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

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)					R-1 Program Element (Number/Name) PE 0603327A / Air and Missile Defense Systems Engineering							
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
Total Program Element	-	6.100	57.649	42.802	1.000	43.802	43.273	42.642	35.597	29.108	0.000	258.171
FG9: Air and Missile Defense (AMD) Electronic Warfare	-	6.100	57.649	42.802	1.000	43.802	43.273	42.642	35.597	29.108	0.000	258.171

A. Mission Description and Budget Item Justification

Funding in this program supports efforts to assess Army Air and Missile Defense (AMD) performance and system vulnerabilities to threats from Cyber and Electromagnetic Activities (CEMA). Army AMD sensors, Integrated Air and Missile Defense (IAMD) Battle Command System (IBCS) Command and Control (C2), Radio Frequency (RF) data and voice networks will be assessed against current and postulated threat systems and techniques. Potential solutions developed by the Army, other Services, and Defense agencies (for example Missile Defense Agency) to close identified gaps will be demonstrated and assessed in live and simulated CEMA environments. Assessment events will be conducted approximately every two years. Analysis of results and implementation of potential solutions will occur between events using system-specific funding. The proposed solutions will then be assessed at the next event after implementation.

Included in this line are funds to plan and execute periodic CEMA activities with Army AMD systems, to include other Service and other Agency AMD systems as appropriate. Upon completion of CEMA demonstration analyses, create concepts for mitigating Army AMD sensor, C2, and RF data link vulnerabilities. Efforts in this program will also develop tools for use by Army AMD systems to improve overall system performance in contested environments, to include effects-based CEMA Modeling and Simulation (M&S) to assess Army AMD CEMA concepts in Hardware-In-The-Loop (HWIL) environment. Collaboration is required with United States Strategic Command (USSTRATCOM) Joint Electromagnetic Preparedness for Advanced Combat (JEPAC) to evaluate, modify, and field existing Army AMD EP Tactics, Techniques, and Procedures (TTPs) in a Joint environment. Additionally, there will be continual interface with intelligence communities to maintain cognizance of emerging CEMA threats and incorporate these threats in future CEMA demonstrations. An output from these activities will be development of a time-phased roadmap that identifies the investments needed to improve the CEMA capabilities of Army AMD sensors, C2, and RF data and voice networks.

Funds in this line will also be used to transition the Army Low-Cost Portable Surveillance (ALPS) sensor from Science and Technology (S&T) into an emerging Program of Record (PoR). Initially, prototype systems will be provided to meet Combatant Commands identified needs and to conduct an operational assessment. This program will also develop and integrate ALPS into the Army Integrated Air & Missile Defense (AIAMD) Battle Command System (IBCS) to improve the CEMA posture of the Army's AMD architecture. The objectives of this effort are to prove component and subsystem maturity in a system-of-systems environment and to reduce subsequent PoR integration risk.

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B. Program Change Summary (\$ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	14.200	48.949	35.795	-	35.795
Current President's Budget	6.100	57.649	42.802	1.000	43.802
Total Adjustments	-8.100	8.700	7.007	1.000	8.007
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	8.700			
• Congressional Directed Transfers	-	-			
• Reprogrammings	6.100	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	7.007	1.000	8.007
• RAA not appropriated	-14.200	-	-	-	-
Change Summary Explanation					
The FY 2017 net change of -\$8.100 million includes: -\$14.200 million in the March 2017 Request for Additional Appropriations but not funded in the FY 2017 Appropriations Act and +\$6.100 million approved in the Missile Defeat Enhancements Above Threshold Reprogramming Action.					
FY18 Congressional Add of \$8.7M for Missile Defeat and Defense Enhancements.					
The FY 2019 Base +\$7.007 million includes: -\$0.135 million for CEMA and +\$7.142 million for ALPS in support of the Asia Pacific Security Initiative.					
The FY 2019 OCO funding is for ALPS.					

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Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603327A / Air and Missile Defense Systems Engineering				Project (Number/Name) FG9 / Air and Missile Defense (AMD) Electronic Warfare			
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
FG9: Air and Missile Defense (AMD) Electronic Warfare	-	6.100	57.649	42.802	1.000	43.802	43.273	42.642	35.597	29.108	0.000	258.171
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding in this program supports efforts to assess Army Air and Missile Defense (AMD) performance and system vulnerabilities to threats from Cyber and Electromagnetic Activities (CEMA). Army AMD sensors, Integrated Air and Missile Defense (IAMD) Battle Command System (IBCS) Command and Control (C2), Radio Frequency (RF) data and voice networks will be assessed against current and postulated threat systems and techniques. Potential solutions developed by the Army, other Services, and Defense agencies (for example Missile Defense Agency) to close identified gaps will be demonstrated and assessed in live and simulated CEMA environments. Assessment events will be conducted approximately every two years. Analysis of results and implementation of potential solutions will occur between events using system-specific funding. The proposed solutions will then be assessed at the next event after implementation.

Included in this line are funds to plan and execute periodic CEMA activities with Army AMD systems, to include other Service and other Agency AMD systems as appropriate. Upon completion of CEMA demonstration analyses, create concepts for mitigating Army AMD sensor, C2, and RF data link vulnerabilities. Efforts in this program will also develop tools for use by Army AMD systems to improve overall system performance in contested environments, to include effects-based CEMA Modeling and Simulation (M&S) to assess Army AMD CEMA concepts in Hardware-In-The-Loop (HWIL) environment. Collaboration is required with United States Strategic Command (USSTRATCOM) Joint Electromagnetic Preparedness for Advanced Combat (JEPAC) to evaluate, modify, and field existing Army AMD EP Tactics, Techniques, and Procedures (TTPs) in a Joint environment. Additionally, there will be continual interface with intelligence communities to maintain cognizance of emerging CEMA threats and incorporate these threats in future CEMA demonstrations. An output from these activities will be development of a time-phased roadmap that identifies the investments needed to improve the CEMA capabilities of Army AMD sensors, C2, and RF data and voice networks.

Funds in this line will also be used to transition the Army Low-Cost Portable Surveillance (ALPS) sensor from Science and Technology (S&T) into an emerging Program of Record (PoR). Initially, prototype systems will be provided to meet Combatant Commands' identified needs and to conduct an operational assessment. This program will also develop and integrate ALPS into the Army Integrated Air & Missile Defense (AIAMD) Battle Command System (IBCS) to improve the CEMA posture of the Army's AMD architecture. The objectives of this effort are to prove component and subsystem maturity in a system-of-systems environment and to reduce subsequent PoR integration risk.

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

	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Advanced Electronic Protection Enhancements and ALPS Development/Integration	6.100	57.649	42.802	1.000	43.802
Description: Provides Cyber and Electromagnetic Activities (CEMA) planning, conducts CEMA demonstrations and post-mission analysis, and develop/integrate Army Low-Cost Portable Surveillance (ALPS).					

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B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
<p>FY 2018 Plans: Funding is provided for additional analysis of the P-11 event output, along with initial planning and preparation for the P-12 event. Funding will also be used to continue the Cyber and Electromagnetic Activities (CEMA) roadmap and strategy that ensures coordination and execution of prioritized goals. Virtualize Integrated Air and Missile Defense (IAMD) and PATRIOT components, validate the models, and assess them in a contested environment. Begin virtualization of additional IAMD sensors and launchers. Continue ALPS development and integration of ALPS into the Army Air and Missile Defense (AMD) architecture. ALPS prototype systems will be acquired and deployed to address emergency warfighting requirements in support of an Operational Needs Statement as identified in the FY2018 Missile Defeat and Defense Enhancements Budget Amendment.</p> <p>FY 2019 Base Plans: Funding is provided for continued planning and preparation and to conduct the P-12 event. Funding will also be used to continue the Cyber and Electromagnetic Activities (CEMA) roadmap and strategy that ensures coordination and execution of prioritized goals. Virtualize IAMD and PATRIOT components, validate the models, and assess them in a contested environment. Continue virtualization of additional IAMD sensors and launchers. Continue ALPS development and integration of ALPS into the Army AMD architecture.</p> <p>FY 2019 OCO Plans: Funds will be used to conduct an operational assessment of prototype systems in support of a Combatant Command identified need. The operational assessment will be used to evaluate the performance of the fielded prototypes to inform and reduce risk for transition to production and fielding under the traditional acquisition system.</p> <p>FY 2018 to FY 2019 Increase/Decrease Statement: The net \$5.647 million reduction from FY 2018 to FY 2019 is primarily based on: a \$14.5 million OCO reduction; an ALPS increase, mostly driven by additional funding in support of the Asia Pacific Security Initiative; and a reduction in assumed inflation.</p>						
Accomplishments/Planned Programs Subtotals		6.100	57.649	42.802	1.000	43.802
C. Other Program Funding Summary (\$ in Millions)						
N/A						
Remarks						
Not applicable for this item.						

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D. Acquisition Strategy <p>Assessment events will be conducted approximately every two years in live and simulated CEMA environments. In addition to government planning and conduct of assessments, funding will also be provided through various contracts for subject matter expertise.</p> <p>ALPS will utilize an existing Defense Ordnance Technology Consortium (DOTC) Section 845 Other Transaction Authority (OTA) agreement to develop and integrate prototypes in the Army AMD architecture. An operational assessment will be used to refine ALPS requirements and assess the longer-term strategy.</p>		
E. Performance Metrics N/A		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army												Date: February 2018			
Appropriation/Budget Activity 2040 / 4						R-1 Program Element (Number/Name) PE 0603327A / Air and Missile Defense Systems Engineering						Project (Number/Name) FG9 / Air and Missile Defense (AMD) Electronic Warfare			
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
Government Program Management	Various	Various : Various	-	-		2.831	Nov 2017	1.688	Nov 2018	-		1.688	Continuing	Continuing	Continuing
Subtotal			-	-		2.831		1.688		-		1.688	Continuing	Continuing	N/A
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
System Integration Assessment	Various	Various : Various	-	-		1.538	Dec 2017	4.850	Nov 2018	-		4.850	Continuing	Continuing	Continuing
ALPS Development/ Integration	Various	Various : Various	-	6.100	Nov 2017	33.741	Jan 2018	20.174	Jan 2019	1.000	Jan 2019	21.174	Continuing	Continuing	Continuing
Subtotal			-	6.100		35.279		25.024		1.000		26.024	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
Component Assessments & Research and Trade Studies	Various	Various : Various	-	-		15.339	Feb 2018	6.150	Feb 2019	-		6.150	Continuing	Continuing	Continuing
Subtotal			-	-		15.339		6.150		-		6.150	Continuing	Continuing	N/A
Test and Evaluation (\$ 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
Demonstration Planning and Execution	Various	Various : Various	-	-		4.200	Nov 2017	9.940	Nov 2018	-		9.940	Continuing	Continuing	Continuing
Subtotal			-	-		4.200		9.940		-		9.940	Continuing	Continuing	N/A

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			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			-	6.100		57.649		42.802		1.000		43.802	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2019 Army			Date: February 2018		
Appropriation/Budget Activity 2040 / 4		R-1 Program Element (Number/Name) PE 0603327A / Air and Missile Defense Systems Engineering		Project (Number/Name) FG9 / Air and Missile Defense (AMD) Electronic Warfare	

Event Name	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
P-11 Demonstration Planning Efforts																												
P-11 Demonstration																												
P-11 Analysis Efforts, Trade Studies, and Implementation																												
P-12 Demonstration Planning Efforts																												
P-12 Demonstration																												
P-12 Analysis Efforts, Trade Studies, and Implementation																												
P-13 Demonstration Planning Efforts																												
P-13 Demonstration																												
P-13 Analysis Effort, Trade Studies, and Implementation																												
P-14 Demonstration Planning Efforts																												
ALPS Prototype Development and Integration																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603327A / Air and Missile Defense Systems Engineering	Project (Number/Name) FG9 / Air and Missile Defense (AMD) Electronic Warfare	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
P-11 Demonstration Planning Efforts	1	2017	1	2018
P-11 Demonstration	2	2018	3	2018
P-11 Analysis Efforts, Trade Studies, and Implementation	3	2018	1	2019
P-12 Demonstration Planning Efforts	3	2018	2	2019
P-12 Demonstration	3	2019	4	2019
P-12 Analysis Efforts, Trade Studies, and Implementation	1	2020	4	2020
P-13 Demonstration Planning Efforts	4	2020	2	2021
P-13 Demonstration	3	2021	3	2021
P-13 Analysis Effort, Trade Studies, and Implementation	4	2021	2	2022
P-14 Demonstration Planning Efforts	1	2022	4	2022
ALPS Prototype Development and Integration	4	2017	4	2023