| Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Army | | | | | | | | | | | DATE: April 2013 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| APPROPRIATION/BUDGET ACTIVITY<br>2040: *Research, Development, Test & Evaluation, Army*<br>BA 2: *Applied Research* | | | | | R-1 ITEM NOMENCLATURE<br>PE 0602270A: *Electronic Warfare Technology* | | | | | | | |
| **COST ($ in Millions)** | **All Prior Years** | **FY 2012** | **FY 2013#** | **FY 2014 Base** | **FY 2014 OCO ##** | **FY 2014 Total** | **FY 2015** | **FY 2016** | **FY 2017** | **FY 2018** | **Cost To Complete** | **Total Cost** |
| Total Program Element | - | 15.667 | 15.068 | 17.585 | - | 17.585 | 18.459 | 19.325 | 20.539 | 21.124 | Continuing | Continuing |
| 906: *Tactical Electronic Warfare Applied Research* | - | 15.667 | 15.068 | 17.585 | - | 17.585 | 18.459 | 19.325 | 20.539 | 21.124 | Continuing | Continuing |

# FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

## The FY 2014 OCO Request will be submitted at a later date

**Note**

FY14 increase for Electronic Warfare modeling, analysis and optimization

**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 booby traps. 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, 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 0603270A (EW Technology), and PE 0603772A (Advanced Tactical Computer Science and Sensor Technology); and fully coordinated with PE 0603008A (Command, Control, Communications Advanced Technology) and PE 0603710A (Night Vision 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 2014 Army | | | | | DATE: April 2013 |
|---|---|---|---|---|---|
| APPROPRIATION/BUDGET ACTIVITY<br>2040: *Research, Development, Test & Evaluation, Army*<br>BA 2: *Applied Research* | | | R-1 ITEM NOMENCLATURE<br>PE 0602270A: *Electronic Warfare Technology* | | |
| **B. Program Change Summary ($ in Millions)** | **FY 2012** | **FY 2013** | **FY 2014 Base** | **FY 2014 OCO** | **FY 2014 Total** |
| Previous President's Budget | 15.765 | 15.068 | 15.221 | - | 15.221 |
| Current President's Budget | 15.667 | 15.068 | 17.585 | - | 17.585 |
| Total Adjustments | -0.098 | 0.000 | 2.364 | - | 2.364 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.098 | - | | | |
| • Adjustments to Budget Years | - | - | 2.364 | - | 2.364 |

| Exhibit R-2A, RDT&E Project Justification: PB 2014 Army | | | DATE: April 2013 |
|---|---|---|---|
| APPROPRIATION/BUDGET ACTIVITY<br>2040: *Research, Development, Test & Evaluation, Army*<br>BA 2: *Applied Research* | R-1 ITEM NOMENCLATURE<br>PE 0602270A: *Electronic Warfare Technology* | PROJECT<br>906: *Tactical Electronic Warfare Applied Research* | |

| COST ($ in Millions) | All Prior Years | FY 2012 | FY 2013# | FY 2014 Base | FY 2014 OCO ## | FY 2014 Total | FY 2015 | FY 2016 | FY 2017 | FY 2018 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 906: *Tactical Electronic Warfare Applied Research* | - | 15.667 | 15.068 | 17.585 | - | 17.585 | 18.459 | 19.325 | 20.539 | 21.124 | Continuing | Continuing |

# FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

## The FY 2014 OCO Request will be submitted at a later date

**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 booby traps. 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, Soldier and Air portfolios.

Work in this project is complimentary of PE 0603270A (EW Technology) and PE 0603772A (Advanced Tactical Computer Science and Sensor Technology); and fully coordinated with PE 0603008A (Command, Control, Communications Advanced Technology) and PE 0603710A (Night Vision 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 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 2012 | FY 2013 | FY 2014 |
|---|---|---|---|
| ***Title:*** Multi-Intelligence Data Fusion and Targeting | 4.071 | 3.300 | 2.787 |
| ***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 | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2014 Army | | DATE: April 2013 |
|---|---|---|
| APPROPRIATION/BUDGET ACTIVITY<br>2040: *Research, Development, Test & Evaluation, Army*<br>BA 2: *Applied Research* | R-1 ITEM NOMENCLATURE<br>PE 0602270A: *Electronic Warfare Technology* | PROJECT<br>906: *Tactical Electronic Warfare Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2012 | FY 2013 | FY 2014 |
|---|---|---|---|
| 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.<br><br>***FY 2012 Accomplishments:***<br>Investigated biometric data matching and fusion algorithms for use in non-cooperative intelligence collection environment; investigated standards of ingestion to facilitate addition of non-cooperatively collected biometrics (partial iris scans, scents, three dimensional (3D) face, thermal face, etc.) into biometrics database; coded enhanced algorithms to conduct near-real-time matching and fusion of cooperative and non-cooperative biometric intelligence into enhanced biometric intelligence products; finalized data collection process, generated candidate templates, and conducted non-cooperative sensor data collection to assess the process and templates.<br><br>***FY 2013 Plans:***<br>Create and populate non-cooperative biometrics database and assess effectiveness of near-real-time matching and fusion algorithms and data templates; interface cooperative and non-cooperative biometrics databases together to permit sharing and fusion of data; evaluate ability to simultaneously collect, query and match biometrics data in near-real-time using representative tactical communications system.<br><br>***FY 2014 Plans:***<br>Will investigate cultural, psychological, social, 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; research political, military, economic, social, infrastructure and information (PMESII) data standards and develop models to assess how cultural and PMESII factors can influence support or alter decisions during military planning and execution. | | | |
| ***Title:*** Offensive Information Operations Technologies<br><br>***Description:*** This effort deigns, 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.<br><br>***FY 2012 Accomplishments:***<br>Refined techniques to perform computer network manipulation to include, traffic redirection, data-in-transit, and network situational awareness; developed comprehensive visualization interface that takes into account CNO and Electronic Warfare (EW) missions; assessed feasibility of integrating next-generation EW systems with tactical CNO capabilities to maximize effects on targets | 4.616 | 4.454 | 5.061 |

| Exhibit R-2A, RDT&E Project Justification: PB 2014 Army | | DATE: April 2013 |
|---|---|---|
| APPROPRIATION/BUDGET ACTIVITY<br>2040: *Research, Development, Test & Evaluation, Army*<br>BA 2: *Applied Research* | R-1 ITEM NOMENCLATURE<br>PE 0602270A: *Electronic Warfare Technology* | PROJECT<br>906: *Tactical Electronic Warfare Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2012 | FY 2013 | FY 2014 |
|---|---|---|---|
| and minimize the training requirements on operator to executing a CNO mission; developed anti-tamper and adapted offensive components, networking resource mutation for network manipulation, and virtualization/virtual-machine monitors for isolation.<br>***FY 2013 Plans:***<br>Investigate denial of service/offensive cyber techniques to counter new threat devices; extend capabilities developed for legacy threat devices to enable a coordinated tactical cyber capability against multiple targets and threat devices simultaneously; design and evaluate offensive denial of service techniques on tactical cyber-capable platforms, to include software defined radios and other ground/air-based sensors and transmitters.<br>***FY 2014 Plans:***<br>Will refine cyber effects and situational awareness techniques for various protocols and signals-of-interest (SOIs); enhance current electronic warfare networking protocol extensions as applicable to enable tactical cyber capabilities; develop advanced cyber techniques. | | | |
| ***Title:*** Multispectral Threat Warning<br>***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.<br>***FY 2012 Accomplishments:***<br>Investigated countermeasure techniques against next-generation MANPADS employing digital imaging seekers; used modeling and simulation and limited hardware-in-the-loop methods to investigate potential effectiveness of current platform-resident infrared (IR) focal plane arrays, likely tracking algorithms, digital IR countermeasure lasers and available imaging sources against these advanced seekers.<br>***FY 2013 Plans:***<br>Create an end-to-end modeling and simulation (M&S) environment to develop countermeasures against advanced imaging missiles consisting of realistic representations of the missile digital seekers, their rotorcraft targets, likely countermeasures, effects and atmospheric effects; use this environment to assess effectiveness of known countermeasures and explore new countermeasure techniques to use against these threats; integrate digital seeker hardware surrogates into this M&S environment for use in hardware-in-the-loop simulations.<br>***FY 2014 Plans:*** | 3.480 | 3.569 | 3.678 |

| Exhibit R-2A, RDT&E Project Justification: PB 2014 Army | | DATE: April 2013 |
|---|---|---|
| APPROPRIATION/BUDGET ACTIVITY<br>2040: *Research, Development, Test & Evaluation, Army*<br>BA 2: *Applied Research* | R-1 ITEM NOMENCLATURE<br>PE 0602270A: *Electronic Warfare Technology* | PROJECT<br>906: *Tactical Electronic Warfare Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2012 | FY 2013 | FY 2014 |
|---|---|---|---|
| Will validate M&S environment and new countermeasure techniques; validate digital seeker hardware surrogate performance in the modeling environment and hardware-in-the-loop simulations; evaluate known countermeasures in the M&S environment to assess effectiveness; investigate new countermeasure techniques to use against advanced threats. | | | |
| ***Title:*** Passive and Active Targeting Techniques<br><br>***Description:*** This effort investigates passive and active techniques and software algorithm design and coding for three dimensional detection, identification, and precision geolocation of next-generation wireless communication threats and improved situational awareness. This effort also addresses operational conditions such as dense, co-channel, and multipath RF environments. This effort continues in FY13 under Multi-Functional Intelligence, Surveillance and Reconnaissance (ISR) Technologies.<br><br>***FY 2012 Accomplishments:***<br>Investigated techniques to improve the resolution of conventional non-cooperative time-difference-of-arrival (TDoA) based geolocation techniques; investigated techniques to overcome multipath effects such as reflection, absorption and diffraction found in complex urban environments that cannot be resolved by traditional TDoA and angle of arrival techniques utilizing electromagnetic propagation mapping tools. | 3.500 | 0.000 | 0.000 |
| ***Title:*** Multi-Function Intelligence, Surveillance and Reconnaissance (ISR) Technologies<br><br>***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 in support of area/base camp protection and investigating an open, scalable architecture adaptable for multiple base sizes and environments and other ISR sensors. This effort transitions from Passive and Active Targeting Techniques which ends in FY12. Work being accomplished under PE 63772/243 complements this effort<br><br>***FY 2013 Plans:***<br>Design and validate radar waveforms to enable communication and coordination between similar radar sensors without the need for a central node; design and implement noise correlation algorithms to mitigate signal interception and compromise, reduce co-site interference and preserve high resolution target detection capability.<br><br>***FY 2014 Plans:***<br>Will assess radar waveforms designed to coordinate radar sensors without the need for a central interface node, facilitating radar data sharing and cross cueing; investigate and analyze 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. | 0.000 | 3.745 | 3.759 |
| ***Title:*** Electronic Warfare Architectures and Countermeasures | 0.000 | 0.000 | 2.300 |

| Exhibit R-2A, RDT&E Project Justification: PB 2014 Army | | DATE: April 2013 |
|---|---|---|
| APPROPRIATION/BUDGET ACTIVITY<br>2040: *Research, Development, Test & Evaluation, Army*<br>BA 2: *Applied Research* | R-1 ITEM NOMENCLATURE<br>PE 0602270A: *Electronic Warfare Technology* | PROJECT<br>906: *Tactical Electronic Warfare Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2012 | FY 2013 | FY 2014 |
|---|---|---|---|
| ***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.<br><br>***FY 2014 Plans:***<br>Will analyze existing EW system components to determine if they may be dual use to address multiple threats or types of threats; develop extensions to traditional EW system architecture to enable a new EW architecture comprised of distributed peripheral components that can be centrally controlled and managed; identify and assess critical components associated with known and emerging threat devices to support laboratory assessments through component and/or surrogate experiments; design and code modeling and simulation resources to enable live, virtual and constructive electronic warfare laboratory assessments. | | | |
| **Accomplishments/Planned Programs Subtotals** | 15.667 | 15.068 | 17.585 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

**E. Performance Metrics**

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.