Exhibit R-2, RDT&E Budget Item Justification: PB 2016 Army											Date: February 2015	
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 2014**	**FY 2015**	**FY 2016 Base**	**FY 2016 OCO**	**FY 2016 Total**	**FY 2017**	**FY 2018**	**FY 2019**	**FY 2020**	**Cost To Complete**	**Total Cost**
Total Program Element	-	24.652	26.046	26.874	-	26.874	27.393	25.767	26.203	26.725	-	-
K15: *Advanced Comm Ecm Demo*	-	9.709	8.603	7.435	-	7.435	7.603	9.769	9.897	10.094	-	-
K16: *Non-Commo Ecm Tech Dem*	-	14.943	17.443	19.439	-	19.439	19.790	15.998	16.306	16.631	-	-

Note

FY16 decrease to support higher priority Army research areas.

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 US 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 complimentary 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 0603008A (Electronic Warfare 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 2016 Army					Date: February 2015
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 3: *Advanced Technology Development (ATD)*			R-1 Program Element (Number/Name) PE 0603270A / *Electronic Warfare Technology*		
B. Program Change Summary ($ in Millions)	**FY 2014**	**FY 2015**	**FY 2016 Base**	**FY 2016 OCO**	**FY 2016 Total**
Previous President's Budget	25.335	26.057	31.652	-	31.652
Current President's Budget	24.652	26.046	26.874	-	26.874
Total Adjustments	-0.683	-0.011	-4.778	-	-4.778
• Congressional General Reductions	-	-0.011			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.683	-			
• Adjustments to Budget Years	-	-	-4.778	-	-4.778

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army			Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
K15: *Advanced Comm Ecm Demo*	-	9.709	8.603	7.435	-	7.435	7.603	9.769	9.897	10.094	-	-

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 US 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 complimentary 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 0603008A (Electronic Warfare 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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
Title: Offensive Operations	4.734	4.905	5.000
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 PE 0603270A/project K16 and PE 0602270/project 906 compliment this effort.			

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
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 2014	FY 2015	FY 2016
FY 2014 Accomplishments: Coded and demonstrated protocol exploitation software and techniques that allow users to remotely coordinate, plan, control and manage tactical EW and cyber assets; developed techniques to exploit protocols of threat devices not conventionally viewed as cyber to expand total situational awareness by providing access to and control of adversary electronic devices in an area of operations. ***FY 2015 Plans:*** Mature techniques to enable tagging, tracking and locating missions for combined cyber/EW signals and entities of interest; mature and demonstrate joint cyber/EW architecture for combined mission operation; integrate and mature cyber/EW and signals intelligence capability into an airborne platform and assess utility of conducting missions with all three capabilities simultaneously. ***FY 2016 Plans:*** Will 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 Programs of Record.			
Title: Stand-off Non-Cooperative Multi-Intelligence (Multi-INT) Technologies	4.975	3.698	2.435
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 2014 Accomplishments:*** Integrated Measurement and signature intelligence (MASINT)/Multi-INT vehicle mounted detection capability with soldier and airborne sensors (electro- optic/infrared/full motion video) to support higher fidelity standoff detection and targeting of threat emitters for small units; matured multi-platform cross cueing techniques and tested multi-int detection and geolocation in a laboratory environment; matured algorithms to fuse multi source detection, geolocation and targeting data into a high fidelity common display and design and code a mechanism to ingest this data into Distributed Common Ground Station-Army (DCGS-A) program of record for greater area situational awareness. ***FY 2015 Plans:*** Develop methods to efficiently cue collocated Electro Optical (EO) /Infrared (IR) sensors with an RF direction finding capability; mature hardware platform that enables an RF direction finding cueing of a collocated EO/IR sensor and conduct validation			

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
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 2014	FY 2015	FY 2016
assessments of system performance; finalize methods to export data to DCGS-A; demonstrate capability to supply data to the intel enterprise in a relevant environment to provide tactically relevant data to the Soldier. ***FY 2016 Plans:*** Will 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.			
Accomplishments/Planned Programs Subtotals	9.709	8.603	7.435

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 2016 Army			Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
K16: *Non-Commo Ecm Tech Dem*	-	14.943	17.443	19.439	-	19.439	19.790	15.998	16.306	16.631	-	-

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 2014	FY 2015	FY 2016
Title: Distributed Aperture Infrared Countermeasures (DAIRCM) Technologies	3.863	4.233	3.278
Description: This effort matures and demonstrates countermeasure technologies that provide platform protection and integrated cueing against EO, IR and RF guided threats.			
FY 2014 Accomplishments: Modified IR jam/receive deconfliction algorithms and interrogation techniques to develop cooperative countermeasures to protect multiple aircraft; integrated air threat detection and geo-location data with ground situational awareness to cooperatively defeat threats to both air and ground platforms; integrated miniature waveform generators, efficient high power amplifiers, and optical fiber signal distribution to add a low weight/power RF jammer to Army rotorcraft; matured and leveraged EO, IR and RF jammers for an integrated aircraft survivability architecture for more efficient jamming and reduced observable signature of the aircraft.			
FY 2015 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
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 2014	FY 2015	FY 2016
Mature and fabricate a brassboard wideband RF warning sensor capable of detecting and identifying modern radar threat systems to airborne platforms; conduct lab testing of brassboard RF warning sensor to evaluate sensor capabilities using RF simulation hardware and software to determine effectiveness against emerging threats and document limitations in performance to enable the development of additionally required functionality. ***FY 2016 Plans:*** Will 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.			
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 PE 0602120A/project H15, PE 0602270A/project 906, and PE 0603270A/project K15 complements this effort. ***FY 2014 Accomplishments:*** Modified and integrated previously matured techniques and developed new techniques, algorithms and waveforms for the detection, location and neutralization of RF threat devices; matured techniques to provide an integrated situational awareness picture and countermeasures against identified threats; improved interoperability between detection and neutralization systems with other systems on the platform such as communications, networking and Global Positioning System/position, navigation and timing. ***FY 2015 Plans:*** Mature 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; design, encode and mature 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:*** Will 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.	4.586	4.835	4.911
Title: Combat ID Technology Demonstrations	3.123	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
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 2014	FY 2015	FY 2016
Description: This effort augments and enhances existing light weight dismount and tactical vehicles systems to add real-time Combat Identification (CID) capabilities, along with embedded training, without significantly altering size, weight and power of current and emerging equipment packages. The focus is on making current systems and capabilities (weapon sites, radios, sensors, and etc.) multifunctional rather than adding stand-alone CID systems that would increase the burden on the Soldier. Work accomplished under PE 0602120A/project H15 compliments this effort. ***FY 2014 Accomplishments:*** Completed component modifications to multifunction laser, site and weapon orientation module which are used to increase probability of positive friend, enemy, neutral non-combatant identification at increased ranges; conducted laboratory and limited field test to demonstrate modified wireless personal area network waveforms and Soldier Radio Waveform, weapons orientation module and multifunction laser; documented and assessed user feedback and make appropriate component and integration modifications; matured non-cooperative target identification techniques.			
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 0602270A/project 906 compliments this effort. ***FY 2014 Accomplishments:*** Leveraged technical assessments of a family of threat systems and conducted a full vulnerability assessment on these systems, generated potential mitigation strategies, determined associated concept of operations and employment scenarios; matured and optimized mitigation strategies that have the highest probability of success by demonstrating the feasibility of the proposed approached in the laboratory, leveraging threat system components, surrogates and modeling and simulation resources. ***FY 2015 Plans:*** Extend capability to conduct hardware in the loop testing of a family of threat systems in a laboratory environment; assess current and emerging red force interference/jamming sources and characterize their performance and conduct modeling and simulation and hardware in the loop testing to determine the extent of potentially harmful effects on blue force EW/C4ISR sensors; generate candidate countermeasure techniques to neutralize these threat systems. ***FY 2016 Plans:*** Will 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;	3.371	3.500	3.500

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
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 2014	FY 2015	FY 2016
continue to demonstrate hardware in the loop testing to provide robust assessments and measurements using realistic threat and blue force systems.			
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 compliments this effort. ***FY 2015 Plans:*** Mature sensor based threat detection, classification, tracking, warning and electronic countermeasure techniques in support of the APS science and technology program; conduct modeling and simulation (M&S) of potential electronic APS capabilities to evaluate and document potential system performance in operational scenarios. ***FY 2016 Plans:*** Will 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 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.	-	4.125	7.000
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 603008A/project TR1 compliments this effort. ***FY 2015 Plans:*** Extend existing RF simulation M&S capabilities to accurately depict the interaction between EW systems and selected signals of interest (SOI); extend the M&S capability to enable new EW techniques and threat SOI to be rapidly and accurately developed	-	0.750	0.750

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
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 2014	FY 2015	FY 2016
within the model environment to analyze the interaction between EW systems and various targets; validate the extended models and simulations to ensure accuracy and performance. ***FY 2016 Plans:*** Will 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.			
Accomplishments/Planned Programs Subtotals	14.943	17.443	19.439

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A