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 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602270A *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	-	17.464	18.500	19.243	-	19.243	20.466	21.041	21.322	21.737	-	-
906: *Tactical Electronic Warfare Applied Research*	-	17.464	18.500	19.243	-	19.243	20.466	21.041	21.322	21.737	-	-

A. Mission Description and Budget Item Justification

This program element (PE) designs and validates electronic warfare (EW) components that deny, disrupt, or degrade the enemy's use of the electromagnetic spectrum for offensive or defensive operations. This is accomplished through the investigation of electronic support measures (ESM); countermeasures against communications systems and networks; the design and fabrication of sensors used to identify and locate threat forces in an asymmetric environment; and threat warning and electronic countermeasures (ECM) against munitions sensors, missile guidance systems, targeting systems, and explosive hazards. Project 906 supports protection of high-value ground platforms, aircraft and the Soldier from threat surveillance and tracking systems, imaging systems, and advanced radio frequency (RF)/electro-optical (EO)/ infrared (IR) missiles, artillery, and smart munitions. Information fusion research addresses sensor correlation and fusion, relationship discovery, and management services through use of automated processing, as well as software that applies higher level reasoning techniques to support automated combat assessment. Project 906 also supports research and application of key EW sensors, direction finders and jammers to intercept, locate, and disrupt current and emerging communications and non-communications threat emitters to provide vital quality combat information directly to users in a timely and actionable manner. Specifically, it focuses on detection of threat sensors and emitters associated with weapon systems, targeting systems and command, control, communications, computers, and intelligence systems and networks.

Work in this PE is complimentary of PE 0602120A (Sensors and Electronic Survivability), PE 0602782A (Command, Control, Communications Technology), PE 0603270A (Electronic Warfare Technology), and PE 0603772A (Advanced Tactical Computer Science and Sensor Technology); and fully coordinated with PE 0603008A (Command, Control, Communications Advanced Technology), PE 0603710A (Night Vision 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 is performed by the Army Research, Development and Engineering Command, 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 2: *Applied Research*		R-1 Program Element (Number/Name) PE 0602270A / *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	17.575	18.502	19.383	-	19.383
Current President's Budget	17.464	18.500	19.243	-	19.243
Total Adjustments	-0.111	-0.002	-0.140	-	-0.140
• Congressional General Reductions	-	-0.002			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.111	-			
• Adjustments to Budget Years	-	-	-0.140	-	-0.140

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army			Date: February 2015
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602270A / *Electronic Warfare Technology*	Project (Number/Name) 906 / *Tactical Electronic Warfare Applied Research*	

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
906: *Tactical Electronic Warfare Applied Research*	-	17.464	18.500	19.243	-	19.243	20.466	21.041	21.322	21.737	-	-

A. Mission Description and Budget Item Justification

This project designs, fabricates, evaluates, and applies key electronic warfare (EW)/information operations technologies to enhance platform survivability (to include ground combat vehicles, aircraft, and the dismounted Soldier) and to intercept, track and locate current and emerging threat munitions, communications and non-communications threat emitters. This project applies recent advances in radio frequency (RF), infrared (IR), and electro-optical (EO) sensors and jamming sources to detect, locate, deceive, and jam threats (to include radar directed target acquisition systems, target-tracking sensors, surface-to-air missiles (SAMs), air-to-air missiles (AAMs), top attack weapons, and electronically fuzed munitions). This project also pursues the ability to neutralize improvised explosive devices. This project designs information systems to provide vital, quality combat information directly to users in a timely, actionable manner in accordance with concepts for future force intelligence operations. This project investigates RF collection and mapping technologies to offer real time emitter detection, location, and identification. In addition, this project enables a remote capability to disrupt, deny, or destroy threat communication signals and enables fusion (automated assimilation and synthesis) of battlefield intelligence data to enable interpretation of current threats and future enemy activities. This allows commanders to develop operational courses of action in time to act decisively and in a pre-emptive manner.

This project supports Army science and technology efforts in the Command, Control, Communications and Intelligence, Ground Maneuver, Soldier/Squad 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, 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: Multi-Intelligence Data Fusion and Targeting	2.767	2.720	2.720
Description: This effort investigates, designs and codes advanced automated exploitation and fusion analysis tools, applications, and software services for the creation of improved intelligence products, common information management and information dissemination systems to facilitate collaboration between intelligence and mission command functions. This will provide relevant and timely information in support of command decisions, such as high value identification and targeting in an asymmetric environment. Work being accomplished under PE 0603772A/project 243 compliments this effort.			
FY 2014 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602270A / *Electronic Warfare Technology*	**Project (Number/Name)** 906 / *Tactical Electronic Warfare Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
Investigated cultural, psychological, social and physical environment and time variables for improving automated reasoning and analysis software ability to track and make associations between persons, places and events of interest; researched political, military, economic, social, infrastructure and information (PMESII) data standards and developed models to assess how cultural and PMESII factors can influence support or alter decisions during military planning and execution. ***FY 2015 Plans:*** Investigate methods to fuse biometric enabled intelligence analysis results with other forms of intelligence data to improve the overall quality of data products; design methods and analysis software tools and algorithms to extract biometric and contextual data from streaming video sources; begin design and coding of software tools to assign quality scores to data gathered from non-dedicated biometric sources. ***FY 2016 Plans:*** Will design biometric/video architecture capable of pulling non-traditional biometric data from disparate video sources and integrate biometric extraction and analysis algorithms into this architecture; experiment with and evaluate software tools for biometric extraction from video sources to determine ability to perform biometric extraction and pull useful intelligence, surveillance and reconnaissance data from the video using the biometric/video architecture.			
Title: Offensive Information Operations Technologies ***Description:*** This effort designs, codes and evaluates cyber software, tools and techniques that identify and capture data traversing targeted networks for the purpose of computer network operations (CNO) or otherwise countering adversary communications. Cyber capabilities include detection, identification, exploitation, direction finding (DF), geolocation, and denial of service. Work being accomplished under PE 0603270A/project K15 compliments this effort. ***FY 2014 Accomplishments:*** Refined cyber effects and situational awareness techniques for various protocols and signals-of-interest (SOIs); enhanced current electronic warfare networking protocol extensions as applicable to enable tactical cyber capabilities; developed advanced cyber techniques. ***FY 2015 Plans:*** Investigate the impacts on cyber/EW techniques of converging disparate RF devices into a common hardware and software platform; develop coordinated cyber/EW techniques to exploit tactically relevant targets; analyze and develop performance predictions for various techniques being employed on different cyber and EW platforms. ***FY 2016 Plans:***	5.028	5.899	5.843

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602270A / *Electronic Warfare Technology*	**Project (Number/Name)** 906 / *Tactical Electronic Warfare Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
Will investigate advanced techniques against next-generation SOIs; research an architecture for resilient operations across cyber, EW and signal intelligence assets; investigate extending cyber enabled operations to software defined radio platforms such as dismounted/mounted radio and/or next generation radar systems.			
Title: Multispectral Threat Warning ***Description:*** This effort investigates and evaluates software and sensor/countermeasure components to increase probability of detection of small arms and probability of detection and defeat of man-portable air defense system (MANPADS) type threats for aviation platforms using modeling and simulation (M&S) and hardware in the loop (HIL) simulations. ***FY 2014 Accomplishments:*** Validated M&S environment and new countermeasure techniques; validated digital seeker hardware surrogate performance in the modeling environment and HIL simulations; evaluated known countermeasures in the M&S environment to assess effectiveness; investigated new countermeasure techniques to use against advanced threats. ***FY 2015 Plans:*** Evaluate effectiveness of current countermeasures techniques against additional classes of emerging multi-spectral threats required by Common IR Countermeasures program of record; expand laboratory and M&S environment to accommodate assessment of advanced threat countermeasures; initiate design, fabrication and encoding of techniques and technologies that provide countermeasures against multi-spectral IR and RF threats; investigate multi-band signature management exploitation and design correlation techniques for improved threat detection, identification and countermeasures. ***FY 2016 Plans:*** Will investigate and develop hardware and software simulation environment to assess countermeasures with appropriate level of simulation fidelity based on threat specifications and studies; explore ways to exploit a second class of emerging threats and assess baseline countermeasure techniques against this second class of emerging threat; develop holistic countermeasure approaches to protect aviation platforms and investigate application of additional technologies to support threat detection as well as optimize countermeasure performance as part of the holistic approach.	3.678	5.332	5.309
Title: Multi-Function Intelligence, Surveillance and Reconnaissance (ISR) Technologies ***Description:*** This effort investigates and codes software algorithms and techniques to intelligently integrate tactical ISR sensors, improve their individual performance and increase the effectiveness of battlespace awareness/intelligence data in an area of operations. Efforts focus on networking of sensors and open, scalable common RF architectures for terrestrial and aerial sensors. Work being accomplished under PE 63772/243 complements this effort. ***FY 2014 Accomplishments:***	3.733	3.349	4.171

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602270A / *Electronic Warfare Technology*	**Project (Number/Name)** 906 / *Tactical Electronic Warfare Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
Assessed radar waveforms designed to coordinate radar sensors without the need for a central interface node, facilitating radar data sharing and cross cueing; investigated and analyzed the performance of noise correlation radar algorithms in operationally relevant hardware platforms to assess their ability to mitigate signal interception and compromise, reducing co-site interference and preserving high resolution target detection capability. ***FY 2015 Plans:*** Study the feasibility of combining a series of synthetic aperture radar (SAR) images to develop a motion video-like data product for more reliable entity resolution and real time tracking; establish metrics for measuring and judging the quality of SAR motion video products; investigate techniques to identify and mitigate the impact of intentional red force interference sources on friendly ISR assets. ***FY 2016 Plans:*** Will investigate and define operational/technical requirements to design an open architecture RF front end for aerial and terrestrial platforms to allow multiple sensors access to platform antenna arrays to avoid redundancy; analyze and determine specifications to standardize RF distribution networks on aerial and terrestrial platforms to facilitate modularity and the interoperability of RF systems.			
Title: Electronic Warfare Architectures and Countermeasures ***Description:*** This effort investigates and evaluates the technical specifications of a family of threats to develop nonkinetic countermeasures. Work being accomplished under PE 0603270A/project K16 compliments this effort. ***FY 2014 Accomplishments:*** Analyzed existing EW system components to determine if they may be dual use to address multiple threats or types of threats; developed extensions to traditional EW system architecture to enable a new EW architecture comprised of distributed peripheral components that can be centrally controlled and managed; identified and assessed critical components associated with known and emerging threat devices to support laboratory assessments through component and/or surrogate experiments; designed and coded modeling and simulation resources to enable live, virtual and constructive electronic warfare laboratory assessments. ***FY 2015 Plans:*** Analyze existing blue force ground EW systems to determine potential deficiencies or weaknesses in the system design and implementation that could be exploited by red forces; investigate emerging red force EW system architectures to identify design characteristics that can be exploited by blue force EW systems to limit their effectiveness. ***FY 2016 Plans:*** Will analyze modular open RF architecture interfaces to determine vulnerabilities that emerged as component interactions are standardized; continue the evaluation of emerging scheduling algorithms for use within the architecture to coordinate various	2.258	1.200	1.200

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602270A / *Electronic Warfare Technology*	**Project (Number/Name)** 906 / *Tactical Electronic Warfare Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
mission functions (Signals Inteligence, EW, Comms); design software for automated classification, detection, identification and correlation algorithm to coordinate EW/SIGINT/Comms transmissions for real time communications across those mission functions.			
Accomplishments/Planned Programs Subtotals	17.464	18.500	19.243

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A