (Proc)																[Bar]												
CSP TLA NGA Validation																[Bar]												
CSP TAI Development Decision												[Bar]																
CSP TAI Development																[Bar]												

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0305204A / <i>Tactical Unmanned Aerial Vehicles</i>	Project (Number/Name) 11A / <i>Advanced Payload Develop & Spt (MIP)</i>

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
CSP TAI PDR																												
CSP TAI CDR																												
CSP TAI Test Readiness Review																												
CSP TAI DT/OT																												
CSP Production Readiness Review																												
CSP TAI Retrofit (Proc)																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0305204A / <i>Tactical Unmanned Aerial Vehicles</i>	Project (Number/Name) 11A / <i>Advanced Payload Develop & Spt (MIP)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
CSP HD (EO/IR/LD) Production	2	2013	2	2020
CSP HD Retrofit (Proc)	4	2013	3	2020
CSP HW/SW Improvements Reduce Cognitive Burden Development	1	2016	4	2021
CSP HW/SW Improvements Reduce Cognitive Burden Testing / Integration	3	2017	4	2020
CSP TLA Development	4	2018	4	2021
CSP TLA PDR/CDR	1	2020	1	2020
CSP TLA Test Readiness Review	2	2020	2	2020
CSP TLA DT/OT	2	2021	4	2021
CSP TLA Production Readiness Review	1	2022	1	2022
CSP TLA Retrofit (Proc)	1	2022	3	2026
CSP TLA NGA Validation	4	2021	2	2022
CSP TAI Development Decision	4	2020	4	2020
CSP TAI Development	1	2021	3	2023
CSP TAI PDR	4	2021	4	2021
CSP TAI CDR	2	2022	2	2022
CSP TAI Test Readiness Review	4	2022	4	2022
CSP TAI DT/OT	4	2022	3	2023
CSP Production Readiness Review	4	2023	4	2023
CSP TAI Retrofit (Proc)	4	2023	4	2027

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Appropriation/Budget Activity 2040 / 7					R-1 Program Element (Number/Name) PE 0305204A / <i>Tactical Unmanned Aerial Vehicles</i>				Project (Number/Name) 123 / <i>Joint Technology Center System Integration</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
123: <i>Joint Technology Center System Integration</i>	-	4.748	4.954	3.905	-	3.905	4.323	4.240	4.095	0.000	0.000	26.265
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Joint Technology Center/Systems Integration Laboratory (JTC/SIL) is a Joint facility that supports UAS and RPA programs within the Joint Services by providing the system engineering, test and integration, interoperability, rapid technology insertion and develops training capability to include the MUSE/AFSERS system. This project funds the management of the JTC/SIL and MUSE/AFSERS Enhancements

The Multiple Unified Simulation Environment (MUSE) is the DoD simulation/training system for Unmanned Aircraft Systems (UAS), RPA, and ISR systems. MUSE is also known as the Air Force Synthetic Environment for Reconnaissance and Surveillance (AFSERS) in its Air Force Application. The MUSE/AFSERS is a software suite that simulates ISR & strike systems, tailored air vehicle & data links, and visualization systems used for payload product outputs-including Full Motion Video (FMV), Fixed Frame Imagery (FFI), Ground Moving Target Indicator (GMTI) data, and Link 16 (J2.2 and J3.5) tracking messages. Outputs are compliant with applicable DoD standards and are continually tested against actual ground ISR processors to ensure interoperability with over 40 systems within DoD.

The MUSE/AFSERS creates a realistic operational environment which supports the ability to assess military utility, architecture and concept of employment development, Tactics, Techniques, and Procedures (TTP) refinement, practice Processing, Exploitation, and Dissemination (PED) of intelligence information, conduct emerging concepts experimentation, and optimize tactical operations within warfighting exercises and experiments. MUSE/AFSERS is currently in use across Services and most unified commands simulating MQ-1, MQ-9, RQ-4, MQ-1C, M/RQ-5, RQ-7, national and commercial satellite collectors, P-3, E-8, and the U-2. During warfighting exercises, the MUSE/AFSERS provides National Imagery Transmission Format (NITF) images for associated C4ISR systems to support the execution of PED. The MUSE/AFSERS is also used as a mission rehearsal tool for current, on-going military combat operations. Most of the components of the MUSE/AFSERS software suite are also used in multiple UAS RPA system training devices including those for the RQ-7 [Shadow], MQ-1C [Gray Eagle], M/RQ-5 [Hunter], MQ-9 [Medium Altitude Long Endurance Tactical (MALET) JSIL Aircrew Trainer (MJAT)] and RQ-4 [Global Hawk Sensor Operator Part Task Trainer (GHSOPTT) and Global Hawk Weapon System Trainer (WST)].

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

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Product Development	4.228	4.354	3.455	-	3.455
Description: Funding is provided for the following efforts planned each Fiscal Year (FY).					

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B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
<p><i>FY 2020 Plans:</i></p> <ul style="list-style-type: none"> - Continued development and release of MUSE/AFSERS RPA and ISR simulation capability supporting theater level exercises such as Dong Maeng (formerly Ulchi Freedom Guardian and Key Resolve), Yama Sakura, Talisman Saber, Pacific Sentry, Austere Challenge, and associated events. - Continued incorporation of mandated Cyber Security updates. - Developed higher fidelity in the Moving Target Indicator payload model into MUSE/AFSERS - Developed and integrated multi-sensor full motion video (FMV) payload simulations to support training missions - Completed the redesign of Connect and Netlink routing software to improve network routing and large data feeds, be web browser accessible, and incorporated the use of Windows Active Directory authentication. - Continued the re-architecture of Vignette Planning & Rehearsal Software (ViPRS) capability. - Continued software architecture optimization and modularization, to facilitate extensibility and scalability. - Extended current Link 16 simulation capabilities to include surface tracks (J3.3). - Conducted an image generator trade study to determine the best image generator to meet USAF training requirements of the future, to include investigating the use of "Gaming Engine" based Image Generation capability such as Unreal4. - Begun development the simulated GPS jamming effects on aircraft systems. - Continued improvement of Moving Target Indicator/Synthetic Aperture Radar payload models into MUSE/AFSERS - Continued integration testing with designated federations (ASCCE, JLVC, JLCCTC) ensuring joint interoperability with services and JS/J7 capabilities. -Development and Integration of Air Launched Effects (ALE) Simulation <p><i>FY 2021 Base Plans:</i></p> <ul style="list-style-type: none"> - Continue development and release of MUSE/AFSERS RPA and ISR simulation capability supporting theater level exercises such as Dong Maeng (formerly Ulchi Freedom Guardian and Key Resolve), Yama Sakura, Talisman Saber, Pacific Sentry, Austere Challenge, and associated events. - Continue incorporation of mandated Cyber Security updates. - Complete the re-architecture of Vignette Planning & Rehearsal Software (ViPRS) capability to include transitioning it to be web browser accessible, developing an after action report (AAR) capability, and more realistic attrition. - Continue architecture software optimization and modularization to facilitate extensibility and scalability. -Begin prototype development of an improved image generator based upon the results of the image generator trade study conducted during FY20. 					

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0305204A / <i>Tactical Unmanned Aerial Vehicles</i>	Project (Number/Name) 123 / <i>Joint Technology Center System Integration</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
- Fully integrate the high fidelity SAR model into the MUSE/AFSERS baseline which provides realistic SAR imagery based upon material encoded terrain. - Fully integrate MTI/SAR sensor cross-cuing capability in MUSE/AFSERS. - Develop and integrate low-cost, fixed-wing support to UAS/RPA operations. - Integrate a Vehicle and Dismount Exploitation Radar (VADER) sensor model in MUSE/AFSERS. - Begin development of the Long Range Radar (LRR) sensor MUSE/AFSERS model. - Development and Integration of Air Launched Effects (ALE) Simulation - Develop IFF Modes 4, 5, & S in MUSE/AFSERS. - Continue integration testing with designated federations (ASCCE, JLVC, JLCCTC) ensuring joint interoperability with services and JS/J7 capabilities. FY 2020 to FY 2021 Increase/Decrease Statement: Increase of \$328 from FY 2020 to FY 2021.					
Title: Management Services Description: Funding is provided for the following efforts. FY 2020 Plans: Continued coordination and oversight of MUSE product development. FY 2021 Base Plans: Continue coordination and oversight of MUSE product development. FY 2020 to FY 2021 Increase/Decrease Statement: \$150K decrease in Program Management funds from FY 2020 to FY 2021	0.520	0.600	0.450	-	0.450
Accomplishments/Planned Programs Subtotals	4.748	4.954	3.905	-	3.905

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• PE 0305206F Air Force: PE 0305206F Air Force	3.480	3.548	3.607	-	3.607	3.680	3.746	-	-	Continuing	Continuing
Remarks	The JTC/SIL and the MUSE receive funding from the Air Force, Program Element (PE) 0305206F. This effort is a continuing effort in support of Service UAS programs.										

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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.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 7				PE 0305204A / Tactical Unmanned Aerial Vehicles				123 / Joint Technology Center System Integration							
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	MIPR	AMC, AMCOM, AMRDEC, SED : Redstone Arsenal, AL	3.519	0.520	Oct 2019	0.600		0.450	Oct 2020	-		0.450	Continuing	Continuing	Continuing
Subtotal			3.519	0.520		0.600		0.450		-		0.450	Continuing	Continuing	N/A
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
MUSE Development	MIPR	AMC, AMCOM, AMRDEC, SED : Redstone Arsenal, AL	21.271	4.228	Dec 2019	4.354		3.455		-		3.455	Continuing	Continuing	Continuing
Subtotal			21.271	4.228		4.354		3.455		-		3.455	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Interoperability Support	MIPR	AMC, RDECOM, AMRDEC : Redstone Arsenal, AL	9.460	-		-		-		-		-	0.000	9.460	-
Subtotal			9.460	-		-		-		-		-	0.000	9.460	N/A
Project Cost Totals			34.250	4.748		4.954		3.905		-		3.905	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0305204A / <i>Tactical Unmanned Aerial Vehicles</i>	Project (Number/Name) 123 / <i>Joint Technology Center System Integration</i>

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Risk Management Framework: MUSE/AFFERS SW Dev. Kit	[Redacted]																											
Vignette Planning and Rehearsal SW Refactoring(Service Oriented)	[Redacted]																											
Web Based MUSE/AFSERS	[Redacted]																											
Integration of Night Vision Image Generator (NVIG)	[Redacted]																											
User Interface Redesign	[Redacted]																											
MUSE/AFSERS Releases	[Redacted]																											
Advanced Payload Simulation	[Redacted]																											
Gaming Engine Integration	[Redacted]																											

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0305204A / <i>Tactical Unmanned Aerial Vehicles</i>	Project (Number/Name) 123 / <i>Joint Technology Center System Integration</i>

Schedule Details

Events	Start		End	
	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	2025
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
MUSE/AFSERS Releases	3	2015	4	2025
Advanced Payload Simulation	1	2021	4	2025
Gamming Engine Integration	1	2022	4	2023