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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2017 Air Force **Date:** February 2016

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 7: Operational Systems Development</i>	<b>R-1 Program Element (Number/Name)</b> PE 0401134F / <i>Large Aircraft IR Countermeasures (LAIRCM)</i>
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COST (\$ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
Total Program Element	-	4.672	6.802	5.166	0.000	5.166	5.267	5.365	5.462	5.559	Continuing	Continuing
674942: <i>Large Aircraft Infrared Counter Measures (LAIRCM)</i>	-	4.672	6.802	5.166	0.000	5.166	5.267	5.365	5.462	5.559	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 (CIU) 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 was first fielded on the C-17 aircraft.

The baseline program development is complete and consists of the small laser transmitter assembly (SLTA), ultra-violet MWS, processor, CIU and a repeater (on some aircraft) to meet the need for advanced IR countermeasures. The Guardian Laser Transmitter Assembly (GLTA) is an upgrade to the baseline transmitter equipment to improve reliability, enhance performance, address obsolescence issues, reduce mass and improve overall functionality. First production GLTA delivery occurred in June 08.

Development of the Next Generation Missile Warning System (NexGen MWS) is complete and includes new hardware that improves capability. Baseline equipment (ultra-violet MWS) will be retrofitted with the NexGen MWS as it becomes available. Developmental test/operational test (DT/OT) was conducted in FY10 with initial operational test and evaluation (IOT&E) in FY11.

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 Test; 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 IRCM.

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<p>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 infrared countermeasures (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.</p> <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.          -----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.          -----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.          -----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.</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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>
Previous President's Budget	4.672	6.802	5.845	0.000	5.845
Current President's Budget	4.672	6.802	5.166	0.000	5.166
Total Adjustments	0.000	0.000	-0.679	0.000	-0.679
• 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	-0.679	0.000	-0.679
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>
<b>Title:</b> Threat Analysis	1.655	2.655	2.055	-	2.055
<b>Description:</b> 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.					
<b>FY 2015 Accomplishments:</b>					
Worked on Threat analysis in the Guided Weapon Evaluation Facility (GWEF),and Dynamic Infrared Missile Evaluation Facility (DIME)Lab.					
GWEF:					
Evaluated Hardware In The Loop (HITL) effectiveness for LAIRCM against a new threat; Modernized radiometer calibration station for improved field radiometer accuracy; and Improved seeker rate table characterization capability.					
DIME:					
Evaluated "hybrid" jam code; Provided characterization of the LAIRCM laser; Evaluated new laser technology for possible future uses; Completed development of a threat hybrid simulation; Verified operation of a threat modified to support static testing; Collected test data of modified threat to support digital model development;					

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<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>					
completed initial characterization and countermeasure testing of the threat system; and Developed/validated the MOSAIC IRCM digital simulation system.					
<b>FY 2016 Plans:</b> Continue to work on Threat analysis in the GWEF, to include purchase of assets, and DIME Lab.					
<b>FY 2017 Base Plans:</b> Continue to work on Threat analysis in the GWEF, to include purchase of assets, and DIME Lab.					
<b>Title:</b> Modeling, Simulation and Emulation Testing					
<b>Description:</b> Activities that verify and validate the information obtained from threat analysis activities.					
<b>FY 2015 Accomplishments:</b> Completed numerous Modeling, Simulation and Emulation Tests. This is a continued effort from LAIRCM Development in previous years.					
<b>FY 2016 Plans:</b> Continue work in Modeling, Simulation and Emulation Tests. This is a continued effort from LAIRCM Development in previous years.					
<b>FY 2017 Base Plans:</b> Will continue to work in Modeling, Simulation and Emulation Tests. This is a continued effort from LAIRCM Development in previous years.					
<b>Title:</b> Hardware/Software/Firmware Upgrades					
<b>Description:</b> 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.					
<b>FY 2015 Accomplishments:</b> N/A					
<b>FY 2016 Plans:</b>					
	<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>
	0.886	0.767	0.911	-	0.911
	0.000	0.121	0.207	-	0.207



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<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>cost, enhance production efficiency, and improve life cycle costs through increased reliability and reduced repair and return cost.</p> <p><b>FY 2015 Accomplishments:</b> Continued the Product Support (PS) Business Case Analysis (BCA), which is a regulatory requirement to review and validate the program's overarching sustainment strategy. Initiated the Best Value IR Sensor Study which provides Headquarters Air Mobility Command (HQ AMC) with an IR sensor comparison of the current IR sensor and the newly developed advanced threat warning (ATW) sensor; purpose of analysis is to determine the best value IR sensor solution. Initiated the Virtual SIL Implementation Study which refines the virtual SIL concept into an executable program; deliverables include an implementation plan (allowing for the delivery of incremental capability) and a cost estimate. Virtual SIL reduces the amount of government furnished equipment needed for lab integration efforts and reduces overall life cycle costs associated with SIL activity.</p> <p><b>FY 2016 Plans:</b> Continuation of the PSBCA, which is a regulatory requirement to review and validate the program's overarching sustainment strategy to be completed by the end of the FY. Continue the Best Value IR Sensor Study which provides Headquarters Air Mobility Command (HQ AMC) with an IR sensor comparison of the current IR sensor and the newly developed advanced threat warning (ATW) sensor; purpose of analysis is to determine the best value IR sensor solution to be completed by the end of the FY.</p> <p><b>FY 2017 Base Plans:</b> Will initiate an engineering focused LAIRCM system Critical Program Information (CPI) Assessment and Review Study.</p>					
<b>Accomplishments/Planned Programs Subtotals</b>	4.672	6.802	5.166	-	5.166

<b>D. Other Program Funding Summary (\$ in Millions)</b>											
Line Item	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
• APAF: BA05: Line Item # LAIRCM: <i>Large Aircraft Infrared Countermeasures</i>	13.159	84.335	0.000	135.801	135.801	0.000	0.000	0.000	0.000	-	-

**Remarks**

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<b>E. Acquisition Strategy</b> 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) and the 782d Test Squadron to conduct threat analysis research and Modeling, Simulation, and Emulation Testing. AFRL contracts with the Guided Weapon Evaluation Facility (GWEF) to provide 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 existing LAIRCM contract may be used to award the various study efforts.		
<b>F. 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 2017 Air Force** **Date:** February 2016

<b>Appropriation/Budget Activity</b> 3600 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0401134F / Large Aircraft IR Countermeasures (LAIRCM)	<b>Project (Number/Name)</b> 674942 / Large Aircraft Infrared Counter Measures (LAIRCM)
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<b>Product Development (\$ in Millions)</b>				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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			
LAIRCM ETA Hardware/ Software/Firmware Upgrades	SS/TBD	NGC : Rolling Meadows, IL	-	0.000		0.121	Jun 2016	0.207	Jun 2017	0.000		0.207	Continuing	Continuing	TBD
LAIRCM ETA Virtual SIL Development	SS/TBD	NGC : Rolling Meadows, IL	-	0.000		2.766	Aug 2016	1.429	Aug 2017	0.000		1.429	Continuing	Continuing	TBD
LAIRCM ETA Studies and Analysis	Various	Various : Various	-	2.131	Feb 2015	0.493	Nov 2015	0.564	Mar 2017	0.000		0.564	Continuing	Continuing	TBD
<b>Subtotal</b>			-	2.131		3.380		2.200		0.000		2.200	-	-	-

<b>Support (\$ in Millions)</b>				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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			
<b>Subtotal</b>			-	-		-		-		-		-	-	-	-

<b>Test and Evaluation (\$ in Millions)</b>				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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			
LAIRCM ETA Threat Analysis/Guided Weapon Evaluation Facility	PO	GWEF : Eglin AFB, FL	-	0.700	Oct 2014	1.030	Jan 2016	1.029	Jan 2017	0.000		1.029	Continuing	Continuing	TBD
LAIRCM ETA Modeling, Simulation and Emulation Test	MIPR	AFRL/Ryf-Omni Sentinel : WPAFB, OH	-	0.361	Apr 2015	0.627	Jan 2016	0.668	Jan 2017	0.000		0.668	Continuing	Continuing	TBD
LAIRCM ETA Threat Analysis/Dynamic Infrared Missile Evaluation (DIME)	MIPR	AFRL/Ryf-DIME : WPAFB, OH	-	0.800	Jun 2015	1.120	Jan 2016	1.010	Jan 2017	0.000		1.010	Continuing	Continuing	TBD
LAIRCM ETA Threat Analysis/Repair of Test Assets	SS/T&M	Northrup Grumman : Rolling Meadows, IL	-	0.155	Jul 2015	0.080	Mar 2016	0.100	Mar 2017	0.000		0.100	Continuing	Continuing	TBD

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Air Force** **Date:** February 2016

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<b>Test and Evaluation (\$ in Millions)</b>				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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			
LAIRCM ETA Threat Analysis/Telemetry Upgrade	PO	46 TS/OGEX : Eglin AFB, FL	-	0.000		0.225	Mar 2016	0.000		0.000		0.000	Continuing	Continuing	-
LAIRCM ETA Threat Analysis/Performance Analysis	TBD	TBD : TBD	-	0.000		0.200	Apr 2016	0.000		0.000		0.000	Continuing	Continuing	-
<b>Subtotal</b>			-	2.016		3.282		2.807		0.000		2.807	-	-	-

<b>Management Services (\$ in Millions)</b>				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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			
LAIRCM ETA Government Travel	Various	Government Employees : WPAFB, OH	-	0.154		0.140		0.159		0.000		0.159	Continuing	Continuing	TBD
LAIRCM ETA A&AS	C/CPFF	COLSA Corp. : Huntsville, AL	-	0.371	Mar 2015	0.000		0.000		0.000		0.000	Continuing	Continuing	TBD
<b>Subtotal</b>			-	0.525		0.140		0.159		0.000		0.159	-	-	-

**Remarks**  
LAIRCM ETA A&AS: FY16 and FY17 is being funded by APAF, LAIRCM: Large Aircraft Infrared Countermeasures.

	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
<b>Project Cost Totals</b>	-	4.672	6.802	5.166	0.000	5.166	-	-	-

**Remarks**



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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2017 Air Force		<b>Date:</b> February 2016
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Development Program and Remaining Integration	1	2015	2	2015
Threat Analysis	1	2015	4	2021
Modeling , Simulation, and Emulation Testing	1	2015	4	2021
Studies and Analysis: Product Support BCA	1	2015	2	2016
Studies and Analysis: Best Value IR Sensor Study	1	2016	3	2016
Studies and Analysis: Virtual SIL Implementation Study	4	2015	1	2016
Studies and Analysis: Critical Program Information Assessment and Review	2	2017	4	2017
Virtual SIL Development	4	2016	4	2018
Hardware/Software/Firmware Upgrades	3	2016	4	2021

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