Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Army											Date: February 2016	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603270A *I Electronic Warfare Technology*							
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	-	27.238	32.874	27.893	-	27.893	25.767	27.703	28.725	29.260	-	-
K12: *EW Demonstrations (CA)*	-	0.000	6.000	0.000	-	0.000	0.000	0.000	0.000	0.000	-	-
K15: *Advanced Comm Ecm Demo*	-	10.383	7.435	8.103	-	8.103	9.769	11.397	12.094	12.296	-	-
K16: *Non-Commo Ecm Tech Dem*	-	16.855	19.439	19.790	-	19.790	15.998	16.306	16.631	16.964	-	-

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and demonstrates electronic warfare (EW) sensors and software intended to deny, disrupt, locate or destroy the enemy's command, control and communications (C3) systems and intelligence, surveillance and reconnaissance assets. This PE matures both countermeasures (CM) and counter-countermeasures (CCM) to deny the enemy the use of their systems while protecting United States assets from enemy deception and jamming. Project K15 matures and demonstrates capabilities to locate and exploit enemy communication systems including computer networks. Project K16 matures and demonstrates multifunctional EW capabilities (jamming) to enhance platform survivability and provide near real-time situational awareness to the Commander through the detection, identification and geo-location of emitters of interest.

Work in this PE is complementary of PE 0602120A (Sensors and Electronic Survivability), PE 0602782A (Command, Control, Communications Technology), PE 0602270A (Electronic Warfare Technology), PE 0603008A (Command, Control, Communications Advanced Technology), PE 0603772A (Advanced Tactical Computer Science) and PE 0603794A (Command, Control and Communications Advanced Technology), and fully coordinated with PE 0602601A (Combat Vehicle and Automotive Technology), PE 0602618A (Ballistics Technology), PE 0603003A (Aviation Advanced Technology), PE 0603004A (Weapons and Munitions Advanced Technology), PE 0603005A (Combat Vehicle and Automotive Advanced Technology), PE 0603313A (Missile and Rocket Advanced Technology) and PE 0603794A (Command, Control and Communications Advanced Technology).

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

Work in this PE is performed by the Army Research, Development, and Engineering Command (RDECOM), Communications-Electronics Research, Development, and Engineering Center (CERDEC), Aberdeen Proving Ground, MD.

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603270A *I Electronic Warfare Technology*	

B. Program Change Summary ($ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	26.046	26.874	27.393	-	27.393
Current President's Budget	27.238	32.874	27.893	-	27.893
Total Adjustments	1.192	6.000	0.500	-	0.500
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	6.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	2.000	-			
• SBIR/STTR Transfer	-0.808	-			
• Adjustments to Budget Years	-	-	0.500	-	0.500

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2015	FY 2016
Project: K12: *EW Demonstrations (CA)*		
Congressional Add: *Program Increase*	-	6.000
Congressional Add Subtotals for Project: K12	-	6.000
Congressional Add Totals for all Projects	-	6.000

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army			Date: February 2016
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603270A / *Electronic Warfare Technology*	Project (Number/Name) K12 / *EW Demonstrations (CA)*	

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
K12: *EW Demonstrations (CA)*	-	0.000	6.000	0.000	-	0.000	0.000	0.000	0.000	0.000	-	-

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Electronic Warfare Demonstrations.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016
Congressional Add: Program Increase	-	6.000
FY 2016 Plans: Program Increase		
Congressional Adds Subtotals	-	6.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army			Date: February 2016
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603270A / *Electronic Warfare Technology*	Project (Number/Name) K15 / *Advanced Comm Ecm Demo*	

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
K15: *Advanced Comm Ecm Demo*	-	10.383	7.435	8.103	-	8.103	9.769	11.397	12.094	12.296	-	-

A. Mission Description and Budget Item Justification

This project matures and demonstrates sensor and software technologies to locate and identify modern tactical enemy and blue force (friendly) radio frequency (RF) communications, radars and computer networks and nodes. This project enables uninterrupted air and ground based intelligence collection and long range targeting operations in a hostile electromagnetic and cyber environment, and enables communications countermeasures (CM) and counter-countermeasures (CCM) to first intercept, identify and locate tactical communications; then degrade threat-computer networks and their components.

This project supports Army science and technology efforts in the Command, Control, Communications and Intelligence, Soldier/Squad, Ground Maneuver and Air portfolios.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

Work in this project is performed by the Army Research, Development, and Engineering Command (RDECOM), Communications - Electronics Research, Development, and Engineering Center (CERDEC), Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Offensive Operations	6.905	5.000	5.575
Description: This effort matures and demonstrates integrated electronic attack (EA) and computer network operations (CNO) hardware and software to execute force protection (FP), EA, electronic surveillance (ES), signals intelligence (SIGINT) and electronic warfare (EW) missions in a dynamic, distributed and coordinated fashion. This results in the capability to engage a multitude of diverse multi-node, multi-waveform, multi-platform and cyber (internetworked computers) targets while maximizing overall network efficiency and effectiveness, and preserving blue force/non-combatant communications. Work being accomplished under Program Element (PE) 0603270A/Project K16 and PE 0602270A/Project 906 complements this effort.			
FY 2015 Accomplishments: Matured techniques to enable tagging, tracking and locating missions for combined cyber/EW signals and entities of interest; matured and demonstrated joint cyber/EW architecture for combined mission operation; integrated and matured cyber/EW and			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603270A / *Electronic Warfare Technology*	**Project (Number/Name)** K15 / *Advanced Comm Ecm Demo*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
signals intelligence capability into an airborne platform and assessed utility of conducting missions with all three capabilities simultaneously. ***FY 2016 Plans:*** Use representative blue force systems to conduct exploitation of emerging signals of interest (SOI) to determine potential cyber/ EW/collection applications for each signal; mature and integrate advanced techniques to enable new mission capabilities to exploit emerging target SOI; utilize emerging software defined radios as platforms to implement and demonstrate these techniques in an open and modular framework for potential porting into candidate existing and emerging acquisition programs. ***FY 2017 Plans:*** Will mature interface definitions and data transfer protocol for the inclusion of tactical cyber capability on a single board computer in a common RF chassis as part of an open, modular converged RF architecture to employ multiple electronic support and electronic attack techniques simultaneously; continue to mature and integrate advanced techniques against SOIs onto representative software defined radio platforms and demonstrate the effectiveness of tactical cyber capabilities.			
Title: Stand-off Non-Cooperative Multi-Intelligence (Multi-INT) Technologies ***Description:*** This effort matures and demonstrates hardware and software to conduct standoff intelligence, surveillance and reconnaissance in a three dimensional urban battlespace. The goal is to detect, identify, map and display personnel, RF devices and other anomalies located within structures and complex terrain to provide dismounted and remote users with real-time, immediate-area situational awareness. ***FY 2015 Accomplishments:*** Developed methods to efficiently cue collocated Electro Optical (EO) /Infrared (IR) sensors with an RF direction finding capability; matured hardware platform that enables an RF direction finding cueing of a collocated EO/IR sensor and conducted validation assessments of system performance; finalized methods to export data to the Distributed Common Ground Station – Army (DCGS-A); demonstrated capability to supply data to the intelligence enterprise in a relevant environment to provide tactically relevant data to the Soldier. ***FY 2016 Plans:*** Mature, assess and demonstrate multi-intelligence and EW techniques and effects on emerging threats, such as unmanned aerial systems (UAS), to identify potential vulnerabilities; integrate, assess and demonstrate advanced EW techniques and effects to use against identified target UAS to determine their effectiveness and potential portability to address other threats. ***FY 2017 Plans:*** Will design, mature, fabricate and program a circuit card to employ viable EW techniques to counter identified UAS threats and integrate it into an open, modular converged RF architecture and demonstrate the effectiveness of the capability in a	3.478	2.435	2.528

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603270A / *Electronic Warfare Technology*	**Project (Number/Name)** K15 / *Advanced Comm Ecm Demo*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
laboratory environment; assess requirement to coordinate data exchange between national and tactical assets to achieve desired, coordinated effects on designated threat systems.			
Accomplishments/Planned Programs Subtotals	10.383	7.435	8.103

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army			Date: February 2016
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603270A / *Electronic Warfare Technology*	Project (Number/Name) K16 / *Non-Commo Ecm Tech Dem*	

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
K16: *Non-Commo Ecm Tech Dem*	-	16.855	19.439	19.790	-	19.790	15.998	16.306	16.631	16.964	-	-

A. Mission Description and Budget Item Justification

This Project matures and demonstrates non-communication, multi-functional electronic warfare (EW) capabilities that enhance the survivability of Army air and ground platforms and dismounted Soldiers. This project matures and demonstrates radio frequency (RF), infrared (IR) and electro-optical (EO) sensors and jamming sources to detect, locate, deceive, and neutralize (jam) booby traps, radar-directed target acquisition systems, target-tracking sensors, surface-to-air missiles (SAMs), air-to-air missiles (AAMs), and top-attack and electronically-fuzed munitions. This project also enables electronic support (ES) hardware and software to detect, identify and geolocate emitters of interest from an effective standoff distance to provide near real-time situational awareness.

This Project supports Army science and technology efforts in the Command Control, Communications and Intelligence, Ground Maneuver, Air and Soldier/Squad portfolios.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

Work in this Project is performed by the Army Research, Development, and Engineering Command (RDECOM), Communications-Electronic Research, Development, and Engineering Center (CERDEC), Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Distributed Aperture Infrared Countermeasures (DAIRCM) Technologies	3.911	3.278	3.326
Description: This effort matures and demonstrates countermeasure technologies that provide platform protection and integrated cueing against EO/IR and RF guided threats.			
FY 2015 Accomplishments: Matured and fabricated a brassboard wideband RF warning sensor capable of detecting and identifying modern radar threat systems to airborne platforms; conducted lab testing of brassboard RF warning sensor to evaluate sensor capabilities using RF simulation hardware and software to determine effectiveness against emerging threats and documented limitations in performance to enable the development of additionally required functionality.			
FY 2016 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603270A / *Electronic Warfare Technology*	**Project (Number/Name)** K16 / *Non-Commo Ecm Tech Dem*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Continue to mature wideband RF warning sensor and integrate RF warning sensor into representative hardware suite; conduct sensor performance assessment to demonstrate the performance and readiness of the RF warning system. ***FY 2017 Plans:*** Will finish requirements and interface definitions for integration of a 2 channel digital RF receiver on a single circuit card assembly for use in modern radar warning receivers, capable of identifying advanced radar threat systems into an open, modular, converged RF architecture; demonstrate system functionality in a representative hardware platform.			
Title: Advanced Tactical Radio Frequency Countermeasures (ATRFCM) Technologies ***Description:*** This effort matures and demonstrates integrated EW/direction finding technologies that provide protection of air, ground and dismounts from emerging RF threats at standoff distances. Work accomplished under Program element (PE) 0602270A/Project 906, and PE 0603270A/Project K15 complements this effort. ***FY 2015 Accomplishments:*** Matured techniques and architecture design to further improve interoperability between RF threat detection and neutralization systems with other systems on the platform, such as communications, networking and Global Positioning System/navigation; designed, encoded and matured algorithms and architecture elements to allow for the sharing of RF and computational resources between various systems that are collocated on a platform. ***FY 2016 Plans:*** Integrate and demonstrate signals intelligence (SIGINT) and cyber enabling capabilities into a common chassis utilizing a set of standards-based hardware and software open modular architectures to improve capability and interoperability, and reduce platform size, weight, power and costs; demonstrate the maturity of a multi-function architecture that integrates defensive electronic attack, active electronic support, SIGINT, and cyber enabling capabilities to evaluate the combined capability performance over-the-air in an anechoic chamber. ***FY 2017 Plans:*** Will use converged RF architecture to mature and integrate EW techniques to determine the utility of sharing data between components, such as software defined radios, sensors, electronic support and countermeasures to identify, geo-locate and neutralize RF threats for platform survivability, and demonstrate in a relevant environment; assess types of data that can be collected from different components to improve platform survivability.	4.835	4.911	4.964
Title: EW Counter Countermeasures ***Description:*** This effort matures and demonstrates hardware and software to counter emerging electronic warfare threats to command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) platforms. Work being accomplished under PE 0603772A/Project 243 and 0602270A/Project 906 complements this effort.	3.234	3.500	3.500

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603270A / *Electronic Warfare Technology*	**Project (Number/Name)** K16 / *Non-Commo Ecm Tech Dem*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
FY 2015 Accomplishments: Extended capability to conduct hardware in the loop testing of a family of threat systems in a laboratory environment; assessed current and emerging red force interference/jamming sources and characterized their performance and conducted modeling and simulation and hardware in the loop testing to determine the extent of potentially harmful effects on blue force EW/C4ISR sensors; generated candidate countermeasure techniques to neutralize these threat systems. ***FY 2016 Plans:*** Analyze previously conducted testing of counter EW techniques to determine effectiveness against identified threats; develop and document standard EW technique assessment protocols to enable independent validation to be conducted of all results; continue to demonstrate hardware in the loop testing to provide robust assessments and measurements using realistic threat and blue force systems ***FY 2017 Plans:*** Will utilize current capability to simulate real world effects of red force jamming in complex (multi-path) environments; conduct hardware in the loop analysis of prioritized emerging threat interference techniques; replicate potential interactions on emerging blue force systems, (i.e. communication, radar) to understand and mitigate the electromagnetic interference caused by these effects; develop, mature and assess advanced signal/data processing algorithms and cancellation techniques to mitigate the effects of the threat; begin hardware in the loop analysis of the effectiveness of these techniques against red force jamming.			
Title: Active Protection System (APS) Soft Kill ***Description:*** This effort matures and demonstrates hardware, software and techniques to provide an EW soft kill capability to the APS suite. This effort supports the Army's APS program to mature and demonstrate technologies to reduce vehicle weight by reducing reliance on armor through the use of other means such as sensing, warning, hostile fire detection, and active countermeasures to achieve increased protection against current and emerging threats. Work being accomplished under PE 0602601A/project C05, PE 0602618A/project H80, PE 0603004A/project 232, PE 0603005A/project 221 and PE 0603313A/ project 263 complements this effort. ***FY 2015 Accomplishments:*** Matured sensor based threat detection, classification, tracking, warning and electronic countermeasure techniques in support of the APS science and technology program; conducted modeling and simulation (M&S) of potential electronic APS capabilities to evaluate and document potential system performance in operational scenarios. ***FY 2016 Plans:*** Investigate and mature sensor framework to facilitate integration of cueing sensors and EW soft kill into the Modular Active Protection System (MAPS) architecture; mature algorithm to utilize a cueing sensor to enable threat detection and determine	4.125	7.000	7.250

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603270A / *Electronic Warfare Technology*	**Project (Number/Name)** K16 / *Non-Commo Ecm Tech Dem*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
threat angle of arrival; mature tracking sensor to improve capability to provide accurate threat tracking and false alarm reduction, characterize threats, provide warning and fire control functions and confirm effective countermeasure performance; mature and conduct initial integration testing and demonstration to assess cueing sensor performance when integrated into the MAPS framework. ***FY 2017 Plans:*** Will complete sensor design, fabrication, and physical interface designs and begin integration onto a demonstration platform; conduct live fire data collection utilizing the sensor that has been integrated into the MAPS framework; characterize data collected to assess sensor performance within the MAPS framework; continue to assist in the development of MAPS framework interface definitions, protocols and requirements.			
Title: Integrated RF Operations ***Description:*** This effort matures and demonstrates a capability to perform modeling and simulation (M&S) of geographically dispersed RF systems to provide a coordinated, collaborative and interoperable suite of EW capabilities. A modular software architecture will allow for rapid, cost effective development and integration of new EW capabilities, target signals of interest and environmental simulations. Work being accomplished under PE 0603794A /project EL4 complements this effort. ***FY 2015 Accomplishments:*** Extended existing RF simulation M&S capabilities to accurately depict the interaction between EW systems and selected signals of interest (SOI); extended the M&S capability to enable new EW techniques and threat SOI to be rapidly and accurately developed within the model environment to analyze the interaction between EW systems and various targets; validated the extended models and simulations to ensure accuracy and performance. ***FY 2016 Plans:*** Develop improvements to RF M&S capabilities that increase M&S fidelity of blue force system performance and interactions with various SOI to enable the evaluation of advanced, emerging EW techniques; assess requirements to extend SOI models to improve fidelity and provide an accurate and consistent modeling environment. ***FY 2017 Plans:*** Will continue to improve RF M&S capabilities to accurately model complex urban environments, system performance in those environments and interactions with relevant SOIs common to urban environment; optimize methods to conduct M&S of complex environments with multiple geographically dispersed SOIs and blue force systems in a timely manner with sufficient fidelity to provide validated performance estimates to system developers.	0.750	0.750	0.750
Accomplishments/Planned Programs Subtotals	16.855	19.439	19.790

Exhibit R-2A, RDT&E Project Justification: PB 2017 Army		Date: February 2016
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603270A / *Electronic Warfare Technology*	**Project (Number/Name)** K16 / *Non-Commo Ecm Tech Dem*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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