

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

February 2006

BUDGET ACTIVITY

**2 - Applied Research**

PE NUMBER AND TITLE

**0602270A - EW TECHNOLOGY**

	COST (In Thousands)	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
	Total Program Element (PE) Cost	19694	29305	19218	16539	16635	16782	16911
442	TACTICAL EW TECHNOLOGY	11099	11380	11604	9477	9532	9614	9685
475	ELECTRONIC WARFARE COMPONENT TECHNOLOGIES (CA)	2108	10449	0	0	0	0	0
906	TAC EW TECHNIQUES	6487	7476	7614	7062	7103	7168	7226

**A. Mission Description and Budget Item Justification:** This Program Element (PE) researches and investigates electronic warfare (EW) technologies that will 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 will be 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 improvised explosive devices (IED's). Project 442 funds efforts related to research, investigation, 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 SA, targeting, and combat identification. Information fusion research will address sensor data reduction 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 0603270 (EW Technology), PE 0602120 (Sensors and Electronic Survivability), PE 0603772 (Advanced Tactical Computer Science and Sensor Technology), PE 0602783 (Computer and Software Technology), and PE 0602784 (Advanced Concepts and Simulation). Project 475 funds 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 is related to and is fully coordinated with efforts funded in PE 0603270A (EW Technology). 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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	FY 2005	FY 2006	FY 2007
<b><u>B. Program Change Summary</u></b>			
Previous President's Budget (FY 2006)	19703	19129	19075
Current BES/President's Budget (FY 2007)	19694	29305	19218
Total Adjustments	-9	10176	143
Congressional Program Reductions		-129	
Congressional Rescissions		-295	
Congressional Increases		10600	
Reprogrammings	-9		
SBIR/STTR Transfer			
Adjustments to Budget Years			143

Five FY06 Congressional adds totaling \$10600 were added to this PE.

FY06 Congressional adds with no R-2A (appropriated amount is shown):

(\$1400) GLADVID for Force Protection

(\$4000) Silver Fox UAV

(\$2800) Silver Fox Unmanned Aerial Vehicle

(\$2000) Subterranean Target Identification

(\$1400) Xenon Light Source for Non Lethal Deterrence from Small UAVs

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COST (In Thousands)	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
442 TACTICAL EW TECHNOLOGY	11099	11380	11604	9477	9532	9614	9685
<p><b>A. Mission Description and Budget Item Justification:</b> This project researches, investigates and applies electronic warfare technologies to enhance the survivability capabilities of ground combat vehicles, aircraft and the dismounted soldier. The survivability approach will provide detection avoidance through signature management and hit avoidance using warning receivers and electronic countermeasures. This project will apply recent advances in radio frequency (RF), infrared (IR) and electro-optical (EO) sensor and jamming sources to detect, locate, deceive and jam Improvised Explosive Devices (IEDs), 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. The ability to neutralize IEDs will be researched with the goal of embedding the maximum capability in the Current Force, and systems to minimize Future Force vehicle weight, cost, logistics and fielding. Additionally, this project will research EO technologies and countermeasures technologies against laser-aided and electro-optically directed gun or missile systems. A substantial amount of work will be accomplished under The Technical Cooperation Program (TTCP) Electronic Warfare Systems (EWS) Panel and cost sharing under project arrangements with the United Kingdom (UK) and Australia. Finally, this project will look at those Electronic Support (ES) technologies used against non-communications signals for targeting and tactical Situation Awareness (SA).</p> <p>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 is performed by the Army Research, Development and Engineering Command, Communications-Electronics Research, Development, and Engineering Center, Fort Monmouth, NJ.</p>							
<b>Accomplishments/Planned Program</b>				<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>	
- Electronic Support for the Future Force: This effort researches technologies to collect, identify, locate, and track hard to detect communications emitters on the battlefield that are otherwise unavailable through space, airborne, or other assets. This will provide full spectrum electronic collection and mapping for the Future Force. In FY05, developed and provided advanced simulation capability to refine the operational utility of Unmanned Ground Vehicle (UGV) and Unmanned Aerial Vehicle (UAV) signals intelligence sensors in the Mounted Maneuver Battlespace Lab at Fort Knox and continued sensor, antenna, and receiver design efforts. In FY06, evaluate UAV and UGS electronic support measures in a warfighter operational environment that demonstrates real time collection, identification and location with sensor data fusion.				3300	1000	0	
- Reconnaissance and Defeat of Improvised Explosive Devices: In FY05, collaborated with other U.S. and foreign government agencies on threat and countermeasure techniques; conducted deception and jamming technique research; investigated modeling and simulation hardware and software; expanded the investigation and conducted field-testing of countermeasures against RF and IR links for detonation of booby traps; assessed potential for embedding the countermeasure capability in near term systems. In FY07, investigate unique wave forms for detection of remote controlled improvised explosive devices. Work on this effort is also being accomplished under PE/Project: 62270/906; 63270/K16.				4100	0	749	
- Suite of Sense Through the Wall Systems (STTW) for the Future Force: This effort will provide users with the ability to detect visibly obscured targets up to the objective stand off distance, operate on the move, accurately geo-locate targets in the presence of clutter with an				2699	3420	3497	

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intuitive user interface. In FY05, investigated technologies for concealed weapons detection/concealed explosives detection (CWD/CED); developed and refined techniques for detection of stationary personnel through light construction materials; integrated prototypes with emerging network communications architectures to demonstrate transmission of STTW data on a real time basis; evaluated data transmission, dissemination, and software tools; provided STTW performance model for incorporation into Battle Lab and Future Force Warrior (FFW) operational modeling & simulation. In FY06, conduct lab and user testing of STTW prototypes; utilize experiments to develop tactics, techniques, and procedures and characterize through demonstration urban and complex terrain phenomenology. In FY07, will begin development of integrated personnel detection/CWD/CED systems with greater standoff capability and increase probability of detection; will conduct lab testing of individual STTW sensors against multiple wall types, and formulate techniques for detection of stationary personnel through multiple wall types; will demonstrate hand held STTW prototype with the FFW ATD.			
- Fusion Based Knowledge for the Future Force: In FY05, developed scenarios, constructed data sets, and identified metrics, to conduct a pilot experiment for assessing fusion tools needed to answer commander's priority intelligence requirements (PIRs). In FY06, use software technologies to represent knowledge needed to logically link multiple, diverse sources of data to answer the commander's PIRs. In FY07, will complete process of acquiring knowledge from analysts and implementing in fusion reasoning software, and finalize refinements to software for representing knowledge and reasoning for answering PIRs.	1000	1000	3165
- Next Generation Electronic Warfare Technology for Survivability: In FY06, evaluate candidate technologies to provide full dimensional protection from electro-optic/ infra-red (EO/IR) guided man-portable weapons systems for ground and airborne platforms; design, study, and evaluate multiband laser countermeasure; investigate photonic gap multiband optical fibers and multi-wavelength beam switching, beam steering and pointing devices. In FY07, will initiate hardware-in-the-loop EO/IR countermeasure exploitation/evaluation of next generation EO/IR threats; will design and develop photonic gap multiband optical fibers, beam switching, beam steering and pointing devices.	0	2000	2000
- Cueing Sensor: The purpose of this effort is to develop a cost effective, reliable threat warning and cueing sensor to protect ground vehicles from rocket propelled grenades, tank fired kinetic energy and high explosive anti-tank rounds and antitank guided missiles. In FY06, develop and demonstrate software algorithms for hardware implementation of the on-the-move frame registration, clutter suppression, specific threat classification for the active protection system cueing sensor; investigate focal plane arrays with required array uniformity, operability, sensitivity in the desired spectral bands. In FY07, will develop and optimize threat classification algorithms and signal processing for the active protection system cueing sensor. Work on this effort is also being accomplished under PE/Project 62120/H15; 63270/K16; 63772/243.	0	3960	2193
Total	11099	11380	11604

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COST (In Thousands)	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
906 TAC EW TECHNIQUES	6487	7476	7614	7062	7103	7168	7226
<p><b>A. Mission Description and Budget Item Justification:</b> This project researches and applies key electronic warfare (EW) technologies to intercept and locate, 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. This project will contribute to the commanders ability to see the enemy, both as a unit and as part of a complex, adaptive organization, allowing a "See First, Understand First, Act First" standard of operations. This project investigates radio frequency (RF) collection and mapping technologies to offer real time emitter detection, location, and identification. Efforts include adding an autonomous RF collection capability and algorithms into tactical software defined radios to detect, locate and display enemy RF emissions. It also evolves electronic attack (EA) components into smaller, lower power, lightweight, common modules that counter modern threat Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) systems. In addition, this project will enable a remote capability to disrupt, deny or destroy threat communication signals. Other research areas include fusion (automated assimilation and synthesis) of battlefield intelligence data to enable interpretation of current and future enemy activities and allowing development of Courses of Action in time to act decisively and in a pre-emptive manner.</p> <p>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 is performed by the Army Research, Development and Engineering Command, Communications-Electronics Research, Development, and Engineering Center, Ft. Monmouth, NJ.</p>							
<b>Accomplishments/Planned Program</b>				<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>	
- Electronic Support for the Future Force (ESFF) & Networked Sensors for the Future Force (NSFF): This effort researches and investigates EW sensors and electronics signal processing technologies. In FY05, researched ESM/SIGINT system capabilities that will operate in unmanned networked environments to detect tactical RF transmissions that can support the movements of the Future Combat Systems warfighters; investigated the ability to integrate the unmanned ESM/SIGINT sensor systems with Networked Sensors for the Future Force ATD communications equipment. In FY06, develop ESFF sensor model; integrate ESM/SIGINT algorithms into ground sensor systems; field test ground sensor systems and demonstrate UAV ESM payload prototype in a warfighter operational environment that demonstrates real time collection, ID and location with sensor data fusion.				4123	5184	0	
- Information Operations: In FY05, identified and tested network analysis and data recognition techniques for RF emission, geolocation and virtual address locations in a lab environment. In FY06, develop and investigate adaptive/smart antenna processing techniques to enhance baseline information operations system. In FY07, will collect target vulnerability data, working with various members of the intelligence community; will continue development of adaptive array processors for use in a tactical setting, to counter problems associated with multipath, co-channel and co-site interference that plague current systems, and to provide a precise geolocation capability; will leverage broadband antenna work performed under the Tactical SIGINT Technology program. Work on this effort is also being accomplished under PE 63270 Project K15.				2364	700	4903	
- Fusion Based Knowledge for the Future Force: In FY06, conduct experiments and demonstrations to show software architectural capabilities to rapidly develop and maintain multiple interpretations and associated confidence levels to answer commander's priority intelligence requirements; identify requirements and construct initial information agents to support intelligence retrieval of information				0	892	1120	

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from diverse data sources. In FY07, will finalize development activities of software architecture capabilities and assess its utility to more rapidly develop highly plausible interpretations as answers to commanders' priority intelligence requirements.			
- Reconnaissance and Defeat of Improvised Explosive Devices: In FY06, investigate novel Radio Frequency (RF) probing and other techniques for detection, location and selective neutralization of Improvised Explosive Device (IED) triggering devices; conduct transmitter study to determine the feasibility of a common transmitter for both electronic countermeasures and signal detect/geolocation functions; investigate the effects of RF energy on electronic triggers for remotely controlled (RC) and non-RC IEDs and measure the power/modulation required to dud or otherwise neutralize selected devices; survey existing RF transmitters and antenna technology to meet requirements and identify gaps. In FY07, will develop counter IED prototypes, including unique waveforms, antenna, high sensitivity receiver, and high power transmitter for IED detection and neutralization. Work on this effort is also being accomplished under PE/Project: 62270/442; 63270/K16.	0	700	1591
Total	6487	7476	7614