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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2012 Army **DATE:** February 2011

<b>APPROPRIATION/BUDGET ACTIVITY</b> 2040: <i>Research, Development, Test &amp; Evaluation, Army</i> BA 3: <i>Advanced Technology Development (ATD)</i>				<b>R-1 ITEM NOMENCLATURE</b> PE 0603270A: <i>Electronic Warfare Technology</i>							
<b>COST (\$ in Millions)</b>	<b>FY 2010</b>	<b>FY 2011</b>	<b>FY 2012 Base</b>	<b>FY 2012 OCO</b>	<b>FY 2012 Total</b>	<b>FY 2013</b>	<b>FY 2014</b>	<b>FY 2015</b>	<b>FY 2016</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
Total Program Element	23.766	18.350	23.677	-	23.677	21.501	22.459	22.690	23.333	Continuing	Continuing
K12: <i>EW Demonstrations (CA)</i>	5.172	-	-	-	-	-	-	-	-	Continuing	Continuing
K15: <i>ADVANCED COMM ECM DEMO</i>	9.114	9.393	12.048	-	12.048	9.724	9.907	9.782	10.062	Continuing	Continuing
K16: <i>NON-COMMO ECM TECH DEM</i>	9.480	8.957	11.629	-	11.629	11.777	12.552	12.908	13.271	Continuing	Continuing

## **Note**

FY12 funding increase for Combat ID Demos, EW Integrated Test, and Ground EW Networking Demos.

## **A. Mission Description and Budget Item Justification**

This program element (PE) matures and demonstrates electronic warfare (EW) technologies 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 K12 funds congressional special interest items. Project K15 matures and demonstrates technologies to locate and exploit enemy communication systems including computer networks. Project K16 matures and demonstrates multifunctional EW capability to enhance platform survivability (jamming) and the detection, identification and geo-location of emitters of interest to provide near real-time situational awareness to the commander.

Work in this PE is complimentary of PE 0602270A (EW Techniques), PE 0602120A (Sensors and Electronic Survivability), and PE 0603772A (Advanced Tactical Computer Science), and fully coordinated with PE 0603313A (Missile and Rocket Advanced Technology) and PE 0603003A (Aviation Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

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

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B. Program Change Summary (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	21.877	18.350	18.654	-	18.654
Current President's Budget	23.766	18.350	23.677	-	23.677
Total Adjustments	1.889	-	5.023	-	5.023
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	2.387	-			
• SBIR/STTR Transfer	-0.498	-			
• Adjustments to Budget Years	-	-	5.023	-	5.023

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<b>APPROPRIATION/BUDGET ACTIVITY</b> 2040: <i>Research, Development, Test &amp; Evaluation, Army</i> BA 3: <i>Advanced Technology Development (ATD)</i>				<b>R-1 ITEM NOMENCLATURE</b> PE 0603270A: <i>Electronic Warfare Technology</i>				<b>PROJECT</b> K12: <i>EW Demonstrations (CA)</i>			
<b>COST (\$ in Millions)</b>	<b>FY 2010</b>	<b>FY 2011</b>	<b>FY 2012 Base</b>	<b>FY 2012 OCO</b>	<b>FY 2012 Total</b>	<b>FY 2013</b>	<b>FY 2014</b>	<b>FY 2015</b>	<b>FY 2016</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
K12: <i>EW Demonstrations (CA)</i>	5.172	-	-	-	-	-	-	-	-	Continuing	Continuing
<b><u>A. Mission Description and Budget Item Justification</u></b> Congressional Interest Item funding for Electronic Warfare Demonstrations.											
<b><u>B. Accomplishments/Planned Programs (\$ in Millions)</u></b>								<b>FY 2010</b>	<b>FY 2011</b>	<b>FY 2012</b>	
<b><i>Title:</i></b> ALQ-211 Networked EW Controller  <b><i>Description:</i></b> This is a Congressional Interest Item.  <b><i>FY 2010 Accomplishments:</i></b> Developed software algorithms and on-board/off-board networking capability for advanced radar warning receiver (RWR) and electronic countermeasures (ECM) systems deployed on rotary wing aircrafts to enable the sharing of RF threat warning and situation awareness data among combat team elements.								0.796	-	-	
<b><i>Title:</i></b> Advanced Ground Electronic Warfare & Signals Intelligence System  <b><i>Description:</i></b> This is a Congressional Interest Item.  <b><i>FY 2010 Accomplishments:</i></b> Developed a next generation system that can be used to detect & jam enemy communications, improvised explosive devices (IEDs), and other EW threats.								1.989	-	-	
<b><i>Title:</i></b> Fourth GEN Wireless Exploitation  <b><i>Description:</i></b> This is a Congressional Interest Item.  <b><i>FY 2010 Accomplishments:</i></b> Developed technology to improve communication and intelligence gathering.								2.387	-	-	
<b>Accomplishments/Planned Programs Subtotals</b>								5.172	-	-	
<b><u>C. Other Program Funding Summary (\$ in Millions)</u></b> N/A											
<b><u>D. Acquisition Strategy</u></b> N/A											

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**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.

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Army									DATE: February 2011		
APPROPRIATION/BUDGET ACTIVITY 2040: Research, Development, Test & Evaluation, Army BA 3: Advanced Technology Development (ATD)				R-1 ITEM NOMENCLATURE PE 0603270A: Electronic Warfare Technology				PROJECT K15: ADVANCED COMM ECM DEMO			
COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
K15: ADVANCED COMM ECM DEMO	9.114	9.393	12.048	-	12.048	9.724	9.907	9.782	10.062	Continuing	Continuing
A. Mission Description and Budget Item Justification											
<p>This project matures and demonstrates technologies to locate and identify modern tactical battlefield 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. This project matures and demonstrates communications countermeasure (CM) and counter-countermeasure (CCM) technologies to first intercept, identify, and locate tactical communications, then degrade threat-computer networks and their components.</p> <p>The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.</p> <p>Work in this project is performed by the Army Research, Development, and Engineering Command (RDECOM), Communications - Electronics Research, Development, and Engineering Center (CERDEC), Ft. Monmouth NJ and Aberdeen Proving Ground, MD.</p>											
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2010	FY 2011	FY 2012
Title: Offensive Operations									4.557	4.696	7.307
Description: This effort matures and demonstrates integrated electronic attack (EA) and computer network operations (CNO) technologies to execute force protection (FP), EA, electronic surveillance (ES), and signals intelligence (SIGINT) 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 while preserving blue force/non-combatant communications. Work being accomplished under PE 0603270A/project K16 compliments this effort.											
FY 2010 Accomplishments: Devised and Coded algorithms for distributed scheduling and predicted impact; devised and coded high-fidelity models of next generation techniques to include lethal effects and threat/node characterization.											
FY 2011 Plans: Enhance system baseline for distributed operation; focus techniques development on threat priorities; identify and implement EW asset and network load balancing techniques to ensure effective and efficient operation; develop techniques to ensure											

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2010</b>	<b>FY 2011</b>
coordination and interoperability with Counter Remote Control Improvised Explosive Device (RCIED) Electronic Warfare (CREW) systems.			
<b>FY 2012 Plans:</b> Will continue fabrication and coding of integrated networked EW technologies and techniques to address current and emerging threat priorities; will complete network load balancing and resource management techniques to aid in this integration; will refine and integrate real-time, On-The-Move (OTM) direction finding / Geolocation technologies; will demonstrate EW technologies in a distributed Comms-EW mission at various levels of interoperability with network registered assets (e.g., coexistence, interoperation, and fully integrated) in conjunction with an existing FP mission. Possible demonstration scenario: an individual EW asset acquires three threat signals but is only able to address and defeat one of them due to constraints (e.g., power, bandwidth, or etc.). Because all three detections are reported to the network, other EW assets can address and defeat the two outstanding signals.			
<b>Title:</b> Stand-off Non-Cooperative Multi-Intelligence Technologies  <b>Description:</b> This effort matures and demonstrates technologies to detect, identify, map, and display structural layouts, identify and locate personnel, RF devices and anomalies located within structures and complex terrain to provide dismounted and remote users with the capability to conduct standoff intelligence, surveillance and reconnaissance in a three dimensional urban battlespace.  <b>FY 2010 Accomplishments:</b> Analyzed and designed optimum sensor mix to identify and locate personnel, RF devices, and anomalies as well as detect structural layouts; devised and coded software algorithms for sensor data fusion and sensor hardware; matured modeling and simulation to aid in assessing sensors for determining optimum sensor mix.  <b>FY 2011 Plans:</b> Improve and implement new algorithms and techniques for detection of slow-moving and stationary personnel inside structures and reduce false positives due to multipath signal propagation in urban environments; leverage data from IED efforts to develop algorithms that would allow through-the-wall detection of personnel carrying weapons and explosive devices; assess/leverage recent developments in 3-D visualization and mapping efforts and apply radio frequency detection techniques as necessary to selected ground radars and/or their ground stations.  <b>FY 2012 Plans:</b> Will integrate and demonstrate software, algorithms and techniques that provide stand-off sense-through-the-wall, counter-cover/concealment/camouflage, and denial-and-deception as pre-planned product improvement increments into PEO Soldier/PM Soldier Sensors & Lasers hand held devices; will demonstrate target identification and discrimination technologies (e.g., RF measures		4.557	4.697
			4.741

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2010</b>	<b>FY 2011</b>
and signals intelligence appliques, personnel detection and fused reporting) against select modern RF emitter threats, RCIEDs and other targets with low or indistinct emissions for both airborne and ground based platforms.			
<b>Accomplishments/Planned Programs Subtotals</b>		9.114	9.393
<b>C. Other Program Funding Summary (\$ in Millions)</b> N/A			
<b>D. Acquisition Strategy</b> N/A			
<b>E. Performance Metrics</b> 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.			

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APPROPRIATION/BUDGET ACTIVITY 2040: Research, Development, Test & Evaluation, Army BA 3: Advanced Technology Development (ATD)				R-1 ITEM NOMENCLATURE PE 0603270A: Electronic Warfare Technology				PROJECT K16: NON-COMMO ECM TECH DEM			
COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
K16: NON-COMMO ECM TECH DEM	9.480	8.957	11.629	-	11.629	11.777	12.552	12.908	13.271	Continuing	Continuing
A. Mission Description and Budget Item Justification											
<p>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 forces. This project matures and demonstrates radio frequency (RF), infrared (IR) and electro-optical (EO) sensor and jamming source technologies 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 matures and demonstrates electronic support (ES) technologies to detect, identify, and geolocate emitters of interest from an effective standoff distance and provide near real-time situational awareness.</p> <p>The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.</p> <p>Work in this project is performed by the Army Research, Development, and Engineering Command (RDECOM), Communications-Electronic Research, Development, and Engineering Center (CERDEC), Ft. Monmouth NJ and Aberdeen Proving Ground, MD, and the Army Research Lab, Adelphi MD.</p>											
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2010	FY 2011	FY 2012
Title: Distributed Aperture Infrared Countermeasures (DAIRCM) Technologies									4.642	4.405	4.444
Description: This effort matures and demonstrates an integrated laser source, distribution system, and beam director that support multi-function helicopter protection with an integrated cueing capability.											
FY 2010 Accomplishments: Aligned a non-mechanical pointer tracker with a multi-band IRCM laser. The pointer tracker scanned areas of interest cued by various missile warning systems and detected the incoming threat.											
FY 2011 Plans: Complete design of closed loop IRCM techniques and multi-band laser demonstrator; integrate advanced two color IR missile warning capability to improve overall demonstrator performance with high probability of detection/low false alarm, while the pointer-tracker expands the mission profile by increasing pointer-tracker reliability and permits simultaneous multiple threat engagement; develop target identification database for mission post analysis; finalize digital threat-warning hardware design; perform assessment on correlation algorithms and architecture.											
FY 2012 Plans:											

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2010</b>	<b>FY 2011</b>
Will conduct field demonstration of single modular, compact pointer tracker capability with a multiband laser jammer and an advanced 2-color missile warner capable of searching and defeating multiple engagements of enemy EO/IR threats; will demonstrate this capability against a representative advanced infrared man-portable air defense system.			
<b>Title:</b> Advanced Tactical Radio Frequency Countermeasures (ATRFCM) Technologies  <b>Description:</b> This effort matures and demonstrates an integrated EW/direction finding system for the protection of platforms from emerging RF threats. Work accomplished under PE 0602120A/project H15, PE 0602270A/project 906, and PE 0603270A/project K15 complements this effort.  <b>FY 2010 Accomplishments:</b> Improved and demonstrated wideband frequency waveform generators for higher spectral purity and modulation flexibility, wideband receivers capable of high speed, dynamic signal demodulation and data collection, and efficient high-power RF amplifiers for improved EW/communications compatibility; began fabrication of a working brassboard for lab and field assessments; fabricated integrated and distributed packaging for improved vehicle integration and thermal performance.  <b>FY 2011 Plans:</b> Optimize platform protection capabilities through the coordination of real-time dynamic antenna selection; demonstrate real time on-the-move direction finding and geolocation capabilities that complement targeting and cueing activities of overarching force protection and Comms EW missions to support a common operating picture  <b>FY 2012 Plans:</b> Will demonstrate a distributed, networked, multi-platform (air and ground) EW framework enabling the coordinated detection, geolocation, reporting, and engagement of multiple diverse threat waveforms; will demonstrate automatic synchronization of EW framework with blue force communications to deconflict threats from friendly forces for improved survivability and situational awareness.		4.838	4.552
<b>Title:</b> Combat ID Technology Demonstrations  <b>Description:</b> This effort matures and demonstrates real time Combat Identification technologies for light weight tactical vehicles and Soldiers. Work accomplished under PE 0602120A/project H15 compliments this effort.  <b>FY 2012 Plans:</b> Will leverage light vehicle demonstration to complete final waveform modifications and select Software Radio Waveform interrogation approach for coding onto Joint Tactical Radio System platform.		-	2.500
<b>Accomplishments/Planned Programs Subtotals</b>		9.480	11.629

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<b>C. Other Program Funding Summary (\$ in Millions)</b> N/A		
<b>D. Acquisition Strategy</b> N/A		
<b>E. Performance Metrics</b> 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.		