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

<b>Appropriation/Budget Activity</b>					<b>R-1 Program Element (Number/Name)</b>							
3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 4: Advanced Component Development &amp; Prototypes (ACD&amp;P)</i>					PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i>							
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022 Base</b>	<b>FY 2022 OCO</b>	<b>FY 2022 Total</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
Total Program Element	-	120.267	0.000	39.742	0.000	39.742	-	-	-	-	-	-
641030: <i>GPS Receiver Development</i>	-	120.267	0.000	39.742	0.000	39.742	-	-	-	-	-	-

**Note**

This program, BA 4, PE 0604201F, project 641030, M-Code EAJ, is a new start.

**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 Position, 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.

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 0605831F. In FY20 \$0M was expended for civilian pay expenses in this program element, and in FY21 \$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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3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 4: Advanced Component Development &amp; Prototypes (ACD&amp;P)</i>	PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i>

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022 Base</b>	<b>FY 2022 OCO</b>	<b>FY 2022 Total</b>
Previous President's Budget	124.600	0.000	0.000	0.000	0.000
Current President's Budget	120.267	0.000	39.742	0.000	39.742
Total Adjustments	-4.333	0.000	39.742	0.000	39.742
• 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	-4.333	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	39.742	0.000	39.742

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 641030: *GPS Receiver Development*

Congressional Add: *Program Increase - M-Code EAJ*

Congressional Add Subtotals for Project: 641030

Congressional Add Totals for all Projects

	<b>FY 2020</b>	<b>FY 2021</b>
	32.000	-
	32.000	-
	32.000	-

**Change Summary Explanation**

FY20 funding decreased by 4.333M to cover SBIR adjustments.

FY22 Funding increased by 39.742M to continue development of M-Code/EAJ receivers to provide an enhanced anti-jam capability.

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2022 Air Force										<b>Date:</b> May 2021		
<b>Appropriation/Budget Activity</b> 3600 / 4					<b>R-1 Program Element (Number/Name)</b> PE 0604201F / PNT Resiliency, Mods, and Improvements				<b>Project (Number/Name)</b> 641030 / GPS Receiver Development			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022 Base</b>	<b>FY 2022 OCO</b>	<b>FY 2022 Total</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
641030: GPS Receiver Development	-	120.267	0.000	39.742	0.000	39.742	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**

This program, BA 4, PE 0604201F, project 641030, M-Code EAJ, is a new start.

**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 emergent or unanticipated civilian pay expenses required to manage, execute, and deliver M-Code GPS receivers for emergent or unanticipated weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605831F.

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

	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>
<b>Title:</b> M-Code EAJ	88.267	0.000	39.742
<b>Description:</b> 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.			
<b>FY 2021 Plans:</b> N/A			
<b>FY 2022 Plans:</b>			

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

<b>Appropriation/Budget Activity</b> 3600 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604201F / PNT Resiliency, Mods, and Improvements	<b>Project (Number/Name)</b> 641030 / GPS Receiver Development
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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>
Perform design and development of High Anti-Jam Miniature M-Code Enhanced Receiver (HAMMER), and support design of JASSM Anti-Jam GPS Receiver (JAGR) M-Code capability.			
<b>FY 2021 to FY 2022 Increase/Decrease Statement:</b> Funding increased to perform development of M-Code/EAJ receivers to provide an enhanced anti-jam capability across multiple munitions.			
<b>Accomplishments/Planned Programs Subtotals</b>	88.267	0.000	39.742

	<b>FY 2020</b>	<b>FY 2021</b>
<b>Congressional Add:</b> Program Increase - M-Code EAJ	32.000	-
<b>FY 2020 Accomplishments:</b> Funds M-Code GPS receiver development and testing for Strategic Anti-Jam Beamforming Receiver-Modernized (SABR-M) receiver prototype, the design and development of High Anti-Jam Miniature M-Code Enhanced Receiver (HAMMER), and support design of JASSM Anti-Jam GPS Receiver (JAGR) M-Code capability.		
<b>Congressional Adds Subtotals</b>	32.000	-

<b>C. Other Program Funding Summary (\$ in Millions)</b>											
<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 Complete</u>	<u>Total Cost</u>
• RDTE 05 PE 0604329F, BPAC 655191: SDB Increment II	11.422	-	-	-	-	-	-	-	-	-	-
• RDTE 07 0207327F: Small Diameter Bomb (SDB)	-	11.313	7.768	-	7.768	-	-	-	-	-	-
• RDTE 04 PE 0604327F, BPAC 645341: Direct Strike Penetrators	-	2.150	-	-	-	-	-	-	-	-	-
• RDTE 05 0604618F: Joint Direct Attack Munition	-	6.806	-	-	-	-	-	-	-	-	-
• RDTE 07 0207325F: Joint Air-to- Surface Standoff Missile (JASSM)	-	-	3.000	-	3.000	-	-	-	-	-	-
• PAAF 01 0604327F: Hardened Target Munitions	-	-	15.500	-	15.500	-	-	-	-	-	-

**Remarks**

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2022 Air Force		<b>Date:</b> May 2021
<b>Appropriation/Budget Activity</b> 3600 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i>	<b>Project (Number/Name)</b> 641030 / <i>GPS Receiver Development</i>

**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 2022 Air Force** **Date:** May 2021

<b>Appropriation/Budget Activity</b> 3600 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604201F / PNT Resiliency, Mods, and Improvements	<b>Project (Number/Name)</b> 641030 / GPS Receiver Development
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<b>Product Development (\$ in Millions)</b>				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 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			
Common Weapons M-Code Receiver Development (SDB II)	Various	Raytheon : Tucson, AZ	-	48.175	Nov 2019	-		20.354	Dec 2021	-		20.354	-	-	-
Common Weapons M-Code Receiver Development (CAAP ASIC)	MIPR	DMEA/Global Foundries : Hopewell Junction, NY	-	5.836	May 2020	-		4.273	Dec 2021	-		4.273	-	-	-
Common Weapons M-Code Receiver Development (JDAM/MOP/ SDB I Phase II)	Various	Boeing : St Louis, MO	-	18.775	Nov 2019	-		-		-		-	-	-	-
Common Weapons M-Code Receiver Development (AJ ASIC)	Various	Collins Aerospace : Cedar Rapids, IA	-	3.315	Feb 2020	-		-		-		-	-	-	-
Common Weapons M-Code Receiver Development (AJ ASIC/ MIPR)	Various	DMEA/Global Foundries : Hopewell Junction, NM	-	6.000	Nov 2019	-		-		-		-	-	-	-
Common Weapons M-Code Receiver Development (Pre-EMD JASSM)	Various	Lockheed Martin : Orlando, FL	-	3.000	Oct 2019	-		-		-		-	-	-	-
Common Weapons M-Code Receiver Development (JASSM C+ + Phase II)	Various	Lockheed Martin : Orlando, FL	-	20.287	Oct 2019	-		1.397		-		1.397	-	-	-
Common Weapons M-Code Receiver Development (JASSM MCU)	Various	Lockheed Martin : Orlando, FL	-	13.311	Nov 2019	-		2.313	Dec 2021	-		2.313	-	-	-
Common Weapons M-Code Receiver Development (JASSM JAGR)	Various	Lockheed Martin : Orlando, FL	-	-		-		9.605	Nov 2021	-		9.605	-	-	-



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<b>Exhibit R-4, RDT&amp;E Schedule Profile:</b> PB 2022 Air Force		<b>Date:</b> May 2021
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	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

<b>M-Code/EAJ Receivers</b>	
M-Code/EAJ Research & Development	[REDACTED]
M-Code/EAJ Test and Qualification	[REDACTED]

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2022 Air Force		<b>Date:</b> May 2021
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b><i>M-Code/EAJ Receivers</i></b>				
M-Code/EAJ Research & Development	1	2020	1	2023
M-Code/EAJ Test and Qualification	3	2020	1	2025