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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 7: Operational Systems Development</i>					R-1 Program Element (Number/Name) PE 0401134F / <i>Large Aircraft IR Countermeasures (LAIRCM)</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	5.095	4.334	5.424	0.000	5.424	5.518	5.633	0.000	0.000	Continuing	Continuing
674942: <i>Large Aircraft Infrared Counter Measures (LAIRCM)</i>	-	5.095	4.334	5.424	0.000	5.424	5.518	5.633	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Large Aircraft Infrared Countermeasures (LAIRCM) system is an evolutionary acquisition program that provides significantly improved defensive systems capability for DoD aircraft to counter the infrared (IR) man-portable air-defense systems (MANPADS) missile threat. The current LAIRCM system configuration [AN/AAQ-24V] consists of missile warning sensors (MWS), a laser transmitter assembly, control interface unit and processors to detect, track, jam and counter incoming IR missiles. The number of sensors and transmitter assemblies per aircraft is determined by the size and signature of the aircraft. The system is fully automatic following system power-up. LAIRCM requirements are documented in the multi-command Operational Requirements Document (ORD) LAIRCM ORD 314-92, validated on 03 Aug 98. The system is currently installed on 54+ aircraft types and over 1200 aircraft.

The baseline program development is complete. Follow-on efforts are addressing integration onto new aircraft types and existing LAIRCM platforms, design changes to address Reliability Maintainability & Availability and system improvements to counter new and emerging threats.

LAIRCM upgrades include, but are not limited to, hardware and software upgrades and testing of the LAIRCM system to maintain defensive capability against new and emerging threats.

Current and future efforts include Threat Analysis; Modeling, Simulation and Emulation Testing; Hardware, Software and Firmware Upgrades; Virtual System Integration Lab (SIL) Development; and Studies and Analysis.

Threat Analysis: Threat analysis encompasses the activities to support threat exploitation analysis of a variety of threats (both known and emerging) against the current LAIRCM jam code with the intent of determining if jam code updates are required. Typical threat analysis activities include: threat seeker characterization; model development for advanced threat IR seekers; development and testing of new infrared countermeasures concepts, techniques, and hardware; new technology assessment for potential incorporation into the LAIRCM system, and the evaluation/exploitation of new threats and threat characteristics relative to infrared countermeasures (IRCM).

Modeling, Simulation, and Emulation Testing: Modeling, Simulation, and Emulation activities verify and validate the information obtained from the threat analysis activities. These activities include: evaluation of (IRCM) techniques used in defeating real threat hardware; developing and evaluating jam code; validating and verifying integration of LAIRCM system components to newly developed jam codes, software or hardware; evaluating system effectiveness; performing platform integration support tests; and conducting predictive risk reduction tests prior to Live Missile Fire Test (LMFT) or on aircraft flight testing.

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<p>Hardware, Software, and Firmware Upgrades: Includes changes of any kind to any LAIRCM hardware components/support equipment with the purpose of adding capability, features, and enhancements which do not presently exist to ensure the LAIRCM system remains viable against current and emerging threats.</p> <p>-----Hardware upgrade activities include engineering tasks required to design, develop, test and produce new capabilities, features, and enhancements, and changes of any kind to any portion of LAIRCM hardware with the purpose of adding capability, features and enhancements which do not presently exist.</p> <p>-----Software upgrade activities include engineering tasks required to design, develop, and test the new or modified code that result in new capabilities, features, and enhancements and changes of any kind to any portion of LAIRCM software with the purpose of adding capability, features and enhancements which do not presently exist. Software upgrades can occur in any of the Line Replaceable Unit (LRU) Operation Flight Programs as well as any of the software residing in other LAIRCM associated components including those systems which support development and test or the LAIRCM support equipment.</p> <p>-----Firmware upgrade activities include engineering tasks required to design, develop, and test the upgrades and those changes resulting from hardware and software updates/modifications as well as firmware upgrades which add new features.</p> <p>Virtual SIL Development: Incrementally design, develop, integrate, and test software code and purchase associated infrastructure (i.e., computers, servers, commercial off-the-shelf (COTS) software, etc.) necessary to develop and implement a virtual SIL providing a critical capability for testing the LAIRCM system to ensure continued effectiveness against current and emerging threats.</p> <p>Studies and Analysis: Includes logistics, programmatic, and engineering studies and analysis activities to ensure continued system viability and sustainability and compliance with acquisition directives. These activities may include the evaluation of low cost/high payback opportunities to reduce software development/implementation cost, enhance production efficiency, and improve life cycle costs through increased reliability and reduced repair and return cost.</p> <p>Program management and administration efforts consist of, but are not limited to, contract services and government costs. This program element may include necessary civilian pay expenses required to manage, execute, and deliver Aircraft Survivability weapon system 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, and 0605833F.</p> <p>As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.</p> <p>This program is in Budget Activity 7, Operational System Development 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.</p>		

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B. Program Change Summary (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget		5.283	4.334	5.424	0.000	5.424
Current President's Budget		5.095	4.334	5.424	0.000	5.424
Total Adjustments		-0.188	0.000	0.000	0.000	0.000
• 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		-0.188	0.000	0.000	0.000	0.000
C. Accomplishments/Planned Programs (\$ in Millions)				FY 2018	FY 2019	FY 2020
Title: LAIRCM Threat Analysis				2.210	3.048	2.589
Description: Encompasses the activities to support threat exploitation analysis of a variety of threats against the current LAIRCM jam code with the intent of determining if jam code updates are required.						
FY 2019 Plans: Continue to work on Threat analysis in the GWEF, to include purchase of assets, and DIME Lab.						
FY 2020 Plans: Continue to work on Threat analysis in the GWEF, to include purchase of assets, and DIME Lab.						
FY 2019 to FY 2020 Increase/Decrease Statement: Decreased analysis planned for FY20 in order to fund software upgrade efforts.						
Title: LAIRCM Modeling, Simulation and Emulation Testing				0.567	0.560	0.787
Description: Activities that verify and validate the information obtained from threat analysis activities.						
FY 2019 Plans: Will continue to work in Modeling, Simulation and Emulation Tests. This is a continued effort from LAIRCM Development in previous years.						
FY 2020 Plans:						

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Will continue to work in Modeling, Simulation and Emulation Tests. This is a continued effort from LAIRCM Development in previous years. FY 2019 to FY 2020 Increase/Decrease Statement: Cost increase allows for inflationary adjustment of effort over FY18 effort.				
Title: LAIRCM Hardware/Software/Firmware Upgrades Description: Hardware/Software/Firmware Upgrades include changes of any kind to any LAIRCM hardware components/support equipment with the purpose of adding capability, features, and enhancements which do not presently exist to ensure the LAIRCM system remains viable against current and emerging threats. FY 2019 Plans: N/A FY 2020 Plans: LAIRCM will continue to make changes to LAIRCM hardware and software components/support equipment as necessary for the purpose of adding capability and feature enhancements which do not presently exist to ensure the LAIRCM system remains viable against current and emerging threats. FY 2019 to FY 2020 Increase/Decrease Statement: Funding increase to provide for software improvements.		0.000	0.000	0.850
Title: LAIRCM Virtual SIL Development Description: VSIL incrementally designs, develops, integrates, and tests software code and purchases associated infrastructure (i.e., computers, servers, COTS software, etc.) necessary to develop and implement a virtual SIL providing a critical capability for testing the LAIRCM system to ensure continued effectiveness against current and emerging threats. FY 2019 Plans: Will continue to design, develop, integrate, and test software code and purchase associated infrastructure (i.e., computers, servers, COTS software, etc.) necessary to develop and implement a virtual SIL providing a critical capability for testing the LAIRCM system to ensure continued effectiveness against current and emerging threats. FY 2020 Plans:		1.774	0.330	0.348

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C. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020
Will continue to design, develop, integrate, and test software code and purchase associated infrastructure (i.e., computers, servers, COTS software, etc.) necessary to develop and implement a virtual SIL providing a critical capability for testing the LAIRCM system to ensure continued effectiveness against current and emerging threats.											
FY 2019 to FY 2020 Increase/Decrease Statement: Funding increase allows for minor inflationary adjustments to VSIL.											
Title: LAIRCM Studies and Analysis									0.544	0.396	0.850
Description: Includes logistics, programmatic, and engineering studies and analysis activities to ensure continued system viability and sustainability and compliance with acquisition directives. These activities may include the evaluation of low cost/high payback opportunities to reduce software development/implementation cost, enhance production efficiency, and improve life cycle costs through increased reliability and reduced repair and return cost.											
FY 2019 Plans: Will initiate an engineering focused LAIRCM system Critical Program Information (CPI) Assessment and Review Study.											
FY 2020 Plans: Will initiate studies to address and/or assess various efforts and projects that enhance and/or update LAIRCM effectiveness.											
FY 2019 to FY 2020 Increase/Decrease Statement: Increase from FY19, restoring Studies and Analysis above FY18 levels.											
Accomplishments/Planned Programs Subtotals									5.095	4.334	5.424
D. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• APAF 05 Line Item LAIRCM: Large Aircraft Infrared Countermeasures	4.046	149.778	97.093	-	97.093	103.781	91.200	0.000	0.000	0.000	445.898
Remarks											
E. Acquisition Strategy											
Efforts awarded on an annual basis, exercising existing contract options, support threat analysis and system effectiveness. The LAIRCM program office partners with the Air Force Research Laboratory (AFRL), the 46th Test Squadron, and the Guided Weapon Evaluation Facility (GWEF) to conduct threat analysis research and Modeling, Simulation, and Emulation Testing. AFRL provides hardware-in-the-loop developmental test simulation capability on a level-of-effort (LOE) basis. AFRL's Dynamic Infrared Missile Evaluation (DIME) Laboratory performs threat analysis. The current LAIRCM contract may be used to award the various study efforts.											

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F. Performance Metrics 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 2020 Air Force												Date: February 2019			
Appropriation/Budget Activity 3600 / 7						R-1 Program Element (Number/Name) PE 0401134F / Large Aircraft IR Countermeasures (LAIRCM)						Project (Number/Name) 674942 / Large Aircraft Infrared Counter Measures (LAIRCM)			
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
LAIRCM ETA Hardware/ Software/Firmware Upgrades	SS/TBD	NGC : Rolling Meadows, IL	-	-		-		0.850	Mar 2020	-		0.850	Continuing	Continuing	-
LAIRCM ETA Virtual SIL Development	SS/TBD	NGC : Rolling Meadows, IL	-	1.774	Feb 2018	0.330	Apr 2019	0.348	Apr 2020	-		0.348	Continuing	Continuing	-
LAIRCM ETA Studies and Analysis	Various	Various : Various, NV	-	0.544	Mar 2018	0.396	Mar 2019	0.850	Mar 2020	-		0.850	Continuing	Continuing	-
Subtotal			-	2.318		0.726		2.048		-		2.048	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
LAIRCM ETA Threat Analysis/Guided Weapon Evaluation Facility	PO	GWEF : Eglin AFB, FL	-	0.344	Jan 2019	0.343	Jan 2019	0.450	Apr 2020	-		0.450	Continuing	Continuing	-
LAIRCM ETA Modeling, Simulation and Emulation Test	MIPR	AFRL/RYF-Omni Sentinel : WPAFB, OH	-	0.403	Nov 2017	0.400	Apr 2019	0.627	Nov 2019	-		0.627	Continuing	Continuing	-
LAIRCM ETA Threat Analysis/Dynamic Infrared Missile Evaluation (DIME)	MIPR	AFRL/RYF-DIME : WPAFB, OH	-	1.600	Jan 2018	2.020	Jan 2019	1.839	Apr 2020	-		1.839	Continuing	Continuing	-
LAIRCM ETA Threat Analysis/ Asset Buys	MIPR	United States Army : Huntsville, AL	-	0.266	Jan 2018	0.685	Jan 2019	0.300	Jun 2020	-		0.300	Continuing	Continuing	-
Subtotal			-	2.613		3.448		3.216		-		3.216	Continuing	Continuing	N/A

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Appropriation/Budget Activity 3600 / 7						R-1 Program Element (Number/Name) PE 0401134F / Large Aircraft IR Countermeasures (LAIRCM)				Project (Number/Name) 674942 / Large Aircraft Infrared Counter Measures (LAIRCM)					

Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
LAIRCM ETA Government Travel	Various	Government Employees : WPAFB, OH	-	0.164		0.160		0.160		-		0.160	Continuing	Continuing	-
Subtotal			-	0.164		0.160		0.160		-		0.160	Continuing	Continuing	N/A

Remarks N/A															
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	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	5.095	4.334	5.424	-	5.424	Continuing	Continuing	N/A

Remarks									
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force										Date: February 2019			
Appropriation/Budget Activity					R-1 Program Element (Number/Name)					Project (Number/Name)			
3600 / 7					PE 0401134F / Large Aircraft IR Countermeasures (LAIRCM)					674942 / Large Aircraft Infrared Counter Measures (LAIRCM)			

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
LAIRCM																												
Threat Analysis																												
Modeling , Simulation, and Emulation Testing																												
Virtual SIL Development																												
Studies and Analysis																												
Hardware/Software/Firmware Upgrades																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0401134F / <i>Large Aircraft IR Countermeasures (LAIRCM)</i>	Project (Number/Name) 674942 / <i>Large Aircraft Infrared Counter Measures (LAIRCM)</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>LAIRCM</i>				
Threat Analysis	1	2018	4	2022
Modeling , Simulation, and Emulation Testing	1	2018	4	2022
Virtual SIL Development	1	2018	4	2022
Studies and Analysis	1	2018	4	2022
Hardware/Software/Firmware Upgrades	2	2020	4	2022