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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 0203752A / Aircraft Engine Component Improvement Program							
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	-	0.138	0.080	0.132	-	0.132	-	-	-	-	-	-
106: A/C Compon Improv Prog	-	0.138	0.080	0.132	-	0.132	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

Aircraft Engine Component Improvement Program (CIP) develops, tests, and qualifies improvements to aircraft engine components to correct service-revealed deficiencies, improve flight safety, enhance readiness and reduce operating and support (O&S) costs. In addition, CIP provides the test vehicles for the testing and qualification efforts required as a part of the Army's Critical Safety Item (CSI) program. Non-program specific Auxiliary Power Unit (APU) as well as Unmanned Aerial Vehicle (UAV) safety and readiness issues are also addressed under this Program Element.

B. Program Change Summary (\$ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.144	0.080	0.145	-	0.145
Current President's Budget	0.138	0.080	0.132	-	0.132
Total Adjustments	-0.006	0.000	-0.013	-	-0.013
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.006	-			
• Adjustments to Budget Years	-	-	-0.013	-	-0.013

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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 0203752A / Aircraft Engine Component Improvement Program	Project (Number/Name) 106 / A/C Compon Improv Prog
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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
106: A/C Compon Improv Prog	-	0.138	0.080	0.132	-	0.132	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

Aircraft Engine Component Improvement Program (CIP) develops, tests, and qualifies improvements to aircraft engine components to correct service-revealed deficiencies, improve flight safety, enhance readiness and reduce operating and support (O&S) costs. In addition, CIP provides the test vehicles for the testing and qualification efforts required as a part of the Army's Critical Safety Item (CSI) program. Non-program specific Auxiliary Power Unit (APU) as well as Unmanned Aerial Vehicle (UAV) safety and readiness issues are also addressed under this Program Element (PE).

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

	FY 2020	FY 2021	FY 2022
<p>Title: Gray Eagle UAS Turbocharger Compressor Blow-off Valve</p> <p>Description: UAV Gray Eagle turbocharger investigation at the United States (US) Army Vehicle Technology Directorate (VTD) at Army Research Laboratory (ARL) Aberdeen Proving Grounds. Provide research to support airworthiness, reliability and performance improvements of the UAV Gray Eagle Turbocharger. Investigate and research the technology challenges of incorporating a turbocharger compressor blow-off valve. The current wastegate configuration was found to be highly sensitive at altitude, resulting in combustion instability. Analysis has been reviewed showing that turbochargers configured with compressor blow-off valves are more reliable and robust than the currently used wastegate configuration.</p> <p>FY 2021 Plans: Research improvements to address service related deficiencies to improve safety and reduce O&S Costs.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: FY22 funding being realigned to the UAS Fuel System Component Evaluation effort within Project 106 to enable application of the identification of failure root causes to improve readiness and reliability across multiple UAS platforms.</p>	0.078	0.037	-
<p>Title: In-House Support</p> <p>Description: In-house support for the CIP engineers. Contracting support for CIP contracts.</p> <p>FY 2021 Plans: Continue to provide in-house engineering support for UAV engine CIP programs.</p> <p>FY 2022 Plans: Will continue to provide in-house engineering support for UAV engine CIP programs.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement:</p>	0.060	0.005	0.054

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
Increase in in-house engineering efforts to support CIP programs.				
<p>Title: Hunter UAS Turbocharger Life Management</p> <p>Description: UAV Hunter fuel injector investigation at the US Army VTD at ARL Aberdeen Proving Grounds. Instrument the Hunter turbochargers and exhaust manifolds, and provide support for in-flight testing to acquire data for turbocharger lifing analysis to support of airworthiness, readiness, reliability, and safety of the Hunter aircraft. UAV Hunter turbocharger investigation at the U.S. ARL VTD at Aberdeen Proving Ground, MD. Also provides research to support airworthiness, reliability and performance improvements of Hunter UAV turbocharger. An alternate turbocharger is required to support airworthiness, reliability and performance of Hunter UAS engine. The Hunter UAS has experienced "Soft Rotation" due to the aircraft's inability to achieve an engine speed sufficient for take-off (i.e. insufficient thrust). The increased frequency in soft rotations during take-off increases the risk of potential damage to equipment or injury to personnel due to the potential for the aircraft to depart the runway after rotation rather than taking flight. Testing has demonstrated that the current turbocharger is operating very close to the surge limit. The engine calibration limits turbocharger speed. However, there is no potential for an increase in performance with the currently installed turbocharger.</p> <p>FY 2021 Plans: Research improvements to address service related deficiencies to improve safety and reduce O&S Costs.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: This effort is ending in FY 2021.</p>		-	0.038	-
<p>Title: UAS Fuel System Component Evaluation</p> <p>Description: This program is to improve aircraft readiness and reliability by mitigating the root cause of common component failures.</p> <p>FY 2022 Plans: UAS Component investigations will support airworthiness, reliability and performance improvements of the critical Unmanned Aerial Vehicle (UAV) components (e.g.. FADECs, fuel injectors, and high pressure fuel pumps) to determine root cause of occurrences which result in performance anomalies during aircraft operation</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: Funds realigned internally within Project 106 from the Gray Eagle UAS Turbocharger Compressor Blow-off Valve effort. FY22 funds will be used to identify/evaluate failure root causes to improve readiness and reliability across multiple UAS platforms.</p>		-	-	0.078
Accomplishments/Planned Programs Subtotals		0.138	0.080	0.132

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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 0203752A / <i>Aircraft Engine Component Improvement Program</i>	Project (Number/Name) 106 / <i>A/C Compon Improv Prog</i>

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Improved designs will be implemented via Engineering Change Proposal (ECP) and follow-on procurement or modification to a production contract to introduce the improved hardware.

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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 0203752A / Aircraft Engine Component Improvement Program				106 / A/C Compon Improv Prog							
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
In-house Engineering	Allot	US Army AMRDEC : Redstone Arsenal, AL	3.020	0.060	Oct 2019	0.005	Oct 2020	0.054	Oct 2021	-		0.054	Continuing	Continuing	Continuing
Subtotal			3.020	0.060		0.005		0.054		-		0.054	Continuing	Continuing	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
T700 Engine	SS/IDIQ	GE-Air : Lynn, MA	61.729	-		-		-		-		-	Continuing	Continuing	Continuing
T55 Engine	SS/IDIQ	Honeywell : Phoenix, AZ	30.161	-		-		-		-		-	Continuing	Continuing	Continuing
T62 Auxiliary Power Unit (APU)	C/IDIQ	Redstone Technical Center Redstone Arsenal, AL : ATEC	0.050	-		-		-		-		-	Continuing	Continuing	Continuing
APU's	SS/IDIQ	Air Force : Kelly AFB, TX	13.647	-		-		-		-		-	Continuing	Continuing	Continuing
Gray Eagle UAS Turbocrahger Compressor Blow-Off Valve	Various	ARL-Vehicle Technology Directorate : TBD	1.012	0.078	Sep 2020	0.037	Sep 2021	0.034	Oct 2021	-		0.034	Continuing	Continuing	Continuing
APU's	SS/IDIQ	Air Force : Hill AFB, UT	2.319	-		-		-		-		-	Continuing	Continuing	Continuing
T-62T-2B Vibration Test	Various	Redstone Technical Text Center : Redstone Arsenal, AL	0.050	-		-		-		-		-	Continuing	Continuing	-
Hunter UAS Fuel Injector Evaluation	TBD	To Be Determined : To Be Determined	0.033	-		-		-		-		-	0.000	0.033	-
Hunter UAS Turbocharger Life Management	TBD	To Be Determined : To Be Determined	0.023	-		0.038	Sep 2021	-		-		-	0.000	0.061	-
Hunter UAS Lower Propeller Shafts	TBD	To Be Determined : To Be Determined	0.020	-		-		-		-		-	0.000	0.020	-

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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 0203752A / Aircraft Engine Component Improvement Program	Project (Number/Name) 106 / A/C Compon Improv Prog	

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
UAV Shadow Engine																												
UAS Fuel System Component Evaluation																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0203752A / Aircraft Engine Component Improvement Program	Project (Number/Name) 106 / A/C Compon Improv Prog

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
T700 Engine Spit Pit Testing	1	2011	4	2012
T700 Engine Temperature Survey	2	2014	4	2015
T55 Engine 1553 Engine Control Unit (ECU)	2	2012	1	2013
T55 Engine N1 Drive Line Redesign	1	2010	4	2012
T55 Engine ECU Block Upgrade	2	2013	4	2015
Auxiliary Power Units (APUs)	1	2014	4	2015
UAV Shadow Engine	2	2014	4	2024
T700 CSI Update	1	2017	4	2017
UAS Fuel System Component Evaluation	1	2022	4	2022