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Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force **Date:** March 2023

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i>
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COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
Total Program Element	-	46.022	12.010	18.041	0.000	18.041	0.000	0.000	0.000	0.000	0.000	76.073
641030: <i>GPS Receiver Development</i>	-	46.022	12.010	18.041	0.000	18.041	0.000	0.000	0.000	0.000	0.000	76.073

A. Mission Description and Budget Item Justification

PE 0604201F, Project 641030 covers the research, development, qualification, and testing of Enhanced Anti-Jam (EAJ) Military Code (M-Code) Global Positioning System (GPS) receivers for Air Force and joint weapon systems. This includes updates to weapon mission planning software to support new M-Code and EAJ receiver development. These acquisitions will enable the Air Force to increase its operational Positioning, Navigation, and Timing (PNT) resiliency while satisfying the DoD and civil mandates. Fielding of EAJ M-Code weapons requires research, development, qualification and testing of M-Code receivers across the Air Force Program Executive Officer (AFPEO) Weapons portfolio. Funds may be used to address emerging and short notice Diminishing Manufacturing Sources and Material Shortages (DMSMS) issues.

This requirement supports performance of a full financial audit as required by title 10 U.S.C. Chapter 9A, Sec 240-D.

The total cost of the Resilient Embedded GPS/INS (R-EGI) Middle Tier of Acquisition effort is 249.57 million, including RDT&E. The R-EGI is fully funded across the Future Years Defense Program.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver weapon system capability. The use of such programs funds would be in addition to the civilian pay expenses budgeted in program element 0605827F, 0605828F, 0605829F, 0605831F, 0605832F, 0605833F, 0605898F, 0606398F. In FY22 0.459M was expended for civilian pay expenses in this program element, and in FY23 0.0M is forecasted for civilian pay expenses in this program element.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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B. Program Change Summary (\$ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	39.742	12.010	0.000	0.000	0.000
Current President's Budget	46.022	12.010	18.041	0.000	18.041
Total Adjustments	6.280	0.000	18.041	0.000	18.041
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	7.670	0.000			
• SBIR/STTR Transfer	-1.390	0.000			
• Other Adjustments	0.000	0.000	18.041	0.000	18.041

Change Summary Explanation

FY22- Below Threshold Reprogramming (BTR) of \$7.670M to fund M-Code for the continuation of design, development, ground qualification, of the High Anti-Jam Miniature M-Code Enhanced Receiver (HAMMER) and to achieve the objectives for M-Code Receiver, Enhanced Anti-Jam of the Common Architecture for Assured Position, Navigation, and Timing (PNT)(CAAP).

The FY24 increase of \$18.000M is for the continuation of design, development, ground qualification, of HAMMER and to achieve the objectives for M-Code Receiver, Enhanced Anti-Jam of CAAP.

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force										Date: March 2023		
Appropriation/Budget Activity 3600 / 4					R-1 Program Element (Number/Name) PE 0604201F / PNT Resiliency, Mods, and Improvements				Project (Number/Name) 641030 / GPS Receiver Development			
COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
641030: GPS Receiver Development	-	46.022	12.010	18.041	0.000	18.041	0.000	0.000	0.000	0.000	0.000	76.073
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This munitions receiver development project includes development of a GPS M-code receiver with EAJ and analysis efforts. M-code receivers with EAJ provide advanced Positioning, Navigation, and Timing (PNT) capabilities required for weapons to operate in Adversarial Anti-access/Area Denial (A2/AD) environments. M-Code receivers with EAJ also provide increased accuracy, better signal acquisition, and advanced security.

M-code receivers with EAJ capability assures continued weapon system precision and lethality.

Fielding EAJ M-Code weapons requires research, development, qualification, testing, and mission planning of M-Code receivers across the weapons portfolio. This will include all systems, subsystems, software, fuzing, and support activities associated with the development and implementation of M-Code receivers.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver weapon system capability. The use of such programs funds would be in addition to the civilian pay expenses budgeted in program element 0605827F, 0605828F, 0605829F, 0605831F, 0605832F, 0605833F, 0605898F, 0606398F. In FY22 \$0.459M was expended for civilian pay expenses in this program element, and in FY23 \$0.0 is forecasted for civilian pay expenses in this program element.

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

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Title: M-Code EAJ	46.022	12.010	18.041	0.000	18.041
Description: M-Code/EAJ receivers provide an enhanced anti-jam capability. M-Code/EAJ receivers provide the capability to operate in increasing adversarial A2/AD jamming environment. M-Code/EAJ receivers also provide increased accuracy, better signal acquisition, and advanced security.					
FY 2023 Plans: Continue performing design and development of multiple cross-platform M-Code receivers, to include the High Anti-Jam Miniature M-Code Enhanced Receiver (HAMMER), for USAF SDB II and USN's Tactical Tomahawk and the Strategic Anti-jam Beamforming Receiver Military-code (SABR-M) for JASSM.					
FY 2024 Base Plans:					

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Continuation of design, development, ground qualification, and production readiness of a High Anti-Jam Miniature M-Code Enhanced Receiver (HAMMER). Complete preliminary integration, prepare for production cut-in, and prepare for fielding in order to achieve the objectives (M-Code Receiver, M-Code Integration, Enhanced Anti-Jam, Exportability). Continuation of the Common Architecture for Assured Position, Navigation, and Timing (PNT)(CAAP). FY 2024 OCO Plans: N/A FY 2023 to FY 2024 Increase/Decrease Statement: Funding increased to provide funds needed for continuation of M-Code development activities for SDB II and JASSM.					
Accomplishments/Planned Programs Subtotals	46.022	12.010	18.041	0.000	18.041

C. Other Program Funding Summary (\$ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
• RDTE 07 0207327F: <i>Small Diameter Bomb (SDB)</i>	13.227	17.327	13.520	-	13.520	-	-	-	-	0.000	44.074
• RDTE 07 0207325F: <i>Joint Air-to-Surface Standoff Missile (JASSM)</i>	8.567	23.507	1.076	-	1.076	2.812	-	-	-	0.000	35.962

Remarks
Other Program Funds reference what is allocated towards internal program M-Code requirements.

D. Acquisition Strategy
M-Code/EAJ effort uses a Family of Systems (FoS) approach where the weapons prime contractors develop receivers capable of operating in any of their Air Force weapons. The receivers are based on a common, internally-developed Interface Requirements Specification (IRS), Technology Requirement Document (TRD), and threat scenarios. This approach uses a combination of contract types based on acquisition phase (Technology Maturation & Risk Reduction (TMRR), Development, Production) and risk. The weapons system program offices share a common development Program Element (PE) to allow flexibility in funding and planning, switching to individual PEs for receiver integration, operational testing, and production. The M-Code/EAJ weapons receiver development effort leverages technology currently under development by the Military GPS User Equipment (MGUE) program and will provide the warfighter with unmatched capability to operate in future A2/AD environments.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Air Force **Date:** March 2023

Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604201F / PNT Resiliency, Mods, and Improvements	Project (Number/Name) 641030 / GPS Receiver Development
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Product Development (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 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
Common Weapons M-Code Receiver Development (SDB II)	Various	Raytheon : Tucson, AZ	-	37.417	May 2022	8.970	Jan 2023	14.901	Nov 2023	-		14.901	Continuing	Continuing	-
Common Weapons M-Code Receiver Development (CAAP ASIC)	MIPR	DMEA/Global Foundries : Hopewell Junction, NY	-	2.236	May 2022	-		-		-		-	0.000	2.236	-
Common Weapons M-Code Receiver Development (JASSM C+ + Phase II)	Various	Lockheed Martin : Orlando, FL	-	3.358	Sep 2022	-		-		-		-	0.000	3.358	-
Common Weapons M-Code Receiver Development (JASSM GPS Receiver)	Various	Consortium Management Gp : Washington, DC	-	1.803	Aug 2022	3.040	Feb 2023	3.140	Feb 2024	-		3.140	Continuing	Continuing	-
Common Weapons M-Code Receiver Development (JASSM GPS - Receiver)	Various	SERCO Inc : Herndon, VA	-	0.746	May 2022	-		-		-		-	Continuing	Continuing	-
Subtotal			-	45.560		12.010		18.041		-		18.041	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 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
DCA CIV PAY	Allot	Allotment : Eglin AFB, FL	-	0.459	Apr 2022	0.000	Jan 2023	-		-		-	0.000	0.459	-
Subtotal			-	0.459		0.000		-		-		-	0.000	0.459	N/A

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Management Services (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 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			
Travel	Various	Not specified. : Eglin AFB, FL	-	0.003	May 2022	0.000	Jan 2023	-		-		-	Continuing	Continuing	-
Subtotal			-	0.003		0.000		-		-		-	Continuing	Continuing	N/A
Project Cost Totals			-	46.022		12.010		18.041		-		18.041	Continuing	Continuing	N/A

Remarks
Common Weapons M-Code Receiver Development (SDB II) funding increased from FY23 to FY24 due to HAMMER and CAAP ASIC development and integration into SDB II and TACTICAL Tomahawk.

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Exhibit R-4A, RDT&E Schedule Details: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i>	Project (Number/Name) 641030 / <i>GPS Receiver Development</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>M-Code/EAJ Receivers</i>				
M-Code/EAJ Research & Development	1	2022	3	2025
M-Code/EAJ Test and Qualification	1	2022	3	2025

Note
Efforts outside existing funding dependent on prior year's funds.