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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Army **Date:** May 2021

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 7: Operational Systems Development	R-1 Program Element (Number/Name) PE 0203744A / Aircraft Modifications/Product Improvement Programs
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COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	8.896	11.261	-	-	-	-	-	-	-	-	-
EB6: MQ-1C Gray Eagle MODS	-	8.896	11.261	-	-	-	-	-	-	-	-	-

Note

Based on the fielding of the Gray Eagle ER ending in FY23 initial transition to sustainment will begin in FY23. Unfunded request is in place for FY22 for GPS - Denied Threat Response, Beamforming, Anti-Jam, M-Code navigators and alternate payload integration efforts on Gray Eagle MODS. There is no RDTE funding for RDTE requirements beyond FY21.

A. Mission Description and Budget Item Justification

The MQ-1C Gray Eagle provides the Army with an extended range, multi-purpose (ERMP) Unmanned Aircraft System (UAS); capable of executing reconnaissance, security, attack, and intelligence collection missions in the range of military operations (ROMO). Sensors/payloads include an Electro-Optical/Infrared/Laser Designator (EO/IR/LD), Synthetic Aperture Radar/Moving Target Indicator (SAR/MTI), Signals Intelligence (SIGINT), and HELLFIRE missiles; providing a near all-weather mission capability. MQ-1C Gray Eagle is a dedicated, assured, multi-mission UAS fielded to all Army Divisions, Intelligence and Security Command and Army Special Operations Command in support of the commander's warfighting priorities within multi-domain battle operations.

Currently MQ-1C Gray Eagle high fuel efficiency engines are undergoing a propulsion reliability effort which will reduce MQ-1C Gray Eagle Return to Base events and decrease the likelihood of engine related aircraft mishaps. This modernization effort will increase operational readiness and posture Gray Eagle to support multi-domain.

B. Program Change Summary (\$ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	9.278	11.688	0.000	-	0.000
Current President's Budget	8.896	11.261	0.000	-	0.000
Total Adjustments	-0.382	-0.427	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.382	-0.427			

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Exhibit R-2A, RDT&E Project Justification: PB 2022 Army **Date:** May 2021

Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0203744A / Aircraft Modifications/Product Improvement Programs	Project (Number/Name) EB6 / MQ-1C Gray Eagle MODS
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COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
EB6: MQ-1C Gray Eagle MODS	-	8.896	11.261	-	-	-	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

Note

Based on the fielding of the Gray Eagle ER ending in FY23 initial transition to sustainment will begin in FY23. Unfunded request is in place for FY22 for GPS - Denied Threat Response, Beamforming, Anti-Jam, M-Code navigators and alternate payload integration efforts on Gray Eagle MODS. FY21 funds will be used for Heavy Fuel Engine (HFE) 2.0 development efforts. HFE 2.0 is an engine development effort to replace our current engine that is obsolete and going out of production.

A. Mission Description and Budget Item Justification

The MQ-1C Gray Eagle provides the Army with an extended range, multi-purpose (ERMP) Unmanned Aircraft System (UAS); capable of executing reconnaissance, security, attack, and intelligence collection missions in the range of military operations (ROMO). Sensors/payloads include an Electro-Optical/Infrared/Laser Designator (EO/IR/LD), Synthetic Aperture Radar/Moving Target Indicator (SAR/MTI), Signals Intelligence (SIGINT), and HELLFIRE missiles; providing a near all-weather mission capability. MQ-1C Gray Eagle is a dedicated, assured, multi-mission UAS fielded to all Army Divisions, Intelligence and Security Command and Army Special Operations Command in support of the commander's warfighting priorities within multi-domain battle operations.

Currently the MQ-1C Gray Eagle high fuel efficiency engine is undergoing a propulsion reliability effort, which will reduce MQ-1C Gray Eagle Return to Base events and decrease the likelihood of engine related aircraft mishaps. Additionally, this effort will increase operational readiness for the Operational Commander.

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

	FY 2020	FY 2021	FY 2022
Title: Global Positioning System (GPS) Denied Description: GPS Denied	1.307	-	-
Title: Alternate Munitions Integration Description: Alternate Munitions Integration	0.211	-	-
Title: Propulsion Reliability Description: Propulsion Reliability improvements address material failures and Return to Base (RTBs) events experienced with the existing fielded MQ-1C engine. Contract efforts will address current engine component obsolescence and supply concerns. The initial contract supports engine qualification planning and execution of component, subsystem and system level testing/analyses, critical to ensure development of a reliable replacement engine. FY 2021 Plans:	6.492	11.261	-

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2020	FY 2021	FY 2022
This funding supports engine development efforts and qualification testing to mitigate engine obsolescence and to increase operational readiness.			
<i>FY 2021 to FY 2022 Increase/Decrease Statement:</i> Fund development of the upgrade of current Gray Eagle (GE) Heavy Fuel Engine (HFE), (current engine OEM no longer manufacturing engine core), designed for High Reliability and Long Life (1800 to 2500 hours) with improvements over existing engine (gear drive vs. belt drive, gearbox, turbocharger, etc.). Drop-in replacement for GE and GE-Extended Range. The decrease in resources from FY2021 to FY2022 are a result of FY22 funds no longer required due to receiving the necessary support in FY21 to support Heavy Fuel Engine (HFE) 2.0 development efforts. Assuming there are no rework or additional upgrade requirements, development efforts are expected to be completed by the end of FY22.			
Title: GETS Program Management Support	0.886	-	-
Accomplishments/Planned Programs Subtotals	8.896	11.261	-

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u> <u>Base</u>	<u>FY 2022</u> <u>OCO</u>	<u>FY 2022</u> <u>Total</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• A00005: MQ-1 UAV	144.000	110.000	-	-	-	-	-	-	-	-	-
• AA6601: Gray Eagle Mods2	14.699	30.280	3.143	-	3.143	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

An ERMP Operational Requirement Document (ORD) was approved by the Joint Requirement Oversight Council (JROC) 6 Apr 2005. Milestone B occurred on 20 Apr 2005, and the System Development and Demonstration contract was awarded 8 Aug 2005, as a result of a competitive solicitation which included a vendor system capabilities demonstration. A Capabilities Production Document (CPD) was approved 14 Mar 2009. MQ-1C Gray Eagle completed Follow-On Test and Evaluation (FOTE) on 12 Jun 2015.

This RDTE element funds a propulsion reliability improvement with the development of the Heavy Fuel Engine (HFE) 2.0 engine system. The current MQ-1C aircraft engine has experienced material failures that have resulted in aircraft mishaps (loss of aircraft) and a high number lost flight hours due to Return to Base (RTB) events. HFE 2.0 implements aviation grade components and focused reliability improvements that will address previous material failures and RTB drivers. Additionally, the Army was notified by the original equipment manufacturer (OEM) that the current engine core is obsolete and the current manufacture will no longer supply the engine core. HFE 2.0 also resolves this obsolescence/supply issue. In 2018, the Army issued an RFI to industry to assess the state of engine technology and availability of a COTS/ NDI engine solution that could meet MQ-1C capability needs and requirements. The primary goal of the RFI was to establish an alternative engine for MQ-1C that is reliable and could be integrated and qualified in a two year timeframe to resolve critical reliability and supply issues with the current engine. Upon completion of the RFI

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Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0203744A / Aircraft Modifications/Product Improvement Programs	Project (Number/Name) EB6 / MQ-1C Gray Eagle MODS

evaluations, HFE 2.0 engine systems will be procured under the PBL contract and fielded through attrition. As a result of the Army's RFI and Industry day event, it was determined that the HFE 2.0 was the only engine to meet requirements for an alternative MQ-1C engine. Funded RDTE elements will support completion of integration, test, and qualification of the HFE 2.0 engine system on the MQ-1C aircraft. This effort will secure engine supply and result in greater propulsion system reliability and increased operational readiness to the commander in the field. Funds are planned for award on the Gray Eagle Technical Services contract as a Technical Services Memorandum (TSM) task order, and as a Military Interdepartmental Purchase Requisitions (MIPRs) to various other Government agencies. Upon completion of qualification, HFE 2.0 engine systems will be procured under the PBL contract and fielded through attrition.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Army												Date: May 2021			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 7				PE 0203744A / Aircraft Modifications/Product Improvement Programs				EB6 / MQ-1C Gray Eagle MODS							
Management Services (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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
FY2019 Reprogramming Action	TBD	PEO M&S : Redstone Arsenal	3.000	-		-		-		-		-	0.000	3.000	-
Subtotal			3.000	-		-		-		-		-	0.000	3.000	N/A
Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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
Global Positioning System (GPS) Denied	SS/CPFF	General Atomics/ ASI : San Diego, CA	10.461	1.307	Jan 2020	-		-		-		-	Continuing	Continuing	-
Universal Ground Control Station (UGCS) Improvements	SS/CPFF	General Atomics/ ASI : San Diego, CA	15.279	-		-		-		-		-	Continuing	Continuing	-
Alternate Munitions Integration	SS/CPFF	General Atomics-ASI : Poway, CA	19.088	0.211	Jan 2020	-		-		-		-	0.000	19.299	-
Ground Base Sense and Avoid Block II	SS/CPFF	Various : Various	25.362	-		-		-		-		-	0.000	25.362	-
Survivability	MIPR	Various : Various	0.148	-		-		-		-		-	Continuing	Continuing	-
Propulsion Reliability	SS/CPFF	General Atomics/ ASI : San Diego, CA	-	6.492	Mar 2020	8.773	Mar 2021	-		-		-	Continuing	Continuing	-
GETS Program Management	TBD	General Atomics/ ASI : San Diego, CA	-	0.886	Nov 2019	-		-		-		-	Continuing	Continuing	-
Subtotal			70.338	8.896		8.773		-		-		-	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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
Engineering Support - GBSAA	MIPR	Various : Various	2.163	-		-		-		-		-	0.000	2.163	-
Subtotal			2.163	-		-		-		-		-	0.000	2.163	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0203744A / Aircraft Modifications/Product Improvement Programs	Project (Number/Name) EB6 / MQ-1C Gray Eagle MODS

Event Name	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	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
Alternate Munitions Integration	[Redacted]				[Redacted]																							
Global Positioning System Denied	[Redacted]				[Redacted]																							
Engineering and Software Development - MQ-1 Gray Eagle	[Redacted]				[Redacted]																							
Training Development and Software/System Testing - MQ-1 Gray Eagle	[Redacted]				[Redacted]																							
Survivability	[Redacted]				[Redacted]																							
Propulsion Reliability	[Redacted]				[Redacted]				[Redacted]																			

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Army		Date: May 2021
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Alternate Munitions Integration	2	2017	4	2020
Global Positioning System Denied	2	2017	4	2020
Engineering and Software Development - MQ-1 Gray Eagle	2	2017	4	2020
Training Development and Software/System Testing - MQ-1 Gray Eagle	3	2017	4	2020
Survivability	2	2018	4	2020
Propulsion Reliability	2	2020	2	2022