

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

**February 2007**

BUDGET ACTIVITY	PE NUMBER AND TITLE							
<b>3 - Advanced technology development</b>	<b>0603270A - EW TECHNOLOGY</b>							
COST (In Thousands)	FY 2006 Actual	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	21564	25280	17419	18864	19402	18780	19193	19615
K12 EW Demonstrations (CA)	9392	6874						
K15 ADVANCED COMM ECM DEMO	7705	9321	9395	9356	9451	9542	9752	9966
K16 NON-COMMO ECM TECH DEM	4467	9085	8024	9508	9951	9238	9441	9649

**A. Mission Description and Budget Item Justification:** This program element (PE) matures and demonstrates electronic warfare (EW) survivability and combat identification systems to significantly enhance the survivability, lethality, and ability to conduct offensive operations to win the information war for the Future Force and, where feasible, exploits opportunities to enhance Current Force capabilities to include combat identification. It addresses the need to locate, disrupt, or destroy the enemy's Command, Control, and Communications (C3) systems and infrastructure, tactical radar surveillance and radio frequency (RF)/infrared (IR)/electro-optical (EO) homing, guided, and directed munitions and missile systems. Communications countermeasures (CM) and communications counter-countermeasures (CCM) applications are matured to deny the enemy the use of their sensors while protecting sensors from enemy deception and jamming. Project K15, The Advanced Communications Electronic Countermeasures (ECM), provides technology demonstrations in CM, information collection and reporting to transition to Army intelligence and electronic warfare (IEW) systems. Project K16, Non-communication ECM Technology Demonstration, focuses on the feasibility and effectiveness of non-communications ECM and electronic support/electronic intelligence. This project provides self-protection from radar, (EO), and (IR) guided anti-aircraft artillery, surface-to-surface missiles, artillery, and top attack weapons. Further, it provides precise targeting information on non-communications emitters. Deception and jamming of the enemy through long range netted sensor webs will assist in neutralizing the enemy's ability to see, understand, decide, and shoot first. RF based detection and jamming techniques will be matured, in coordination with on-going IR sensor research, to protect ground forces against command and sensor-initiated threats. Efforts in this PE are coordinated with PE 0603313 (Missile and Rocket Advanced Technology) and PE 0603003A (Aviation Advanced Technology), PE 0602270 (EW Techniques), PE 0602120 (Sensors and Electronic Survivability), and PE 0603772 (Advanced Tactical Computer Science). Projects K12, K19, and K20 fund congressional special interest efforts.

The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). Work in this PE contains no duplication with any effort within the Military Departments and is fully coordinated with PE 0602270A (EW Technology). Work in this PE 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 2006	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2007)	22280	18612	18857	18898
Current BES/President's Budget (FY 2008/2009)	21564	25280	17419	18864
Total Adjustments	-716	6668	-1438	-34
Congressional Program Reductions		-97		
Congressional Rescissions				
Congressional Increases		6950		
Reprogrammings	-716	-185		
SBIR/STTR Transfer				
Adjustments to Budget Years			-1438	-34

Five FY07 congressional adds totaling \$6661 (after adjustment for Congressional undistributed reductions) were added to this PE.

- (\$1534) US Army Tactical ELINT for Grnd Maneuver Forces
- (\$1773) Portable Level I Fusion Tool Set
- (\$958) Aerial Canopy MASINT Sensor (ACMS)
- (\$958) Advanced IED Jammer R&D Program
- (\$1438) WIZARD - Remotely Controlled IED CM for DM Soldier

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

**February 2007**

<b>BUDGET ACTIVITY</b> <b>3 - Advanced technology development</b>	<b>PE NUMBER AND TITLE</b> <b>0603270A - EW TECHNOLOGY</b>					<b>PROJECT</b> <b>K15</b>		
COST (In Thousands)	FY 2006 Actual	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	7705	9321	9395	9356	9451	9542	9752	9966

**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) will provide lightweight, low cost Unmanned Aerial Vehicle (UAV), and Unattended Ground Sensors (UGS) Electronic Support Measures (ESM) to detect and locate modern signals of interest. This project investigates, researches, 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 Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). Work in this project is performed by the Army Research, Development, and Engineering Command, Communications-Electronics Research, Development, and Engineering Center, Ft. Monmouth NJ.

<u>Accomplishments/Planned Program:</u>	<u>FY 2006</u>	<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 FY06, demonstrated UAV and UGS electronic support measures (ESM) with real time collection, identification, and location; matured situational awareness algorithms, traffic analysis algorithms, and electronic attack capabilities for signals of interest; matured and demonstrated adaptive array processor for geolocation of signals of interest. In FY07, demonstrate UAV and ground-based ESM systems in a high emitter density suburban and urban operational environment; transition ESM systems to Program Manager Signal Warfare; mature wideband antenna and power amplifiers that cover multiple octaves jamming; continue development of adaptive array processor to counter problems associated with multipath, co-channel, and co-site interference; mature software algorithms to map present communications architecture in areas of interest; perform analysis to determine the optimal network based attack schema. In FY08, will conduct developmental tests and operational assessment; will continue to refine system design and integrate complementary jamming and detection/location/neutralization capabilities; will integrate wideband antenna into adaptive array; 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 62270 projects 442 and 906 and PE 63270 project K16.	7705	9122	9395	9356
Small Business Innovative Research/Small Business Technology Transfer Programs		199		
<b>Total</b>	<b>7705</b>	<b>9321</b>	<b>9395</b>	<b>9356</b>

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<b>BUDGET ACTIVITY</b> <b>3 - Advanced technology development</b>	<b>PE NUMBER AND TITLE</b> <b>0603270A - EW TECHNOLOGY</b>						<b>PROJECT</b> <b>K16</b>		
COST (In Thousands)	FY 2006 Actual	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	4467	9085	8024	9508	9951	9238	9441	9649	

**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 will provide 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. The ability to neutralize booby traps will be matured and demonstrated by embedding the maximum capability in projected brigade combat team (BCT)/Future Force systems to minimize vehicle weight, cost, logistics, and fielding. Additionally, this project will demonstrate 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 Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). 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.

<u>Accomplishments/Planned Program:</u>	<u>FY 2006</u>	<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 FY06, investigated the effects of radio frequency (RF) energy on electronic triggers for threats and measured the power/modulation required to dud or otherwise neutralize selected devices; developed power/energy requirements for neutralization concepts and design parameters. In FY07, develop counter threat prototypes and algorithms, including unique waveforms, antennas, high sensitivity receivers, and high power transmitters for threat detection and neutralization technologies. In FY08, will integrate algorithms into government off the shelf hardware; will conduct performance testing of prototype system; will continue to refine the system design based on test results and begin integration of jamming and detection/location/neutralization capabilities. In FY09, will complete algorithm development and validation and fabrication 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: 62270/442; 62270/906, and 63270/K15.	2330	1989	2066	2230
Cueing Sensor: This effort matures and demonstrates low cost infrared sensors that detect rocket propelled grenades, anti-tank guided missiles, and tank fired kinetic energy and high energy anti-tank rounds and then cue active protection system for Army vehicles. In FY07, mature dual band focal plane arrays (FPA), algorithms, and signal processing; perform live-fire test of prototype warning and cueing sensors and systems; select one system based on test results. In FY08, will optimize FPA design; will enhance sensor, electronics, and algorithms for testing on-the-move (OTM) environment. In FY09, will demonstrate the cueing sensor software and hardware against		1926	3600	7278

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BUDGET ACTIVITY	PE NUMBER AND TITLE			PROJECT
<b>3 - Advanced technology development</b>	<b>0603270A - EW TECHNOLOGY</b>			<b>K16</b>
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 integration into the kinetic energy APS vehicle survivability system. Work related to this effort is also being accomplished under PE/Projects: 62270/442; 62120/H15; and 63772/243.				
Combat Identification Technologies: In FY06, matured custom application specific integrated circuits (ASICs) for millimeter wave (mmW) identification (ID) functionality; demonstrated tools for determining cost effectiveness of combat identification (CID) capabilities; matured modeling and simulation of CID concepts. In FY07, design and fabricate geometric pairing (GP) and RF Tag hardware for the ground Soldier to demonstrate dismounted integration concepts and technical performance characteristics; conduct first technical testing of GP situation awareness and RF Tag concepts and complete inserting mmW ID functionality into custom ASICs. Work related to this effort is also being accomplished under PE/Project 62120/H15.	1350	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 FY06, initiated aircraft and threat modeling and simulation for tactics, techniques, and procedures development, modified Common Missile Warning System (CMWS) processor to enable small arms detection. In FY07, investigate RPG detection with CMWS; modify the APR-39A(V)1 Radar Warning System software to display HFI warnings; mature modeling and simulation of sensor and threats; leverage UK/USAF/NVESD optical CM for small arms and RPGs. In FY08, will complete software modifications to cockpit display HFI display interface; will define overall suite architecture for net-centric survivability in a Simulation environment; will conduct live fire test to demonstrate CMWS processing upgrades for hostile fire indication and countermeasure; will transition technology to Aviation and Missile Research, Development, and Engineering Center aircraft survivability program for flight testing.	787	3880	2358	
Small Business Innovative Research/Small Business Technology Transfer Programs		212		
<b>Total</b>	<b>4467</b>	<b>9085</b>	<b>8024</b>	<b>9508</b>