

# ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

**February 2008**

BUDGET ACTIVITY	PE NUMBER AND TITLE						
<b>3 - Advanced technology development</b>	<b>0603270A - Electronic Warfare Technology</b>						
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
Total Program Element (PE) Cost	24674	41951	23996	19317	18700	19118	19547
K12 EW Demonstrations (CA)	6730	24643					
K15 ADVANCED COMM ECM DEMO	9096	9335	14534	9415	9506	9718	9936
K16 NON-COMMO ECM TECH DEM	8848	7973	9462	9902	9194	9400	9611

**A. Mission Description and Budget Item Justification:** This program element (PE) designs and develops electronic warfare (EW) component technologies that deny, disrupt, or degrade the enemy's use of the electromagnetic spectrum for offensive or defensive operations, for use in the Future Force and, where feasible, exploits opportunities to enhance Current Force capabilities. This is accomplished through the investigation of electronic support measures (ESM), countermeasures against communications systems and networks; the development of sensors used to identify and locate threat forces in an asymmetric environment; and threat warning and electronic countermeasures (ECM) against: munitions sensors and targeting capabilities, missile guidance and targeting systems, and booby traps. Project 442 funds efforts related to the design, development, and application of electronic warfare technologies to enhance the survivability capabilities of ground combat vehicles, aircraft, and the dismounted Soldier. In addition, this project offers improvements to Current Force EW sensors and ECM systems to further protect high-value ground targets, aircraft, and the Soldier from threat surveillance and tracking systems; imaging systems; and advanced RF/EO/IR missiles, artillery, and smart munitions. Improvements to the next generation EW protection sensors augment the classic intelligence, surveillance, and reconnaissance (ISR) sensors by providing multi-functional capabilities for on-board and off-board situational awareness (SA), targeting, and combat identification. Information fusion research addresses sensor correlation, relationship discovery, and management services through use of automated processing, as well as higher level reasoning techniques that support automated combat assessment. Project 906 funds efforts related to research and application of key EW technologies to intercept, locate, and disrupt, current and emerging threat communications and non-communications emitters, to provide vital, quality combat information directly to users in a timely actionable manner in accordance with concepts for Future Force intelligence operations. Specifically, its technologies focus on detecting threat sensors and emitters associated with weapon systems, targeting systems and command, control, communications, computers, and intelligence (C4I) systems and networks.

Efforts in this PE are coordinated with PE 0603270A (EW Technology), PE 0602120A (Sensors and Electronic Survivability), PE 0603772A (Advanced Tactical Computer Science and Sensor Technology), PE 0602783A (Computer and Software Technology), and PE 0602784A (Advanced Concepts and Simulation). Project 475 funds congressional special interest efforts. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work is performed by the Army Research, Development and Engineering Command, Communications-Electronics Research, Development, and Engineering Center, Fort Monmouth, NJ.

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<u><b>B. Program Change Summary</b></u>	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2008/2009)	25280	17419	18864
Current BES/President's Budget (FY 2009)	24674	41951	23996
Total Adjustments	-606	24532	5132
Congressional Program Reductions		-268	
Congressional Rescissions			
Congressional Increases		24800	
Reprogrammings	-1		
SBIR/STTR Transfer	-605		
Adjustments to Budget Years			5132

FY09 was increased to support the advanced development research for combat identification.

Six FY08 congressional adds totaling \$24800 were added to this PE.

- (\$1600) WIZARD - Remotely Controlled Improvised Explosive Device Countermeasures
- (\$2000) US Army Future Force ELINT
- (\$2400) Advanced IED Jammer Research and Development Program
- (\$2800) DAIRCM/CMWS for Army Helicopters
- (\$6400) Non-communications ECM Technology Demonstration (Augments current program)
- (\$9600) Advanced Communications ECM Demonstration (Augments current program)

# ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

**February 2008**

<b>BUDGET ACTIVITY</b> <b>3 - Advanced technology development</b>		<b>PE NUMBER AND TITLE</b> <b>0603270A - Electronic Warfare Technology</b>					<b>PROJECT</b> <b>K15</b>	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
K15      ADVANCED COMM ECM DEMO	9096	9335	14534	9415	9506	9718	9936	

**A. Mission Description and Budget Item Justification:** This project matures and demonstrates the ability to locate and identify modern tactical battlefield enemy and blue force radio frequency (RF) communications and radars for the Future Force to conduct uninterrupted air and ground based intelligence collection and long range targeting operations in a hostile electromagnetic environment. This project provides flexible, modern systems to achieve information dominance, protect the force, and shape the battlespace. Networked Electronic Warfare (NEW) provides lightweight, low cost Unmanned Aerial System (UAS), and Unattended Ground Sensors (UGS) Electronic Support Measures (ESM) to detect and locate modern signals of interest. This project designs, develops, and demonstrates communications countermeasures (CM) and counter-countermeasures (CCM) technologies to first intercept, identify, and locate tactical communications and then manipulate threat computer networks and their components.

The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work in this project is performed by the Army Research, Development, and Engineering Command, Communications-Electronics Research, Development, and Engineering Center, Ft. Monmouth NJ.

<b><u>Accomplishments/Planned Program:</u></b>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Networked Electronic Warfare: This effort provides autonomous detection, classification, correlation, and geo-location capability against modern wireless emitters and other threats. In FY07, demonstrated UAS and ground-based electronic support measures (ESM) systems in a high emitter density suburban and urban operational environment; transitioned ESM systems to Program Manager Signal Warfare; matured wideband antenna and power amplifiers that cover the entire frequency range of current and anticipated future threats; optimized adaptive array processor to counter problems associated with multipath (signal bouncing off structures and arriving at different times and from varying directions), co-channel (receiving two signals on the same frequency at the same time), and co-site interference (transmitting and receiving at the same time from the same location); matured software algorithms to map present communications architecture in areas of interest; performed analysis to determine the optimal network based attack schema. In FY08, conduct developmental tests of surgical EW techniques against 3 threats simultaneously; integrate complementary jamming and detection/location/neutralization capabilities such as time difference of arrival (TDOA) geolocation and electronic attack based on geolocation; integrate algorithms into government off the shelf hardware. In FY09, will integrate commercial off-the-shelf 3-D visualization and mapping tools with geo-location solution set for optimal urban situational awareness and emitter representation; will integrate capabilities into net-centric solution that combines jamming and detection/locations/ neutralization capabilities; will complete algorithm development and validation and fabrication of adaptive processing arrays. Work related to this effort is also being accomplished under PE 0602270A projects 442 and 906 and PE 0603270A project K16.	9096	9140	9310
Combat Identification (CID) Technology Demonstration: This effort matures and demonstrates real time CID technologies for light weight tactical vehicles and Soldiers. In FY09, will mature and demonstrate the Soldier Radio Waveform (SRW) as a radio-based application that would provide both a target identification (TI) and situational awareness (SA) capability for light vehicle applications as well as urban and open terrain operation for Soldier level applications; will mature TI interrogation approaches utilizing either laser or radio frequency			5224

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<b>3 - Advanced technology development</b>	<b>0603270A - Electronic Warfare Technology</b>	<b>K15</b>	
components; will enhance the SRW software to allow it to respond to directed interrogations for TI capability as well as to provide SA capability even in Global Positioning System denied environments; will integrate and demonstrate the processor, transceiver, and antenna for the miniaturized Battlefield Target Identification Device (BTID) CID system on light weight tactical vehicles. Work related to this effort is also being accomplished under PE/project: 0602120A/H15.			
Small Business Innovative Research/Small Business Technology Transfer Programs		195	
<b>Total</b>	<b>9096</b>	<b>9335</b>	<b>14534</b>

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COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
K16 NON-COMMO ECM TECH DEM	8848	7973	9462	9902	9194	9400	9611	

**A. Mission Description and Budget Item Justification:** This project matures and demonstrates the Future Force non-communication, multi-functional electronic warfare capability to enhance the survivability of aviation platforms, ground combat vehicles, and the dismounted forces. The survivability approach provides detection avoidance through situational awareness and identification technologies, signature management, hit avoidance using warning receivers, and electronic countermeasures. This project demonstrates recent advances in radio frequency (RF), infrared (IR) and electro-optical (EO) sensor and jamming sources to detect, locate, deceive, and jam booby traps, radar directed target acquisition systems, target-tracking sensors, surface-to-air missiles (SAMs), air-to-air missiles (AAMs), top attack and electronically fuzed munitions. This project matures the ability to neutralize booby traps. Technology is demonstrated by embedding the maximum capability in projected brigade combat team (BCT)/Future Force systems with a focus on minimizing impacts to vehicle weight, cost, logistics, and fielding. Additionally, this project demonstrates EO technologies and countermeasure technologies against laser-aided and electro-optically directed gun or missile systems. This project also demonstrates Electronic Support (ES) technologies used against communications and non-communications signals for targeting, combat identification and tactical Situation Awareness (SA). Efforts are focused on detecting, identifying, and geolocating emitters of interest from an effective standoff distance and providing near real-time SA updates to the BCT commander.

The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work in this project is performed by the Army Research, Development, and Engineering Command, Communications-Electronic Research, Development, and Engineering Center, Ft. Monmouth NJ, and the Army Research Lab, Adelphi MD.

<b><u>Accomplishments/Planned Program:</u></b>	<b><u>FY 2007</u></b>	<b><u>FY 2008</u></b>	<b><u>FY 2009</u></b>
Networked Electronic Warfare: This effort provides autonomous detection, classification, correlation, and geo-location capability against modern wireless emitters and other threats. In FY07, developed counter threat prototypes and algorithms, including unique waveforms, antennas, high sensitivity receivers, and high power transmitters for threat detection and neutralization technologies. In FY08, integrate algorithms into government off-the-shelf hardware; conduct performance testing of prototype system; refine the system design based on test results; integrate jamming and detection/location/neutralization capabilities. In FY09, will complete algorithm development and validation of adaptive processing arrays; will integrate visualization and mapping tools with geolocation solution sets; will demonstrate capability in the lab. Work related to this effort is also being accomplished under PE/project: 0602270A/442; 0602270A/906, and 0603270A/K15.	1989	1967	2232
Cueing Sensor: This effort matures and demonstrates low cost infrared sensors that detect rocket propelled grenades, anti-tank guided missiles, tank fired kinetic energy and high energy anti-tank rounds and then cue active protection systems for Army vehicles. In FY07, matured dual band focal plane arrays (FPA), detection algorithms, and signal processing; performed live-fire testing of prototype warning and cueing sensors and systems; selected one system based on test results. In FY08, optimize FPA design; enhance and evaluate sensor, electronics, and algorithms for testing on-the-move (OTM) environment. In FY09, will demonstrate the cueing sensor software and hardware against different types of live fire munitions (threats to ground vehicle); will demonstrate the capability to detect, declare, and classify the live fire threats; will transition the cueing sensor hardware and software to the active protection system (APS) effort for	1926	3483	7230

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integration into the kinetic energy APS vehicle survivability system. Work related to this effort is also being accomplished under PE/projects: 0602270A/442; 0602120A/H15; and 0603772A/243.			
Combat Identification Technologies: In FY07, designed and fabricated geometric pairing (GP) and RF Tag hardware for the ground Soldier and demonstrated dismounted integration concepts and technical performance characteristics; conducted first technical testing of GP situation awareness and RF Tag concepts; completed inserting millimeter wave identification functionality into custom ASICs. Work related to this effort is also being accomplished under PE/project 0602120A/H15.	1078		
Hostile Fire Indication (HFI) and Countermeasure (CM): This effort implements affordable hostile fire indication for aircraft against small arms fire and rocket propelled grenades (RPG) by modifying currently fielded systems. In FY07, assessed RPG detection with Common Missile Warning System (CMWS); modified the APR-39A(V)1 Radar Warning System software to display HFI warnings; matured modeling and simulation of sensor and threats; leveraged UK/USAF optical CM for small arms and RPGs. In FY08, complete software modifications to cockpit display HFI display interface; define overall suite architecture for net-centric survivability in a Simulation environment; conduct live fire test to demonstrate CMWS processing upgrades for hostile fire indication and countermeasure; transition technology to Aviation and Missile Research, Development, and Engineering Center aircraft survivability program for flight testing.	3855	2346	
Small Business Innovative Research/Small Business Technology Transfer Programs		177	
<b>Total</b>	<b>8848</b>	<b>7973</b>	<b>9462</b>