| BUDGET ACTIVITY
2 - APPLIED RESEARCH | PE NUMBER AND TITLE
0602270A - EW Technology |

COST (In Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	16602	22007	17449	0	0	0	0	0	0	0
442 TACTICAL EW TECHNOLOGY	9374	9814	10119	0	0	0	0	0	0	40
906 TAC EW TECHNIQUES	7228	7338	7330	0	0	0	0	0	0	06
91F MULTIPLE INTEL REMOTED SENSOR SYSTEM - 2ND GEN	0	4855	0	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification:
PLEASE NOTE: This administration has not addressed FY2003-2007 requirements. All FY 2003-2007 budget estimates included in this book are notional only and subject to change.

This Program Element (PE) researches and investigates Electronic Warfare (EW) technologies to improve the Army's Objective Force battlespace Situational Awareness (SA), targeting, Battlefield Assessment (BA), and enhanced Force Protection. This PE will deny, disrupt, or degrade the enemy's use of the electromagnetic spectrum for offensive or defensive operations. Specifically, its technologies focus on detection, identification, geolocation and Battlefield Electronic Mapping of threat emitters associated with weapon guidance systems, targeting systems and Command, Control, Communications, Computers and Intelligence (C4I) systems and networks. Sensor and related research and advanced technology development will focus on a small, self-configuring family of modular sensor products capable of being hosted on a core monitoring and control architecture. This PE covers the spectrum in the Radio Frequency (RF), Infrared (IR), Electro-Optical (EO), and Ultra-Violet (UV) ranges. This PE offers improvements to our EW sensors, and Electronic Countermeasures (ECM) systems to further protect high-value ground targets, aircraft, and the soldier from threat surveillance/tracking systems, imaging systems and advanced RF/EO/IR missiles, artillery, and smart munitions. 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. Finally, this PE will research automated intelligence fusion and automated battlefield assessment management tools. The cited work is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, the Future Combat Systems and Project Reliance. It adheres to the Tri-Service Reliance Agreements on Intelligence And Electronic Warfare (IEW). It is related to and fully coordinated with efforts in PE 0602782A (Command, Control and Communications (C3) Technology), PE 0602709A (Night Vision and Electronics-Optics Technology), PE 0603789F (C3 Intelligence Technology Development), PE 0603270A (Electronic Warfare Advanced Technology), PE 0604270A (Electronic Warfare Development), and PE 0603745A (Tactical Electronics Support Systems - Advanced Development). The PE contains no duplication with any effort within the Military Departments. Work is performed by the US Army Communications-Electronics Command (CECOM), Fort Monmouth, NJ.

0602270A
EW Technology

Item No. 9 Page 1 of 9
142

Exhibit R-2
Budget Item Justification

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)

June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE
2 - APPLIED RESEARCH	**0602270A - EW Technology**

B. Program Change Summary	FY 2000	FY 2001	FY 2002	FY 2003
Previous President's Budget (FY2001 PB)	17402	17310	18378	0
Appropriated Value	17487	22210	0	
Adjustments to Appropriated Value	0	0	0	
a. Congressional General Reductions	0	0	0	
b. SBIR / STTR	-300	0	0	
c. Omnibus or Other Above Threshold Reductions	-46	0	0	
d. Below Threshold Reprogramming	-500	0	0	
e. Rescissions	-39	-203	0	
Adjustments to Budget Years Since FY2001 PB	0	0	-929	
Current Budget Submit (FY 2002/2003 PB)	16602	22007	17449	0

In FY2001, Congressional add was received for Multiple Intelligence Remoted Sensor System ($4900).
-($4900) Design block two enhancements (e.g. advanced transducers, multiple access methods, enhanced networking) to the block one Multiple Intelligence Remoted Sensor System baseline.

0602270A
EW Technology

Item No. 9 Page 2 of 9
143

Exhibit R-2
Budget Item Justification

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602270A - EW Technology**	**442**

COST (In Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
442 TACTICAL EW TECHNOLOGY	9374	9814	10119	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: This project researches, investigates and applies technologies to provide self protect capabilities to the Objective Force and Future Combat Systems (FCS). The intent is to use RF, IR and EO technologies to detect, identify, locate, and employ countermeasures against threat systems. Specifically, this project will investigate the use of RF technologies against radar directed target acquisition, target-tracking sensors, Surface-to-Air Missiles (SAMs), Air-TO-Air Missiles (AAMs), top attack and fuzed munitions. It also will investigate and apply IR technologies against heat seeking SAMs, AAMs and Anti-Tank Guided Missiles (ATGMs). Additionally, this project will focus on EO technologies against laser-aided and electro-optically directed gun or missile systems. Finally, this project will look at those Electronic Support (ES) technologies used against non-communications signals for targeting and tactical SA. This program supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 1399   - Investigated, in conjunction with Defense Advanced Research Projects Agency (DARPA), Air Force (AF) and Navy laboratories, augmenting legacy radios with evolving digital software technology that will provide the capability to receive, classify and support information from a variety of sources for use by tactical maneuver vehicle commanders.

  - Identified front-end and processing hardware for software radios.

  - Conducted preliminary design study of Single Channel Ground and Airborne Radio System (SINCGARS) based radio location sensors.

  - Evolved Battle Lab scenario simulations to evaluate warfighter benefits from, and to mature operational concepts for, an alerting and collecting system for tactical maneuver vehicle commanders.

- 778   - Used DARPA high-speed analog-to-digital converter technology to evolve ultra-wide bandwidth digital RF memory module that deceives and jams a variety of enemy radars.

  - Coordinated with Naval Research Lab (NRL) and Air Force Research Lab (AFRL) the development of software for digital RF memory.

- 1925   - Investigated the missile warning applications of low cost sensor technologies and corresponding warning algorithms common to air and ground platforms.

  - Conducted field measurements of the IR and UV signatures of surface-to-air missiles, ATGM's, background and man-made point false alarm sources.

FY 2000 Accomplishments (Continued)

- 2934   - Investigated multi-band Ultra Violet (UV) and IR countermeasures to emerging multispectral surface-to-air and air-to-air missiles (SAMs and AAMs).

  - Enhanced jammer laboratory to study advanced IR countermeasure techniques for advanced ATGMs.

- 2338   - Designed conformal and low observable, multi-octave antenna technology for upgrades to RF and missile warning systems.

  - Upgraded and tested RF threat simulator capabilities in the System Integration Laboratory (SIL).

  - Upgraded SIL's data links to the battle labs and schools for interactive simulations using RF countermeasure systems.

  - Studied, with NRL and AFRL, techniques for designing an RF deception and countermeasures testbed based on analysis of next generation Electronic Warfare (EW), electronic intelligence (ELINT), and communications intelligence (COMINT) threats.

Total   9374

FY 2001 Planned Program

- 3419   - Investigate conformal and low observable, multi-octave antenna technology for upgrades to RF and missile warning systems.

  - Test SIL's upgraded data links with battle labs and schools for interactive simulations using RF countermeasure systems.

  - Design RF deception and countermeasure techniques testbed.

  - Conduct additional field-testing of radar countermeasures under technical panels 1 and 2 of the Technical Cooperation Program Electronic Warfare Simulator.

  - Evaluate enhancements in detection and location capabilities through the integration of COMINT and ELINT.

- 1914   - Evolve the missile warning applications of low cost sensor and corresponding warning algorithms common to air and ground platforms.

  - Conduct field measurements of IR and UV signatures of SAMs, ATGMs, background and manmade point false alarm sources.

- 2894   - Investigate warning algorithms for 2-colored ATGMs and evaluate IR countermeasures to advanced ATGMs and emerging SAMs and AAMs including focal plane array (FPA) imaging missiles.

  - Evaluate cooperative jamming and decoy/flare techniques to support a demonstration of integrated countermeasures against ATGMs and SAMs.

  - Design, in coordination with DARPA and Tri-Service Technology Panel for EW (TPEW), a multispectral laser to counter missile seekers and trackers.

0602270A (442)
TACTICAL EW TECHNOLOGY

Item No. 9 Page 4 of 9
145

Exhibit R-2A
Budget Item Justification

FY 2001 Planned Program (Continued)

- 1426   - Evolve antennas and RF collectors for airborne and ground tactical maneuver vehicles.

  - Integrate spread spectrum receiver technology for eventual transition to countermeasure systems.

  - Perform research to provide ES technology to intercept, geolocate, and counter emerging hostile non-communications emitters on the battlefield.

  - Participate in a Battle Labs distributed simulation demonstration that will evolve radio software algorithms to refine their operational concepts and improve signal mapping visualization and analysis tools.

  - Evolve advanced antennas, and collection and mapping capabilities of micro electromechanical systems (MEMS) low voltage switch technology.

  - Evolve SINCGARS for radio location sensor.

  - Evolve electronic mapping SIGINT object model using artificial intelligence algorithms and digital signal processing (DSP) based optimization techniques.

- 161   - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.

Total   9814

FY 2002 Planned Program

- 1557   - Mature & test an advanced wavelet based algorithm for simulation of specific emitter identification (SEI).

  - Conduct multi-function electronic collection and mapping system simulation using a combination of field experiments and operational workstation demonstrations.

- 3710   - Research and conduct simulation of innovative RF countermeasures capabilities with SIL and Battle Labs.

  - Utilize RF countermeasures testbed to test deception techniques against targeting and air defense radars.

  - Research techniques against frequency hopping air defense radars and top attack munitions.

  - Conduct SIL testing of countermeasures against artillery top attack fuzes.

- 2878   - Transition warning algorithms for 2-colored ATGMs to FPA missile warning program. Demonstrate IR countermeasures to advanced ATGM's and emerging surface-to-air and air-to-air missiles including FPA imaging missiles.

  - Demonstrate cooperative jamming and decoy/flare techniques to support integrated countermeasure technology demonstration.

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602270A - EW Technology**	**442**

FY 2002 Planned Program (Continued)

        - Research multispectral laser to defeat advanced IR surface-to-air and imaging missiles.

        - Mature IR jammer to defeat advanced ATGMs.

•   1974   - Research, mature and test the missile warning applications of low cost sensor and corresponding warning algorithms common to air and ground platforms.

        - Continue field measurements of IR and UV signatures of surface-to-air missiles, ATGMs, background and manmade point false alarm sources.

Total 10119

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

June 2001

BUDGET ACTIVITY **2 - APPLIED RESEARCH**	PE NUMBER AND TITLE **0602270A - EW Technology**	PROJECT **906**

COST (In Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
906 TAC EW TECHNIQUES	7228	7338	7330	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: The project researches and applies key EW technologies to intercept, and locate current and emerging threat communications emitters in accordance with concepts for Objective Force intelligence operations. The results are used for targeting, tactical situation awareness, and disruption/destruction of C4I systems. This project matures RF collection and mapping technologies into integrated multifunction devices, to offer real time emitter detection, location, and identification. It also evolves Electronic Attack (EA) components into smaller, lower power, lightweight, common modules that counter modern threat C4I systems. In addition, this project will enable a remote capability to disrupt, deny or destroy of threat communication signals. Other research areas include fusion (automated assimilation and synthesis) of battlefield intelligence data, and brigade level joint ISR capability to address operational shortfalls. Fusion and dissemination efforts will integrate data from traditional intelligence sensors and non-traditional sources, such as target acquisition systems, to provide ground force commanders unprecedented battlefield awareness and dominance of the electro-magnetic spectrum. This system supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 2000 - Modified existing testbed to emulate adversary digital communication networks, computer-based networks, and tactical information systems. Identified and assessed the vulnerabilities and susceptibilities of RF and wired networked components.

  - Performed exploitation and attack strategies against the RF and wired network components in the enhanced testbed.

- 3892 - Evolved enhanced intelligence collection, asset management tools and terrain reasoning tools to provide effective, user-friendly intelligence data dissemination techniques, and battle damage assessment tools to enhance and protect the commander's decision and execution cycle.

  - Enhanced technologies to integrate, disseminate, and display intelligence data from tactical and national assets necessary to provide/enhance SA of red forces at the brigade level.

  - Investigated neural network tools to optimize sensor arrays for sensor cross-cueing to provide the capability to intercept emitters 90% of time, given the emitter is within sensitivity range of two distributed sensors.

- 1336 - Surveyed sources of data to be displayed and determined connectivity to national assets.

  - Adapted electronic mapping object models to display information.

0602270A (906)
TAC EW TECHNIQUES

Item No. 9 Page 7 of 9
148

Exhibit R-2A
Budget Item Justification

FY 2000 Accomplishments (Continued)

- Evolved target set to identify priorities of targets.

- Modeled concurrent collection/communication function with tactical internet.

Total   7228

FY 2001 Planned Program

- • 1113 - Generate exploitation and attack capability against identified vulnerabilities and susceptibilities of adversaries' emerging communications networks, tactical information systems, and computer based networks.

  - Leverage commercial-off-the-shelf (COTS) technologies to mature the capability to assess tactical network security. Utilize these assessment techniques to evaluate the current tactical internet (TI) architecture.

- • 1996 - Evolve software products that integrate existing joint and national intelligence sensors, provide a common format for integration of sensor information and provide a common SA of enemy forces for the brigade commander.

  - Evolve neural network tools to provide the capability to intercept emitters 90% of time, when the emitter is within sensitivity range of two distributed sensors UAV linkage.

  - Identify technologies and techniques to provide next generation tools for intelligence preparation of the battlefield, asset management, and SA.

- • 4150 - Integrate electronic mapping of SIGINT object models into workstations.

  - Generate advanced algorithms using digital signal processing (DSP)-based optimization techniques and artificial intelligence (AI) sensor-cueing.

  - Mature prototype of a multi-function RF collector.

  - Evolve signal collection, mapping, analysis and visualization tools for auto-detection, templating, and Battle Lab prototyping.

  - Participate in a Battle Lab distributed simulation demonstration that will evolve radio software algorithms to refine their operational concept and improve signal mapping visualization and analysis tools.

- • 79 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.

Total   7338

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602270A - EW Technology**	**906**

FY 2002 Planned Program

•	530	- Integrate exploitation and attack capabilities onto an identified common operating platform.
		- Utilize tactical network security assessment techniques to delineate needed upgrades to tactical internet security architecture. Use findings to establish countermeasures and self-protection strategies.
•	4200	- Mature advanced wavelet based algorithms for SEI. Test in digital receiver testbed.
		- Interface low profile direction finding antennas. Test as back-up to omni-directional antenna/TDOA emitter location.
		- Conduct a lab based multi-function electronic collection and mapping simulation using a combination of field experiments and operational workstation demonstration.
•	2100	- Complete software to integrate existing joint and national intelligence sensors into a common format.
		- Complete baseline neural network tools to optimize sensor cross-cueing for a 90% or greater capability to intercept emitters.
•	500	- Battlefield Electronic Mapping leveraging inputs from multiple intelligence sensors.
Total	7330	