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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2019 Air Force **Date:** February 2018

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 4: Advanced Component Development &amp; Prototypes (ACD&amp;P)</i>					<b>R-1 Program Element (Number/Name)</b> PE 0604201F / <i>Integrated Avionics Planning and Development</i>							
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019 Base</b>	<b>FY 2019 OCO</b>	<b>FY 2019 Total</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
Total Program Element	-	0.000	65.458	14.894	0.000	14.894	0.000	0.000	0.000	0.000	Continuing	Continuing
641029: <i>GPS Receiver Development</i>	-	0.000	5.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
641030: <i>GPS Receiver Development</i>	-	0.000	60.444	14.894	0.000	14.894	0.000	0.000	0.000	0.000	Continuing	Continuing

## **Note**

In FY2018, specific efforts initiated under PE 0305164F, NAVSTAR Global Positioning System (User Equipment) (Space), Project 643833, Military Global Positioning System User Equipment, were transferred to PE 0604201F, Integrated Avionics Planning & Development, Project 641029, Aircraft-Store development, to realign resources with the execution responsibilities supporting aircraft weapon system platforms.

In FY2018, M-Code efforts initiated under PE 0207325F (Joint Air-Surface Standoff Missile-Extended Range), PE 0604329F (Small Diameter Bomb II), PE 0604270F (Advanced IR Counter Measures), 0604327F (Hard and Deeply Buried Targets System) and PE 0604618F (Joint Direct Attack Munition) were transferred to PE 0604201F, Integrated Avionics Planning & Development, Project 641030, Munitions Receiver Development for transparency to stakeholders and to realign resources with the organization executing the efforts.

## **A. Mission Description and Budget Item Justification**

PE 0604201, Project 641029 conducts navigation-aircraft interface standard development to include the Universal Navigation Interface (UNI). The Universal Navigation Interface project develops, enhances, and implements standardized interfaces in current/future aircraft and mission planning to support integration of EGI receivers independent of Operational Flight Program (OFP) cycles. Standardization of navigation-aircraft interface enables a more affordable approach and faster upgrade capabilities to an ever changing threat to navigation accuracy.

PE 0604201F, Project 641030 covers the development, integration and testing of Enhanced Anti-Jam (EAJ) Military Code (M-Code) GPS receivers for AF 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 PNT resiliency while satisfying the DoD and civil mandates. Fielding of EAJ M-Code weapons requires the development, integration and testing of M-Code receivers across the AFPEO Weapons Portfolio.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver M-Code Development capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

This program is in Budget Activity 4, Demonstration and Validation, because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Air Force				Date: February 2018	
Appropriation/Budget Activity		R-1 Program Element (Number/Name)			
3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)		PE 0604201F I Integrated Avionics Planning and Development			
B. Program Change Summary (\$ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	0.000	65.458	15.006	0.000	15.006
Current President's Budget	0.000	65.458	14.894	0.000	14.894
Total Adjustments	0.000	0.000	-0.112	0.000	-0.112
• 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	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-0.112	0.000	-0.112
Change Summary Explanation					
No significant changes					

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force										Date: February 2018		
Appropriation/Budget Activity 3600 / 4					R-1 Program Element (Number/Name) PE 0604201F / Integrated Avionics Planning and Development				Project (Number/Name) 641029 / GPS Receiver Development			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
641029: GPS Receiver Development	-	0.000	5.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**

In FY18, efforts initiated under PE 0305164F, NAVSTAR Global Positioning System (User Equipment) (Space), Project 643833, Military Global Positioning System User Equipment were transferred to PE 0604201F, Integrated Avionics Planning & Development, Project 651029, Aircraft-Store Development for transparency and to realign resources with the execution responsibilities supporting aircraft weapon system platforms.

**A. Mission Description and Budget Item Justification**

PE 0604201, Project 641029 conducts navigation-aircraft interface standard development to include the Universal Navigation Interface (UNI). The Universal Navigation Interface project develops, enhances, and implements standardized interfaces in current/future aircraft and mission planning to support integration of EGI receivers independent of Operational Flight Program (OFP) cycles. Standardization of navigation-aircraft interface enables a more affordable approach and faster upgrade capabilities to an ever changing threat to navigation accuracy.

This program is in Budget Activity 4, Demonstration and Validation, because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver PNT solutions.

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

	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019</b>
<b>Title:</b> UNI	0.000	5.014	0.000
<b>Description:</b> Conducts navigation-to-aircraft interface standard development to include the Universal Navigation Interface (UNI). Develops standardized software interfaces in aircraft and mission planning to support integration of EGI receiver boxes capable of receiving Modernized GPS signals (M-code).			
<b>FY 2018 Plans:</b> Conduct studies and risk reduction activities to define standard interfaces across multiple platforms. Award development contract.			
<b>FY 2019 Plans:</b> No FY19 Requirement.			
<b>FY 2018 to FY 2019 Increase/Decrease Statement:</b>			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2019 Air Force								<b>Date:</b> February 2018			
<b>Appropriation/Budget Activity</b> 3600 / 4				<b>R-1 Program Element (Number/Name)</b> PE 0604201F / <i>Integrated Avionics Planning and Development</i>				<b>Project (Number/Name)</b> 641029 / <i>GPS Receiver Development</i>			
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>								<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019</b>	
FY18 funds cover current scope of requirement.											
<b>Accomplishments/Planned Programs Subtotals</b>								0.000	5.014	0.000	
<b>C. Other Program Funding Summary (\$ in Millions)</b>											
<b>Line Item</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019 Base</b>	<b>FY 2019 OCO</b>	<b>FY 2019 Total</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• RDTE 05 PE0305164F: <i>NAVSTAR Global Positioning System User Equipment</i>	36.912	-	-	-	-	-	-	-	-	0.000	36.912
<b>Remarks</b>											
In FY2018, PE 0305164F, NAVSTAR Global Positioning System (User Equipment) (Space), Project 643833, Military Global Positioning System User Equipment partial efforts were transferred to PE 0604201F, Integrated Avionics Planning & Development, Project 641029, STORES - Aircraft Interface for transparency and to realign resources with execution responsibilities that support various aircraft weapon system platforms.											
<b>D. Acquisition Strategy</b>											
Award delivery order on existing PEO Fighter/Bomber with scope to accomplish risk reduction and complete initial Interface Control Document.											
<b>E. Performance Metrics</b>											
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.											

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2019 Air Force												<b>Date:</b> February 2018		
<b>Appropriation/Budget Activity</b> 3600 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0604201F / <i>Integrated Avionics Planning and Development</i>				<b>Project (Number/Name)</b> 641029 / <i>GPS Receiver Development</i>				

  

<b>Product Development (\$ in Millions)</b>				<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
UNI Software Interface Development	TBD	Not specified. : TBD	-	-		5.014		0.000		-		0.000	Continuing	Continuing	-
<b>Subtotal</b>			-	-		5.014		0.000		-		0.000	Continuing	Continuing	N/A

  

	<b>Prior Years</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019 Base</b>	<b>FY 2019 OCO</b>	<b>FY 2019 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Project Cost Totals</b>	-	-	5.014	0.000	-	0.000	Continuing	Continuing	N/A

  

**Remarks**

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Exhibit R-4, RDT&E Schedule Profile: PB 2019 Air Force										Date: February 2018									
Appropriation/Budget Activity										R-1 Program Element (Number/Name)									
3600 / 4										PE 0604201F / Integrated Avionics Planning and Development									
										Project (Number/Name)									
										641029 / GPS Receiver Development									

	FY 2017				FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023			
	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
Universal Navigation Interface (UNI)																												
UNI																												

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2019 Air Force			<b>Date:</b> February 2018
<b>Appropriation/Budget Activity</b> 3600 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604201F / <i>Integrated Avionics Planning and Development</i>	<b>Project (Number/Name)</b> 641029 / <i>GPS Receiver Development</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b><i>Universal Navigation Interface (UNI)</i></b>				
UNI	3	2018	2	2019

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force										Date: February 2018		
Appropriation/Budget Activity 3600 / 4					R-1 Program Element (Number/Name) PE 0604201F / Integrated Avionics Planning and Development				Project (Number/Name) 641030 / GPS Receiver Development			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
641030: GPS Receiver Development	-	0.000	60.444	14.894	0.000	14.894	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**

In FY2018, M-Code efforts initiated under PE 0207325F (Joint Air-Surface Standoff Missile-Extended Range), PE 0604329F (Small Diameter Bomb II), PE 0604270F (Advanced IR Counter Measures), 0604327F (Hard and Deeply Buried Targets System) and PE 0604618F (Joint Direct Attack Munition) were transferred to PE 0604201F, Integrated Avionics Planning & Development, Project 641030, Munitions Receiver Development for transparency to stakeholders and to realign resources with the organization executing the efforts.

**A. Mission Description and Budget Item Justification**

This munitions receiver development project includes development of a GPS military code (M-code) receiver with enhanced anti-jam (EAJ) and analysis efforts. M-code receivers with EAJ will be developed and integrated with advanced positioning, navigation, and timing (PNT) capabilities to provide the capability to operate in adversarial anti-access/area denial (A2/AD) environments. M-Code receivers with EAJ also provides increased accuracy, better signal acquisition, and advanced security.

Current GPS guided weapons require M-code receivers with EAJ in order to operate in A2/AD jamming environments. An M-code with EAJ capability assures continued weapon system precision and lethality.

Fielding EAJ M-Code weapons requires the development, integration, 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.

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

	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019</b>
<b>Title:</b> M-Code EAJ	-	60.444	14.894
<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 2018 Plans:</b> Developed M-code/EAJ receivers for implementation across the AFPEO weapons portfolio.			
<b>FY 2019 Plans:</b>			



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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2019 Air Force								<b>Date:</b> February 2018			
<b>Appropriation/Budget Activity</b> 3600 / 4				<b>R-1 Program Element (Number/Name)</b> PE 0604201F / <i>Integrated Avionics Planning and Development</i>				<b>Project (Number/Name)</b> 641030 / <i>GPS Receiver Development</i>			
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>								<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019</b>	
Develop and integrate M-code/EAJ receivers across the AFPEO weapons portfolio.											
<b><i>FY 2018 to FY 2019 Increase/Decrease Statement:</i></b> Funding decrease due to an increase of funding in specific weapons' PEs.											
<b>Accomplishments/Planned Programs Subtotals</b>								-	60.444	14.894	
<b>C. Other Program Funding Summary (\$ in Millions)</b>											
<b>Line Item</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019 Base</b>	<b>FY 2019 OCO</b>	<b>FY 2019 Total</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• RDTE 07 PE 0207325F, BPAC 675356: <i>JASSAM-ER</i>	0.200	1.645	17.594	-	17.594	1.400	14.000	12.000	-	0.000	46.839
• RDTE 05 PE 0604329F, BPAC 655191: <i>SDB Increment II</i>	8.001	16.800	41.243	-	41.243	12.100	11.000	21.000	-	0.000	110.144
• RDTE 05 PE 0604270F, BPAC 655305: <i>Adv Infrared Counter Measures</i>	10.000	-	-	-	-	-	-	-	-	0.000	10.000
• RDTE 04 PE 0604327F, BPAC 645341: <i>Direct Strike Penetrators</i>	34.808	-	32.962	-	32.962	2.200	-	-	-	0.000	69.970
• RDTE 05 PE 0604618F, BPAC 653891: <i>JDAM Development</i>	9.901	-	15.787	-	15.787	-	8.001	-	-	0.000	33.689
<b>Remarks</b>											
<b>D. Acquisition Strategy</b> M-Code/EAJ effort uses a Family of Systems approach where the three prime weapons contractors develop receivers capable of operating in any of their AF weapons. The receivers are based on a common, internally-developed IRS, TRD, and threat scenario. This approach uses a combination of contract types based on acquisition phase (TMRR, Development, Production) and risk. The Weapons SPOs share a common development PE to allow flexibility in funding and planning, switching to individual PEs for receiver integration, OT, and production. The M-Code/EAJ Weapons Receiver Development effort leverages technology currently under development by the GPS-D MGUE program and will provide the warfighter with unmatched capability to operate in future A2/AD environments.											
<b>E. Performance Metrics</b> Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Air Force												Date: February 2018			
Appropriation/Budget Activity 3600 / 4						R-1 Program Element (Number/Name) PE 0604201F / Integrated Avionics Planning and Development				Project (Number/Name) 641030 / GPS Receiver Development					
Product Development (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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
M-code Receiver Development	Various	Various : TBD	-	-		51.171	Dec 2017	13.006	Dec 2018	-		13.006	Continuing	Continuing	-
Subtotal			-	-		51.171		13.006		-		13.006	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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
M-Code Receiver Development Support	Various	TBD : TBD	-	-		6.453	Apr 2018	-		-		-	Continuing	Continuing	-
Subtotal			-	-		6.453		-		-		-	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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
M-Code Receiver Development PMA	Various	Various : TBD	-	-		2.820	Feb 2018	1.888	Feb 2019	-		1.888	Continuing	Continuing	-
Subtotal			-	-		2.820		1.888		-		1.888	Continuing	Continuing	N/A
			Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-		60.444		14.894		-		14.894	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2019 Air Force																Date: February 2018			
Appropriation/Budget Activity 3600 / 4								R-1 Program Element (Number/Name) PE 0604201F / Integrated Avionics Planning and Development								Project (Number/Name) 641030 / GPS Receiver Development			

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2019 Air Force			<b>Date:</b> February 2018
<b>Appropriation/Budget Activity</b> 3600 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604201F / <i>Integrated Avionics Planning and Development</i>	<b>Project (Number/Name)</b> 641030 / <i>GPS Receiver Development</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b><i>M-Code/EAJ Receivers</i></b>				
M-Code Receiver Development and Integration	1	2018	3	2022