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<b>ARMY RDT&amp;E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)</b>	DATE <b>February 2000</b>
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<b>BUDGET ACTIVITY</b> <b>3 - Advanced Technology Development</b>	<b>PE NUMBER AND TITLE</b> <b>0603270A Electronic Warfare (EW) Technology</b>
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<i>COST (In Thousands)</i>	FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	10911	16060	15359	13818	11159	10504	20152	Continuing	Continuing
DK15 Advanced Communications Electronics Countermeasures Demonstration	2699	6852	5326	6563	3217	2006	11249	Continuing	Continuing
DK16 Non-Communications Electronic Countermeasures Technology Demonstration	8212	9208	10033	7255	7942	8498	8903	Continuing	Continuing

**A. Mission Description and Justification:** This program element funds two projects that provide technology options for current and future electronic warfare (EW) systems. The Advanced Communications Electronics Countermeasures Demonstration (DK15) provides technology demonstrations in communications countermeasures (CM), information collection and reporting for transition to Army intelligence, and electronic warfare (IEW) systems through the block improvement process. The effective use of specific components, software and hardware for multiple applications will enable the Army to collect intelligence from modern threat electronic systems. The intent is to disrupt their operation, denying the enemy use of their command, control and communication (C3) assets and provide alerts/warnings to tactical commanders. This project also supports demonstrations of automatic fusion of intelligence data from multiple sources. Non-Communications Electronic Countermeasures Technology Demonstration (DK16) demonstrates the feasibility and effectiveness of non-communications EW CM and electronic support/electronic intelligence (ES/ELINT) for self protection from radar, electro-optical (EO), and infrared (IR) guided anti-aircraft artillery, surface-to-air missiles, artillery, and top attack weapons, and provides precise targeting information on non-communications emitters. Area protection technology from radar threats also is developed. Work in these projects will lead to technology applications that will significantly contribute to winning the battlefield information war by controlling the electromagnetic spectrum. Work in this PE supports the Multispectral CM Advanced Technology Demonstration (ATD), Integrated Situation Awareness and Targeting (ISAT) ATD, the Integrated CM (ICM) technology demonstration and provides component technology for the hit avoidance technology demonstration. Work in this program element adheres to tri-service Reliance agreements on EW. Work in this program element is related to and fully coordinated with efforts in PE 0602270A (Electronic Warfare Technology), and various Navy and Air Force program elements in accordance with the on-going Reliance joint planning process. Navy developments are conducted in PEs 0604755N (Ship Self Defense), 0204575N (Electronic Warfare Support), and 0604573N (Shipboard Electronic Warfare Improvements). Air Force developments are conducted in PEs 0604738F (Protective Systems), 0604793F (Tactical Protective Systems) and 0604710F (Reconnaissance Electronics Warfare Systems). Coordination is effected between the Services and Defense Advanced Research Projects Agency (DARPA) to eliminate duplication of effort and ensure the interchange of technical data.

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<b>B. Program Change Summary:</b>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
Previous President's Budget ( <u>FY 2000 / 2001 PB</u> )	11425	16169	17008
Appropriated Value	11508	16169	
Adjustments to Appropriated Value			
a. Congressional General Reductions	-83		
b. SBIR / STTR	-264		
c. Omnibus or Other Above Threshold Reductions		-59	
d. Below Threshold Reprogramming	-204		
e. Rescissions	-46	-50	
Adjustments to Budget Years Since ( <u>FY 2000 / 2001 PB</u> )			-449
New Army Transformation Adjustment		TBD	-1200
Current Budget Submit ( <u>FY 2001 PB</u> )	10911	16060	15359

Change Summary Explanation: Funding – FY 2001: Project joint intelligence, surveillance, and reconnaissance was adjusted to reflect the new Army Transformation.

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COST (In Thousands)				FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
DK15 Advanced Communications Electronics Countermeasures Demonstration				2699	6852	5326	6563	3217	2006	11249	Continuing	Continuing
<p><b>Mission Description and Justification:</b> This project supports the Army's concept for Force XXI intelligence operations. Communications countermeasure and counter-countermeasure technologies are demonstrated to provide information warfare and information operations capabilities to intercept, identify, locate and manipulate threat computer networks and their components. Electronic attack products provide the capability to disrupt, deny, degrade or destroy enemy threat computer networks or information resident in those networks. Knowledge gained from demonstration and testing of these technologies and techniques is used to assess vulnerabilities of friendly systems and to develop protection capabilities. In addition, data fusion techniques are being integrated and transitioned to program managers to demonstrate a joint intelligence, surveillance, and reconnaissance product for brigade level and below. Data from traditional intelligence sensors and from non-traditional sources will be integrated to provide situational awareness of red and blue forces. User friendly tools and visualization technology will be demonstrated to provide quality data in a timely manner to enable friendly commanders to operate effectively within the decision cycle of threat commanders. This project focuses on testing, evaluating, and integrating specific information warfare and information operations components, hardware, and software to provide flexible, modern systems and upgrades to existing systems to achieve information dominance, protect the force, and shape the battlespace.</p> <p><b>FY 1999 Accomplishments</b></p> <ul style="list-style-type: none"> <li>• 1892 – Conducted demonstration against modern communication signals using the field programmable gate array analysis/control system.             <ul style="list-style-type: none"> <li>– Performed laboratory and field evaluation of capabilities against more complex modern communication signals.</li> <li>– Evaluated command and control attack capabilities against existing security architecture and participate in lab testing to evaluate next generation information assurance tools.</li> <li>– Established program with Navy for integration of “non-standard” collectors for Time Difference of Arrival (TDOA).</li> <li>– Transitioned ES/Electronic Attack techniques to information warfare system.</li> </ul> </li> <li>• 807 – Demonstrated and evaluated, through simulation, an automatic target tracking capability based on combined airborne survivability equipment/moving target indicator (MTI).             <ul style="list-style-type: none"> <li>– Upgraded operator planning and sensor management tool to integrate air and ground based capabilities. Begin transition to GUARDRAIL system.</li> <li>– Evaluated effectiveness of integrating various traditional and non-traditional sensor products to enhance intelligence, surveillance and reconnaissance (ISR) at the Brigade level.</li> </ul> </li> </ul> <p>Total 2699</p> <p><b>FY 2000 Planned Program:</b></p>												
Project DK15				Page 3 of 6 Pages				Exhibit R-2A (PE 0603270A)				

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<ul style="list-style-type: none"> <li>• 1761 Integrate signal intelligence (SIGINT)/MTI sensor cross-cueing and situation displays into the common ground station and all source analysis system. Complete transition of operator planning tool to GUARDRAIL.</li> </ul> <p><b>FY 2000 Planned Program: (continued)</b></p> <ul style="list-style-type: none"> <li>• 762 – Designate system architecture and begin prototyping for joint ISR technology demonstration. Identify joint experiments.</li> <li>• 762 – Integrate technology to provide intelligence collection, counter measures, counter-counter measures capabilities and alerts/warnings for tactical units to enable interception, identification, and geolocation of threat emitters in the presence of decoys, deception, and jamming.</li> <li>• 762 – Develop prototype remotely reprogrammable payload to support close-in ,pre-filtering for electronic mapping of the battlefield.</li> <li>• 762 – Begin assessment of collection, timing allocation and operational concept of multi-function capability through Battle Lab Distributed Interactive Simulation (DIS) experiments.</li> <li>• 4186 – Demonstrate capability to develop and launch both radio frequency (RF) and wired-based attacks against Army information systems as a tool to validate protection mechanisms.</li> <li>• 4186 – Perform field testing / validation of Army First Digitized Division command and control protection systems against developed attacks.</li> <li>• 4186 – Conduct vulnerability assessment to evaluate level of security achieved /tool suitability based on test results.</li> <li>• 4186 – Iteratively revise protect/attack tools to counter newly identified threats.</li> <li>• 143 – Small Business Innovation Research / Small Business Technology Transfer Programs.</li> </ul> <p>Total 6852</p> <p><b>FY 2001 Planned Program:</b></p> <ul style="list-style-type: none"> <li>• 1492 – Integrate wide band conformal antenna, adaptive angle of arrival power control, and specific emitter identification technology for advanced intelligence collection and countermeasure modular building blocks and prototype in tactical software radio test bed.</li> <li>• 1492 – Develop prototype of multi-function RF collector; perform additional Battle Lab DIS experiments to further refine operational concept.</li> <li>• 3834 – Provide an information operation capability to search for, intercept, identify, locate and manipulate computer networks and their components to detect and recognize threat computers and information resident in those computers.</li> <li>• 3834 – Provide an information operation capability to disrupt, deny, degrade or destroy information resident in threat computers or computer networks or the computers and networks themselves.</li> <li>• 3834 – Design and conduct distributed simulation experiments to support development efforts and training for integrated command and control protect and attack capabilities, culminating in a field test for the digitized division by FY02. Provide results/recommendations to Program Executive Officer C3S and Program Executive Officer IEW and jointly develop a transition and integration plan.</li> <li>• 3834 – Interactively revise protect/attack tools to counter newly identified threats.</li> </ul> <p>Total 5326</p>		
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COST <i>(In Thousands)</i>	FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
DK16 Non-Communications Electronic Countermeasures Technology Demonstration	8212	9208	10033	7255	7942	8498	8903	Continuing	Continuing

**Mission Description and Justification:** This program demonstrates the feasibility and effectiveness of non-communication EW hardware and software countermeasure technologies for aircraft, ground vehicles, and the dismounted soldier which provides self-protection against radar, optical, EO, and IR threats. Integrated multispectral radar and IR CM will be demonstrated to provide present and future Army aircraft with full spectrum protection against advanced missiles and integrated air defense systems that can near simultaneously direct radar and IR homing missiles and fuzed anti-aircraft artillery fire. ISAT ATD and ICM technology demonstration will demonstrate an integrated multispectral suite of precision warning sensors that will provide Army aviation and ground vehicles with full dimensional protection, and demonstrate a “non-traditional “ use of electronic combat systems to provide precision targeting, combat identification, and real time situation awareness updates to other aircraft, ground vehicles, and command and intelligence fusion centers.

**FY 1999 Accomplishments:**

- 6624 – Completed integration and survivability integration lab testing of the multispectral CM ATD test bed.
    - Completed captive seeker tests that demonstrated the new capability to jam and defeat advanced pseudo imaging and imaging surface to air missiles (SAM).
    - Transitioned alternative laser technologies, jamming waveforms, fiber optic cable and missile detection algorithms as technology options for suite of integrated IR CM (SIIRCM) product improvement.
  - 987 Developed requirements and design architecture for ISAT ATD that will demonstrate multispectral threat warning, geo-location, emitter identification, and situation awareness technology upgrades to the suite of integrated RF CM (SIRFCM).
  - 601 – Integrated digital and hardware-in-the-loop jamming effects models of advanced IR SAMs, anti tank guided missiles (ATGMs) and RF SAM systems into the survivability integration lab to support demonstration of ICM technologies.
- Total 8212

**FY 2000 Planned Program:**

- 7615 Conduct distributed interactive simulations with aviation and ground users to refine integrated sensors and targeting functional modes and operator interfaces.
  - Investigate multi-wavelength missile warning sensor technologies that will provide extended range detection of missile launches, reduce false alarms, and provide sufficient signature data to allow discrimination of anti-tank from anti-aircraft missiles.
  - Investigate laser warning technologies that provide the capability to locate and discriminate between laser designators, laser range finders, and laser beamriders.

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<p><b>FY 2000 Planned Program: (continued)</b></p> <ul style="list-style-type: none"> <li>- Identify communication links, and define variable message format requirements needed to transmit reports of missile launch, laser designator, laser range finder, laser beamriders and radar locations and emitter identification data from aircraft to ground vehicles and command/intelligence fusion centers.</li> <li>- Investigate new instantaneous/time refined techniques to precisely locate surveillance and targeting air defense radars</li> <li>- Investigate algorithms/software for correlating missile warning data and digital terrain elevation data to provide geolocation of missile launch locations.</li> <li>- Conduct modeling and simulation activities with the Air Maneuver Battle Lab to refine technology architecture for advanced situational awareness and targeting concepts</li> <li>• 1354 - Develop and conduct hardware-in-the-loop tests of an advanced coherent RF jammer modulator/transmitter to defeat coherent phased array radars and anti-aircraft artillery employing RF fuzes.</li> <li>- Develop and evaluate techniques to counter a new generation of IR tracked, command-to-line-of-sight surface- to-air and ATGMs directed against aviation.</li> <li>• 239 - Small Business Innovation Research / Small Business Technology Transfer Programs.</li> </ul> <p>Total 9208</p> <p><b>FY 2001 Planned Program:</b></p> <ul style="list-style-type: none"> <li>• 8327 - Conduct distributed interactive simulations with aviation and ground users to evaluate integrated sensors and targeting functions; define demonstration scenarios and performance measures.</li> <li>- Complete development of compact, multi-wavelength missile warning sensor modules.</li> <li>- Complete development of data fusion software/circuit card modules that provide geolocation of missile launches, radars, laser designators, laser range finders and laser beamriders and identify emitters.</li> <li>- Complete development of data fusion software modules to generate situation awareness displays and messages, and select and manage countermeasure responses based on the specific threat.</li> <li>- Integrate ISAT hardware/software modules into testbed and conduct hardware-in-the-loop simulation and testing to verify end-to-end functionality.</li> <li>• 1706 - Develop, integrate and test component technologies for an ICM capability.</li> <li>- Integrate and test DARPA and Army Research Laboratory microwave and millimeter wave power modules to replace traditional traveling wave tube assemblies to reduce transmitter weight and increase reliability and jamming power output.</li> </ul> <p>Total 10033</p>		
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