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

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</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	-	15.294	34.569	53.332	-	53.332	25.950	41.477	23.566	33.477	Continuing	Continuing
126: <i>FAAD C2 ED</i>	-	0.000	0.000	17.076	-	17.076	5.809	21.819	5.828	21.826	Continuing	Continuing
146: <i>Air & Msl Defense Planning Control Sys</i>	-	13.018	15.757	15.561	-	15.561	15.914	16.108	14.294	8.325	Continuing	Continuing
149: <i>Counter-Rockets, Artillery & Mortar</i>	-	2.276	18.812	20.695	-	20.695	4.227	3.550	3.444	3.326	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Advanced Electronic Protection Enhancement (AEPE) Program funds efforts to assess and initiate development of solutions to Army Air and Missile Defense (AMD) vulnerabilities from Advanced Electronic Attack (AEA). Army AMD sensors, Integrated Air and Missile Defense (IAMD) Battle Command System (IBCS) Command and Control (C2), and Radio Frequency (RF) data and voice networks will be assessed against current and postulated AEA systems and techniques. Potential Electronic Protection (EP) solutions developed by the Army will be demonstrated and assessed in live and simulated AEA environments. Similarly, EP solutions developed by the Joint services and other Agencies (e.g., the Missile Defense Agency) will also be assessed for potential incorporation into Army AMD systems.

Note: AEPE funds transitioned from APE 655457 DU4 to APE 0604741A, Proj. 126, to respond to an OSD directive. AEPE is a new start in FY 2017. The last funding associated with AEPE was in FY 2013. The AEPE effort crosses all AMD System efforts of which only a portion is Air Defense Command and Control.

The Air and Missile Defense Planning and Control System (AMDPCS) is an Army Objective Force System that provides integration of Air and Missile Defense (AMD) operations at all echelons. AMDPCS systems are deployed with Air Defense Artillery (ADA) brigades, Army Air and Missile Defense Commands (AAMDCs), and Air Defense and Airspace Management (ADAM) Cells at the Brigade Combat Teams (BCT's), Multi Functional Support Brigades and Divisions/Corps. AMDPCS systems also provide air defense capabilities to Homeland Defense systems. ADAM Cells provide the Commander at BCTs, Brigades and Divisions with air defense situational awareness and airspace management capabilities. They also provide the interoperability link with Joint, multinational and coalition forces. AMDPCS components are vital in the transformation of ADA units and the activation of the Air & Missile Defense (AMD) Battalions. AMDPCS has three major components: (1) The Air and Missile Defense Workstation (AMDWS) is an automated defense and staff planning tool that displays the common tactical and operational 3-dimensional air picture. AMDWS is the air picture provider for the Army, producing an integrated and correlated air picture at all tactical levels and locations. AMDWS is also an integral component of Integrated Base Defense. AMDWS provides an interoperability link to multinational air defense forces; (2) The Air Defense System Integrator (ADSI) is a communications data link processor and display system that provides near-real time, 3-dimensional, joint airspace situational awareness and fire direction command and control for AMD forces; (3) The Army Air Defense shelter configurations use automated data processing equipment, tactical communications, Common Hardware Systems, standard vehicles and tactical power to provide AMD unit commanders and staffs with the capabilities to plan missions, direct forces, and control the airspace.

The Counter-Rocket, Artillery, Mortar (C-RAM) system-of-systems (SoS) is an evolutionary, non-developmental program that detects RAM launches; provides localized warning to the defended area, with sufficient time for personnel to take appropriate action; intercepts rounds in flight, thus preventing damage to ground forces or

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facilities; and enhances response to and defeat of enemy forces. The C-RAM capability is comprised of a combination of multi-service fielded and non-developmental item (NDI) sensors, command and control (C2) equipment, warning systems, and a modified U.S. Navy intercept system (Land-based Phalanx Weapon System (LPWS)), with a commercial off-the-shelf (COTS) wireless local area network. The Forward Area Air Defense Command and Control (FAAD C2) system, also under the management of the C-RAM Program Directorate, has been enhanced to integrate the sensors, weapons, and warning systems to provide C2 for the C-RAM SoS. The C-RAM SoS capability is currently deployed at multiple sites in Afghanistan, Iraq, and Egypt, providing correlated air and ground pictures, linking units to the Army Mission Command and the Joint Defense Network, and using various forms of communications to provide situational awareness and exchange of timely and accurate information to synchronize and optimize automated Shape, Sense, Warn, Intercept, Respond, and Protect decisions.

Multiple acquisition efforts are associated with the C-RAM program, including C-RAM Intercept, which fields existing LPWS guns to two Indirect Fire Protection Capability (IFPC)/Avenger composite Battalions, and RAM Warn, a horizontal technology insertion, using current C-RAM warning capability to provide early, localized warning to all Maneuver Brigade Combat Teams (BCT).

B. Program Change Summary (\$ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	15.898	24.569	27.131	-	27.131
Current President's Budget	15.294	34.569	53.332	-	53.332
Total Adjustments	-0.604	10.000	26.201	-	26.201
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	10.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-0.604	-	26.201	-	26.201

Change Summary Explanation

FY16 funding increase of \$10.000 million is a Congressional add to increase the overall effectiveness of the C-RAM system-of-systems through the integration of sensor communications and legacy systems and the development and integration of C-RAM network security enhancements.

FY17 funding increase of \$26.201 million includes \$17.076 million of AEPE funds transitioned from APE 655457 DU4 to APE 0604741A, Proj. 126, to respond to an OSD directive. The remainder of the increase supports completion of an LPWS cruise missile capability study and modification development effort.

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army										Date: February 2016		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>				Project (Number/Name) 126 / <i>FAAD C2 ED</i>			
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
126: <i>FAAD C2 ED</i>	-	0.000	0.000	17.076	-	17.076	5.809	21.819	5.828	21.826	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Advanced Electronic Protection Enhancements (AEPE) funds transitioned from APE 655457 DU4 to respond to OSD directive. AEPE is a new start in FY 2017. The last funding associated with AEPE was in FY 2013.

A. Mission Description and Budget Item Justification

The Advanced Electronic Protection Enhancement (AEPE) Program funds efforts to assess and initiate development of solutions to Army Air and Missile Defense (AMD) vulnerabilities from Advanced Electronic Attack (AEA). Army AMD sensors, Integrated Air and Missile Defense (IAMD) Battle Command System (IBCS) Command and Control (C2), and Radio Frequency (RF) data and voice networks will be assessed against current and postulated AEA systems and techniques. Potential Electronic Protection (EP) solutions developed by the Army will be demonstrated and assessed in live and simulated AEA environments. Similarly, EP solutions developed by the Joint services and other Agencies (e.g., the Missile Defense Agency) will also be assessed for potential incorporation into Army AMD systems.

The initial assessment event was conducted in 2QFY15. Subsequent events will be conducted approximately every two (2) years. Analysis and implementation that provide AEA solutions will occur between events and will be assessed at the next event after implementation.

The following tasks were developed based on previous AEPE demonstration results and the following planned activities will assess the AEA impacts on AMD components and development of countermeasures. The tasks for AEPE are: (1) Plan and execute periodic AEPE demonstrations with Army AMD systems and perform post-demonstration analysis. Integrate Joint service and other Agency AMD systems into AEPE demonstrations as appropriate. (2) Upon completion of AEPE demonstration analyses, create EP concepts to mitigate Army AMD sensor, C2, and RF data link vulnerabilities. (3) Develop EP tools for use by Army AMD systems to improve overall system performance in AEA environments. (4) Develop effects-based AEA Modeling and Simulation (M&S) to assess Army AMD EP concepts in Hardware-In-The-Loop (HWIL) environment. (5) Continue to collaborate 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. Evaluate and modify applicable Joint EP TTPs for use in Army AMD systems. (6) Continually interface with intelligence communities to maintain cognizance of emerging AEA threats and incorporate these threats in future AEPE demonstrations. (7) Develop a time-phased EP roadmap that identifies the investments needed to improve the EP capabilities of Army AMD sensors, C2, and RF data and voice networks.

The AEPE effort crosses all AMD System efforts of which only a portion is Air Defense Command and Control.

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

	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Title: Advanced Electronic Protection Enhancements	-	-	17.076	-	17.076

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>	Project (Number/Name) 126 / <i>FAAD C2 ED</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Description: Funding is provided for conduct of AEPE planning efforts, conduct of demonstrations and post-mission analysis.					
FY 2017 Base Plans: Funding is provided for conduct of AEPE planning efforts, conduct of demonstrations and post-mission analysis.					
Accomplishments/Planned Programs Subtotals	-	-	17.076	-	17.076

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

Not applicable for this item.

D. Acquisition Strategy

Not applicable for this item.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Army												Date: February 2016				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)								
2040 / 5				PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev				126 / FAAD C2 ED								
Management Services (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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	
Other Government Agencies & Government Program Management	Various	Various : Various	2.252	-		-		0.692		-		0.692	Continuing	Continuing	Continuing	
Subtotal			2.252	-		-		0.692		-		0.692	-	-	-	
Product Development (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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	1.218	-		-		2.013		-		2.013	Continuing	Continuing	Continuing	
Concept Solutions	Various	Various : Various	1.531	-		-		3.905		-		3.905	Continuing	Continuing	Continuing	
Subtotal			2.749	-		-		5.918		-		5.918	-	-	-	
Support (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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	5.137	-		-		3.918		-		3.918	Continuing	Continuing	Continuing	
Modeling and Simulation	Various	Various : Various	3.377	-		-		-		-		-	Continuing	Continuing	Continuing	
Subtotal			8.514	-		-		3.918		-		3.918	-	-	-	
Test and Evaluation (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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	0.000	-		-		6.548		-		6.548	Continuing	Continuing	Continuing	
Subtotal			0.000	-		-		6.548		-		6.548	-	-	-	

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Exhibit R-4, RDT&E Schedule Profile: PB 2017 Army **Date:** February 2016

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>	Project (Number/Name) 126 / <i>FAAD C2 ED</i>
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Event Name	FY 2015				FY 2016				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021							
	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 Efforts, Trade Studies, and Implementation																																

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Exhibit R-4A, RDT&E Schedule Details: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>	Project (Number/Name) 126 / <i>FAAD C2 ED</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
P-11 Demonstration Planning Efforts	1	2017	4	2017
P-11 Demonstration	4	2017	1	2018
P-11 Analysis Efforts, Trade Studies, and Implementation	2	2018	4	2018
P-12 Demonstration Planning Efforts	3	2018	3	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 Efforts, Trade Studies, and Implementation	4	2021	4	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army										Date: February 2016		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev				Project (Number/Name) 146 / Air & Msl Defense Planning Control Sys			
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
146: Air & Msl Defense Planning Control Sys	-	13.018	15.757	15.561	-	15.561	15.914	16.108	14.294	8.325	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Air and Missile Defense Planning and Control System (AMDPCS) is an Army Objective Force System that provides integration of Air and Missile Defense (AMD) operations at all echelons. AMDPCS systems are deployed with Air Defense Artillery (ADA) brigades, Army Air and Missile Defense Commands (AAMDCs), and Air Defense and Airspace Management (ADAM) Cells at the Brigade Combat Teams (BCT's), Multi Functional Support Brigades and Divisions/Corps. AMDPCS systems also provide air defense capabilities to Homeland Defense systems. ADAM Cells provide the Commander at BCTs, Brigades and Divisions with air defense situational awareness and airspace management capabilities. They also provide the interoperability link with Joint, multinational and coalition forces. AMDPCS components are vital in the transformation of ADA units and the activation of the Air & Missile Defense (AMD) Battalions. AMDPCS has three major components: (1) The Air and Missile Defense Workstation (AMDWS) is an automated defense and staff planning tool that displays the common tactical and operational 3-dimensional air picture. AMDWS is the air picture provider for the Army, producing an integrated and correlated air picture at all tactical levels and locations. AMDWS is also an integral component of Integrated Base Defense. AMDWS provides an interoperability link to multinational air defense forces; (2) The Air Defense System Integrator (ADSI) is a communications data link processor and display system that provides near-real time, 3-dimensional, joint airspace situational awareness and fire direction command and control for AMD forces; (3) The Army Air Defense shelter configurations use automated data processing equipment, tactical communications, Common Hardware Systems, standard vehicles and tactical power to provide AMD unit commanders and staffs with the capabilities to plan missions, direct forces, and control the airspace.

FY17 funds the development, software engineering, testing and certification of the AMDWS, ADSI, and sheltered subsystem software as described below.

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

	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Title: AMDWS Software Development	10.024	11.975	12.335	-	12.335
Description: Continue AMDWS development and support of LandWarNet as well as various Common Operating Environments (COEs). Complete AMDWS software engineering and development consistent with COE requirements, evolving the air and missile defense planning and control requirements to a net-centric environment, and fulfilling the air defense force operations capabilities identified in the AMD TRADOC capabilities requirement list. Virtualize AMDWS software development and rehost onto COE Real-Time Computing Environment common hardware systems. Support the evolving development of the Force Operations portion of the Integrated Air and Missile Defense (IAMD) System of Systems.					
FY 2015 Accomplishments:					

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>	Project (Number/Name) 146 / <i>Air & Msl Defense Planning Control Sys</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
<p>Continued AMDWS software engineering consistent with Capability Set 15-16 / COE v2 requirements. Continued to develop interfaces with IAMD systems. Support testing of defense design planning with C2BMC and THAAD. Maintain interconnectivity with PATRIOT. Develop Fires Gateway Modularization of AMDPCS External Interfaces and integrate it with IAMD.</p> <p>FY 2016 Plans: Begin AMDWS software engineering consistent with Capability Set 17-18 / COE v3 requirements. Support test of COE product. Work user requirements from 32nd, 94th, and 10th AAMDCs and ADA Brigades. Implement interface to the Cooperative Aircraft Surveillance System (CASS) in support of commercial aircraft de-confliction.</p> <p>FY 2017 Base Plans: Continue AMDWS software engineering consistent with Capability Set 17-18 / COE v3 requirements. Integrate COE AMDWS version, which is the initial Server-client Capability. Integrate the COE AMDWS with the ADAM. Update Air Force interfaces.</p>					
<p>Title: ADSI Software Engineering and Development</p> <p>Description: Continue ADSI software engineering and development in software versions 15, including testing and certification of capabilities for TacView Situational Awareness, with air control support, scenario generation and 3-dimensional capability across various tactical data links. The version 15 software upgrades the ADSI OS to use Windows 7 and Red Hat Linux.</p> <p>FY 2015 Accomplishments: Conducted Authority to Operate (ATO) and Army Interoperability Certification (AIC) of version 15.0 software. Continued to work virtual ADSI solution to keep ADSI common with COE software architecture strategy as a Real Time, Safety Critical, Embedded (RTSCE CE) system.</p> <p>FY 2016 Plans: Begin ADSI version 15.1 software development. Begin version 15.1 test activities. Complete implementation of baseline updates.</p> <p>FY 2017 Base Plans: Continue ADSI version 15.1 software development. Continue version 15.1 test activities, including certification.</p>	0.651	0.788	0.515	-	0.515
<p>Title: Engineering, Development, Test and Evaluation</p> <p>Description: Continued engineering, development, test and evaluation of the AMDPCS Family of Shelter (FoS) subsystems Objective configuration; continued evaluation and definitization of the AMDPCS tactical</p>	1.562	2.048	1.855	-	1.855

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army **Date:** February 2016

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev	Project (Number/Name) 146 / Air & Msl Defense Planning Control Sys
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C. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2015</u>	<u>FY 2016</u>	<u>FY 2017</u> <u>Base</u>	<u>FY 2017</u> <u>OCO</u>	<u>FY 2017</u> <u>Total</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• AD5070: AD5070, AMDPCS	27.374	28.176	54.376	69.958	124.334	17.005	17.960	6.366	6.951	Continuing	Continuing
• PE 0604741A, Proj 149: PE 0604741A, Proj 149, Counter-Rockets, Artillery & Mortar	2.276	18.812	20.695	-	20.695	4.227	3.550	3.444	3.326	Continuing	Continuing
• SSN H30503: SSN H30503, Rocket, Artillery, Mortar (RAM) Warn (Parent is IFPC Family of Systems: BZ0501)	27.652	42.458	25.410	4.270	29.680	11.380	3.472	-	-	0	114.642
• SSN H30504: SSN H30504, C-RAM Enhancements (Parent is IFPC Family of Systems: BZ0501)	40.644	18.221	23.017	-	23.017	-	-	-	-	0	81.882
• PE 06043019A, Proj DU3: PE 06043019A, Proj DU3, IFPC (FY12 PE0603305A IFPC II - Intercept)	92.475	155.361	-	-	-	40.003	80.004	12.004	12.006	Continuing	Continuing
• PE 0605457A, Proj S40: PE 0605457A, Proj S40, Army Integrated Air and Missile Defense (AIAMD)	147.250	220.075	252.811	-	252.811	169.070	152.942	32.914	34.447	Continuing	Continuing
• SSN BZ5075: SSN BZ5075, IAMD Battle Command System	-	20.917	204.969	-	204.969	287.220	372.916	440.567	439.780	Continuing	Continuing
• PE 060482A, Proj E10: PE 060482A, Proj E10, Sentinel	5.022	12.309	15.983	-	15.983	20.844	20.612	30.106	41.402	Continuing	Continuing

Remarks

This program is an integral part of the Army Integrated Air and Missile Defense (IAMD) architecture.

D. Acquisition Strategy

The acquisition strategy relies on non-development items (NDI) and evolutionary software development to rapidly meet the demands of air defense battle management command, control, communications, computers, and intelligence (BM/C4I) requirements and to keep pace with automated information technologies. The concept of evolutionary software development will be accomplished in a series of AMDWS and ADSI Block releases and upgrades. AMDPCS is being developed for both the Army's Active and Reserve components.

AMDWS is a prime component of C-RAM. It provides the Forward Operating Base (FOB) commander with clearance of fires display and enemy munitions flight paths.

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>	Project (Number/Name) 146 / <i>Air & Msl Defense Planning Control Sys</i>

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Army												Date: February 2016			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 5				PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev				146 / Air & Msl Defense Planning Control Sys							
Management Services (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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
Program Management Administration	Various	Various : Various	26.491	1.640	Dec 2014	1.757	Dec 2015	1.727	Dec 2017	-		1.727	Continuing	Continuing	0
Subtotal			26.491	1.640		1.757		1.727		-		1.727	-	-	0.000
Remarks															
Not Applicable															
Product Development (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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
AMDWS Software Development and Engineering	SS/CPFF	Northrop Grumman : Huntsville AL	110.804	9.951	Oct 2014	11.660	Oct 2015	11.604	Oct 2016	-		11.604	Continuing	Continuing	Continuing
ADSI Software Development and Engineering	SS/T&M	Ultra Electronics : Austin, TX	6.642	0.089	Feb 2015	0.112	Feb 2016	0.078	Feb 2017	-		0.078	Continuing	Continuing	Continuing
Developmental Engineering	Various	Various : Various	36.339	1.211	Dec 2014	2.071	Dec 2015	2.020	Dec 2016	-		2.020	Continuing	Continuing	Continuing
Subtotal			153.785	11.251		13.843		13.702		-		13.702	-	-	-
Test and Evaluation (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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
Certification/Testing	Various	JITC : Ft Huachuca, AZ	1.021	0.053	Feb 2015	0.073	Feb 2016	0.054	Feb 2017	-		0.054	Continuing	Continuing	Continuing
Interoperability Assessment	Various	CTSF : Ft Hood, TX	1.338	0.074	May 2015	0.084	May 2016	0.078	May 2017	-		0.078	Continuing	Continuing	Continuing
Subtotal			2.359	0.127		0.157		0.132		-		0.132	-	-	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Army							Date: February 2016						
Appropriation/Budget Activity 2040 / 5			R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev				Project (Number/Name) 146 / Air & Msl Defense Planning Control Sys						
	Prior Years	FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	182.635	13.018		15.757		15.561		-		15.561	-	-	-

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2017 Army **Date:** February 2016

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev	Project (Number/Name) 146 / Air & Msl Defense Planning Control Sys
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Event Name	FY 2015				FY 2016				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021			
	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
AMDWS Block IV Contract	AMDWS Block IV																											
AMDWS Block V Contract					AMDWS Contract																							
AMDWS Contract																												
AMDWS Software Block Development, Testing, Certification	AMDWS Software Block Testing (Includes Intra-Army Interoperability Cert)																											
AMDWS Capability Set and COE Development and Test	AMDWS CS & COE Development & Test																											
AMDWS AMD Interfaces: C2BMC, C2IS, C2AOS, AOC WS, Patriot, IB	C2BMC, C2IS, C2AOS, AOC WS, Patriot, IBCS, THAAD, C-RAM C2, TBMCS, COE, ABCS																											
ADSI Software Service Level Testing, Interoperability Certification	ADSI SW SLT, Interoperability Cert																											
COE ADAM Shelter in Army Warfighting Assessment (AWA) 16.1 DOT	AWA 16.1																											
AWA 17.1					17.1																							
AWA 18.1													18.1															
AWA 19.1																					19.1							
AWA 20.1																												
AWA 21.1																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev	Project (Number/Name) 146 / Air & Msl Defense Planning Control Sys

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
AMDWS Block IV Contract	2	2011	2	2016
AMDWS Block V Contract	2	2016	2	2021
AMDWS Contract	2	2021	2	2026
AMDWS Software Block Development, Testing, Certification	3	2007	4	2021
AMDWS Capability Set and COE Development and Test	1	2013	1	2022
AMDWS AMD Interfaces: C2BMC, C2IS, C2AOS, AOC WS, Patriot, IBCS, THAAD, C-RAM C2	4	2012	4	2021
ADSI Software Service Level Testing, Interoperability Certification	1	2005	4	2021
COE ADAM Shelter in Army Warfighting Assessment (AWA) 16.1 DOTMLPF Evaluation	4	2015	1	2016
AWA 17.1	4	2016	1	2017
AWA 18.1	4	2017	1	2018
AWA 19.1	4	2018	1	2019
AWA 20.1	4	2019	1	2020
AWA 21.1	4	2020	1	2021
AWA 22.1	4	2021	1	2022
NIE 16.2	2	2016	3	2016
NIE 17.2	2	2017	3	2017
NIE 18.2	2	2018	3	2018
NIE 19.2	2	2019	3	2019
NIE 20.2	2	2020	3	2020
NIE 21.2	2	2021	3	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army										Date: February 2016		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>				Project (Number/Name) 149 / <i>Counter-Rockets, Artillery & Mortar</i>			
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
149: <i>Counter-Rockets, Artillery & Mortar</i>	-	2.276	18.812	20.695	-	20.695	4.227	3.550	3.444	3.326	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Counter-Rocket, Artillery, Mortar (C-RAM) system-of-systems (SoS) is an evolutionary, non-developmental program that detects RAM launches; provides localized warning to the defended area, with sufficient time for personnel to take appropriate action; intercepts rounds in flight, thus preventing damage to ground forces or facilities; and enhances response to and defeat of enemy forces. The C-RAM capability is comprised of a combination of multi-service fielded and non-developmental item (NDI) sensors, command and control (C2) equipment, warning systems, and a modified U.S. Navy intercept system (Land-based Phalanx Weapon System (LPWS)), with a commercial off-the-shelf (COTS) wireless local area network. The Forward Area Air Defense Command and Control (FAAD C2) system, also under the management of the C-RAM Program Directorate, has been enhanced to integrate the sensors, weapons, and warning systems to provide C2 for the C-RAM SoS. The C-RAM SoS capability is currently deployed at multiple sites in Afghanistan, Iraq, and Egypt, providing correlated air and ground pictures, linking units to the Army Mission Command and the Joint Defense Network, and using various forms of communications to provide situational awareness and exchange of timely and accurate information to synchronize and optimize automated Shape, Sense, Warn, Intercept, Respond, and Protect decisions.

The deployment of the C-RAM SoS was accomplished through an incremental acquisition process driven by urgent operational needs, theater priorities, and emerging capability requirements to provide a counter-RAM capability to combat forces. The C-RAM SoS approach was initially validated by a Proof of Principle demonstration in December 2004 and has undergone more than 25 Army Test and Evaluation Command (ATEC)-supported operational assessments to incorporate multiple improvements in response to changes in threat tactics and lessons learned. C-RAM capabilities are currently deployed to locations in support of Operation Freedom's Sentinel (OFS), Operation Inherent Resolve (OIR), and Task Force Sinai (TFS). Continuing C-RAM SoS improvement efforts, required to meet emerging theater requirements, include C2 and LPWS software upgrades as well as integration and deployment of Ku band Radio Frequency System (KuRFS) radars for an enhanced detection capability against stressing threats. Base RDTE funding for FY 2015 and beyond supports maintenance of C-RAM C2 basic Air Defense functionality. Support of the existing C-RAM SoS capability deployed in theater has been through the Overseas Contingency Operations (OCO) process.

Recent directed enhancements to the C-RAM SoS capability included use of Army tactical communications rather than commercial systems; integration of Warn functionality into the C2 workstation to reduce complexity and footprint; and integration with Unmanned Aircraft Systems (UAS) Universal Ground Control Station (UGCS) for enhanced situational awareness, combat identification, and response options. FY16-17 enhancements include testing and upgrade of dynamic clearance of unplanned fires (DCUF) in conjunction with the Advanced Field Artillery Tactical Data System (AFATDS) V2 for rapid and enhanced response, integration of sensor communications and legacy systems, development and integration of C-RAM network security enhancements, and completion of an LPWS cruise missile capability study and modification development effort.

FY 2017 Base RDT&E dollars in the amount of \$20.695 million provide C-RAM C2 development and upgrades, including an automated unplanned fires clearance capability, as well as an LPWS cruise missile capability study and modification development.

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>	Project (Number/Name) 149 / <i>Counter-Rockets, Artillery & Mortar</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Funds DCUF participation within the Maneuver Fires Integration Experiment (MFI) for the purpose of demonstrating the effectiveness of the DCUF contribution to the Brigade Combat Team (BCT) warfight and informing the TRADOC requirements generation process. FY 2017 Base Plans: Complete DCUF software development and Materiel Release activities based on the DCUF requirements established during FY16.					
Title: C-RAM Capability Enhancements Description: Funds capability enhancements to increase the overall effectiveness of the C-RAM system-of-systems through the integration of sensor communications and legacy systems and the development and integration of C-RAM network security enhancements. Completes LPWS cruise missile capability study and modification development efforts. FY 2016 Plans: Integrate sensor communications and legacy systems. Develop and integrate C-RAM network security enhancements. FY 2017 Base Plans: Complete LPWS cruise missile capability study and modification development efforts.	-	10.000	9.529	-	9.529
Accomplishments/Planned Programs Subtotals	2.276	18.812	20.695	-	20.695

C. Other Program Funding Summary (\$ in Millions)											
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
• SSN H30503: <i>SSN H30503, Rocket, Artillery, Mortar (RAM) Warn (Parent is IFPC Family of Systems: BZ0501)</i>	27.652	42.458	25.410	4.270	29.680	11.380	3.472	-	-	0.000	114.642
• SSN H30504: <i>SSN H30504, C-RAM Enhancements (Parent is IFPC Family of Systems: BZ0501)</i>	40.644	18.221	23.017	-	23.017	-	-	-	-	0.000	81.882
• PE 0604741A, Proj 146: <i>PE 0604741A, Proj 146,</i>	13.018	15.757	15.561	-	15.561	15.914	16.108	14.294	8.325	Continuing	Continuing

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army **Date:** February 2016

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev	Project (Number/Name) 149 / Counter-Rockets, Artillery & Mortar
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C. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2015</u>	<u>FY 2016</u>	<u>FY 2017</u> <u>Base</u>	<u>FY 2017</u> <u>OCO</u>	<u>FY 2017</u> <u>Total</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
<i>Air & Missile Defense Planning and Control System</i>											
• SSN AD5070: SSN 5070, Air & Missile Defense Planning and Control System	27.374	28.176	54.376	69.958	124.334	17.005	17.960	6.366	6.951	Continuing	Continuing
<i>0604319A, Proj DU3, IFPC2 (FY12 PE0603305A IFPC II - Intercept)</i>											
• PE 0604319A, Proj DU3: PE 0604319A, Proj DU3, IFPC2 (FY12 PE0603305A IFPC II - Intercept)	92.475	155.361	-	-	-	40.003	80.004	12.004	12.006	Continuing	Continuing
<i>• PE 0605457A, Proj S40: PE 0605457A, Proj S40, Army Integrated Air and Missile Defense (AIAMD)</i>											
• PE 0605457A, Proj S40: PE 0605457A, Proj S40, Army Integrated Air and Missile Defense (AIAMD)	147.250	222.075	252.811	-	252.811	169.070	152.942	32.914	34.447	Continuing	Continuing
<i>• SSN BZ5075: SSN BZ5075, IAMD Battle Command System</i>											
• SSN BZ5075: SSN BZ5075, IAMD Battle Command System	-	20.917	204.969	-	204.969	287.220	372.916	440.567	439.780	Continuing	Continuing
<i>• PE 060482A, Proj E10: PE 060482A, Proj E10, Sentinel</i>											
• PE 060482A, Proj E10: PE 060482A, Proj E10, Sentinel	5.022	12.309	15.983	-	15.983	20.844	20.612	30.106	41.402	Continuing	Continuing
<i>• PE 0604823A, Proj L86: PE 0604823A, Proj L86, Lightweight Counter Mortar Radar (LCMR)</i>											
• PE 0604823A, Proj L86: PE 0604823A, Proj L86, Lightweight Counter Mortar Radar (LCMR)	-	2.967	3.187	-	3.187	3.463	3.500	-	-	0.000	13.117
<i>• PE 0604823A, Proj L88: PE 0604823A, Proj L88, Enhanced AN/TPQ-36</i>											
• PE 0604823A, Proj L88: PE 0604823A, Proj L88, Enhanced AN/TPQ-36	22.587	-	6.048	-	6.048	7.351	6.670	8.415	9.104	Continuing	Continuing
<i>• SSN B05201: SSN B05201, Lightweight Counter Mortar Radar (LCMR)</i>											
• SSN B05201: SSN B05201, Lightweight Counter Mortar Radar (LCMR)	29.358	63.472	74.038	25.892	99.930	10.855	9.618	-	-	0.000	213.233
<i>• SSN B05310: SSN B05310, Enhanced AN/TPQ-36</i>											
• SSN B05310: SSN B05310, Enhanced AN/TPQ-36	154.520	198.379	314.509	-	314.509	214.357	98.940	86.986	14.893	Continuing	Continuing
<i>• SSN BZ7325: SSN BZ7325, Mod of In-Svc Equip (Firefinder Radars)</i>											
• SSN BZ7325: SSN BZ7325, Mod of In-Svc Equip (Firefinder Radars)	4.186	-	-	-	-	-	-	-	-	0.000	4.186

Remarks
This program is an integral part of the Army Integrated Air and Missile Defense (IAMD) architecture.

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>	Project (Number/Name) 149 / <i>Counter-Rockets, Artillery & Mortar</i>

D. Acquisition Strategy

The C-RAM program is following an evolutionary acquisition strategy for rapid fielding of mature technology to the user. The objective of the strategy is to balance needs, available technology, and resources to quickly provide a robust capability to engage RAM threats. Both C-RAM Intercept (LPWS) and RAM Warn have transitioned to acquisition programs and continue to capitalize on RDTE investments (e.g., reuse/repurpose of Navy interceptor, Future Combat Systems (FCS) sensor technology development for Ku band Radio Frequency System (KuRFS) radar, etc.).

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Army												Date: February 2016			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 5				PE 0604741A / Air Defense Command, Control and Intelligence - Eng Dev				149 / Counter-Rockets, Artillery & Mortar							
Management Services (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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
Program Management Administration	Various	Various : Various	22.685	0.211		1.706		1.876		-		1.876	Continuing	Continuing	Continuing
Subtotal			22.685	0.211		1.706		1.876		-		1.876	-	-	-
Product Development (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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
Northrop Grumman	C/CPIF	C-RAM C2 Development and Enhancements : Redondo Beach, CA	91.739	2.065	Apr 2015	15.156	Apr 2016	9.591	Apr 2017	-		9.591	Continuing	Continuing	Continuing
Raytheon Company	C/CPIF	Improved Interceptor : Tucson, AZ	77.675	-		-		-		-		-	0	77.675	0
Raytheon Company	C/CPIF	LPWS Enhancements : Tucson, AZ	3.500	-		-		6.807	Aug 2017	-		6.807	0	10.307	0
Northrop Grumman	C/CPFF	Modeling and Simulation : Redondo Beach, CA	1.800	-		-		-		-		-	0	1.800	0
Subtotal			174.714	2.065		15.156		16.398		-		16.398	-	-	-
Test and Evaluation (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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
OGA	Various	TBD : TBD	28.354	-		1.950		2.421		-		2.421	Continuing	Continuing	Continuing
Subtotal			28.354	-		1.950		2.421		-		2.421	-	-	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2017 Army **Date:** February 2016

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>	Project (Number/Name) 149 / <i>Counter-Rockets, Artillery & Mortar</i>
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Event Name	FY 2015				FY 2016				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021			
	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
C-RAM System-of-Systems (SoS)	Develop/Enhance C-RAM SoS (Sense & Warn, Intercept) per Theater ONS / JUON																											
C-RAM C2 Development	C-RAM C2 Development, Updates, Virtualization, & Integration w/IAMD																											
(1) C-RAM C2	v5.5C-2.0 FMR																											
(2) Full Materiel Release (FMR)					v5.5C-2.2 FMR																							
C-RAM Directed Enhancements - Integration & Test	C2 & Warn Improvements, DCUF Upgrades																											
(3) C-RAM Intercept Operational Assessment (OA)	C-RAM Intercept OA																											
(4) C-RAM Intercept (LPWS Spiral 6.0) Materiel Release					C-RAM Intercept Materiel Release																							
C-RAM Intercept Logistics Demonstration					C-RAM Intercept Log Demo 																							

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Exhibit R-4A, RDT&E Schedule Details: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604741A / <i>Air Defense Command, Control and Intelligence - Eng Dev</i>	Project (Number/Name) 149 / <i>Counter-Rockets, Artillery & Mortar</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
C-RAM System-of-Systems (SoS)	1	2007	4	2021
C-RAM C2 Development	1	2013	4	2021
C-RAM C2	2	2016	2	2016
Full Materiel Release (FMR)	3	2016	3	2016
C-RAM Directed Enhancements - Integration & Test	1	2012	4	2017
C-RAM Intercept Operational Assessment (OA)	2	2015	2	2015
C-RAM Intercept (LPWS Spiral 6.0) Materiel Release	2	2016	2	2016
C-RAM Intercept Logistics Demonstration	4	2017	1	2018

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