Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army											Date: April 2022	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 0203744A *I Aircraft Modifications/Product Improvement Programs*							
COST ($ in Millions)	**Prior Years**	**FY 2021**	**FY 2022**	**FY 2023 Base**	**FY 2023 OCO**	**FY 2023 Total**	**FY 2024**	**FY 2025**	**FY 2026**	**FY 2027**	**Cost To Complete**	**Total Cost**
Total Program Element	-	11.261	10.000	-	-	-	0.000	0.000	0.000	0.000	Continuing	Continuing
EB6: *MQ-1C Gray Eagle MODS*	-	11.261	10.000	-	-	-	-	-	-	-	Continuing	Continuing

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.

The Ground Based Sense And Avoid (GBSAA) System provides an alternative means of compliance with FAR Part 91.113 requirement for an aircraft to "see and avoid" other aircraft while in the National Airspace System. This capability enhances the warfighter's ability to train with the Gray Eagle at CONUS fielding locations.

B. Program Change Summary ($ in Millions)	**FY 2021**	**FY 2022**	**FY 2023 Base**	**FY 2023 OCO**	**FY 2023 Total**
Previous President's Budget	11.261	0.000	0.000	-	0.000
Current President's Budget	11.261	10.000	0.000	-	0.000
Total Adjustments	0.000	10.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	10.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			

Congressional Add Details ($ in Millions, and Includes General Reductions)	**FY 2021**	**FY 2022**
Project: EB6: *MQ-1C Gray Eagle MODS*		
Congressional Add: *Ground Based Sense And Avoid (GBSAA)*	-	10.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0203744A *I Aircraft Modifications/Product Improvement Programs*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Congressional Add Subtotals for Project: EB6	-	10.000
Congressional Add Totals for all Projects	-	10.000

Change Summary Explanation

FY22 Congressional plus-up of $10.0M will be used to increase the capability of the Ground Based Sense And Avoid (GBSAA) System to provide better support for training activities, to investigate new solutions aimed at addressing hardware obsolescence, and to increase flexibility and useability of GBSAA system by allowing quicker configuration/setup and SATCOM capability."

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
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*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
EB6: *MQ-1C Gray Eagle MODS*	-	11.261	10.000	-	-	-	-	-	-	-	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Based on the fielding of the Gray Eagle ER ending in FY24 initial transition to sustainment will begin in FY24. Unfunded request is in place for FY23 for integration of Navigation (M-Code, dual EGI), Anti-Jam, Complementary Navigation (VBN), Timing, and other solutions to Survive, Persist, and Thrive in GPS denied/ contested environments (emerging GPS threats). M-Code transition is required by public law 111-383.

FY22 Congressional plus-up of $10.0M will be used to increase the capability of the Ground Based Sense And Avoid (GBSAA) System to provide better support for training activities, to investigate new solutions aimed at addressing hardware obsolescence, and to increase flexibility and useability of GBSAA system by allowing quicker configuration/setup and SATCOM capability.

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.

The Ground Based Sense And Avoid (GBSAA) System provides an alternative means of compliance with FAR Part 91.113 requirement for an aircraft to "see and avoid" other aircraft while in the National Airspace System. This capability enhances the warfighter's ability to train with the Gray Eagle at CONUS fielding locations.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Propulsion Reliability	11.261	-	-
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.			
Accomplishments/Planned Programs Subtotals	11.261	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
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*

	FY 2021	FY 2022
Congressional Add: Ground Based Sense And Avoid (GBSAA)	-	10.000
FY 2022 Plans: FY22 Congressional plus-up of $10.0M will be used to increase the capability of the GBSAA System to provide better support for training activities, to investigate new solutions aimed at addressing hardware obsolescence, and to increase flexibility and useability of GBSAA system by allowing quicker configuration/setup and SATCOM capability.		
Congressional Adds Subtotals	-	10.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• A00005: *MQ-1 UAV*	110.000	-	0.000	-	0.000	-	-	-	-	0.000	110.000
• AA6601: *Gray Eagle Mods2*	30.280	123.143	13.038	-	13.038	11.735	-	-	-	0.000	178.196

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 evaluations, HFE 2.0 engine systems will be procured 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)

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
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*

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.

This RDTE effort funds increased capability for the Ground Based Sense And Avoid (GBSAA) system to include better performance in a terminal environment, alternative methods of obtaining telemetry data which will enable operations with classified systems, and address new hardware - which will provide better performance while also addressing system obsolescence issues. The current GBSAA system is not able to support classified operations, and by including an "ADS-B as ownship" solution in the software development, support for classified operations will be possible. During the 5+ years of operation of the GBSAA system at 5 fielding sites, issues with excessive alerts in congested airspace have been noticed. Part of the Block 2 effort will refine the maneuver algorithms to adjust for areas where air traffic is allowed to be in a closer proximity to other air traffic. Units currently utilizing the GBSAA system have requested the ability to conduct a quicker set up and operation of the system for systems with transportable radars systems. A portion of this funding will be used to investigate and implement the best way to accomplish this task.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Army			Date: April 2022
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*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total 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)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Global Positioning System (GPS) Denied	SS/CPFF	General Atomics/ ASI : San Diego, CA	11.768	-		-		-		-		-	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	19.299	-		-		-		-		-	0.000	19.299	-
Ground Based Sense And Avoid Block II	SS/CPFF	Various : Various	25.362	-		10.000	May 2022	-		-		-	0.000	35.362	-
Survivability	MIPR	Various : Various	0.148	-		-		-		-		-	Continuing	Continuing	-
Propulsion Reliability	SS/CPFF	General Atomics/ ASI : San Diego, CA	6.492	8.773	Mar 2021	-		-		-		-	Continuing	Continuing	-
GETS Program Management	TBD	General Atomics/ ASI : San Diego, CA	0.886	-		-		-		-		-	Continuing	Continuing	-
		Subtotal	79.234	8.773		10.000		-		-		-	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total 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

Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Army			Date: April 2022
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*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Testing and Software Testing Block II - GBSAA	MIPR	Various : Various	0.403	-		-		-		-		-	0.000	0.403	-
Flight Test and Analysis	SS/ Various	Dugway Proving Grounds : Dugway Proving Grounds	4.350	2.488	Mar 2021	-		-		-		-	0.000	6.838	-
		Subtotal	4.753	2.488		-		-		-		-	0.000	7.241	N/A

	Prior Years	FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	89.150	11.261		10.000		-		-		-	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2023 Army		Date: April 2022
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*

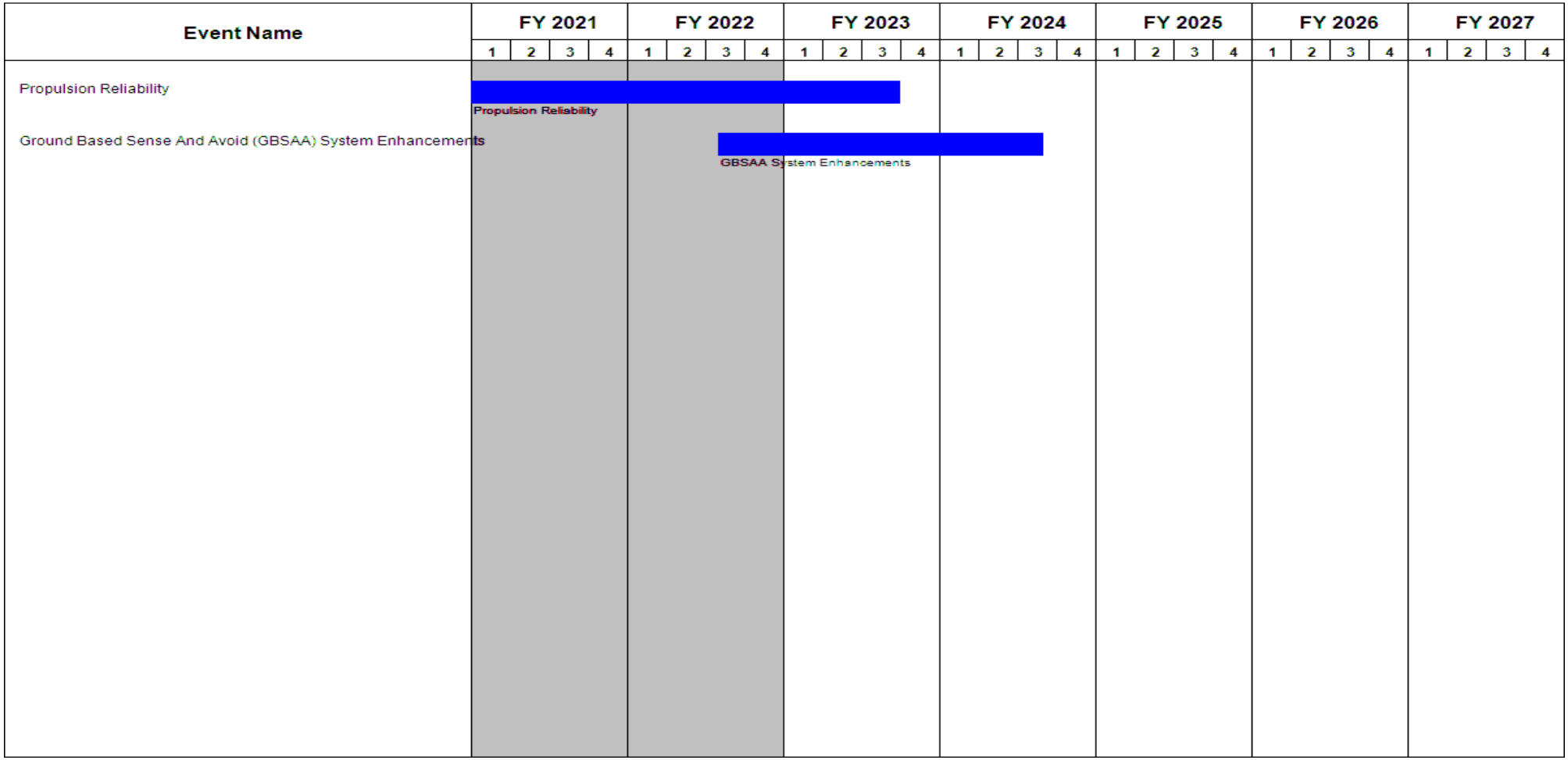

Exhibit R-4A, RDT&E Schedule Details: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0203744A / *Aircraft Modifications/Product Improvement Programs*	**Project (Number/Name)** EB6 / *MQ-1C Gray Eagle MODS*

Schedule Details

	Start		End	
Events	**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	3	2023
Ground Based Sense And Avoid (GBSAA) System Enhancements	3	2022	3	2024