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

February 2002

BUDGET ACTIVITY	PE NUMBER AND TITLE
3 - Advanced technology development	**0603710A - NIGHT VISION ADVANCED TECHNOLOGY**

	COST (In Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate
	Total Program Element (PE) Cost	41598	49389	36494	39336	36831	37170	39910
C65	DC65	2268	2844	2873	6809	6541	2687	2637
C67	DC67	6066	9104	5896	0	0	0	0
K70	NIGHT VISION ADV TECH	21531	24418	18129	22957	20856	22632	24856
K86	NIGHT VISION, ABN SYS	11733	9523	9596	9570	9434	11851	12417
NA1	THROUGH WALL SURVEILLANCE RADAR TECHNOLOGY	0	3500	0	0	0	0	0

A. Mission Description and Budget Item Justification: This Program Element (PE) matures and demonstrates tactical night vision and electronic sensor technologies to improve the Army's ability to operate in the dark, i.e., "own the night." Technologies and applications under this PE focus on reconnaissance, surveillance, target acquisition, air defense, and air/ground mobility. The goal is to increase survivability by providing capabilities to acquire, engage, and destroy targets at longer ranges in complex environments and conditions (e.g. day/night, obscured, smoke, bad weather). A system of networked, low-cost, distributed unmanned sensors has the potential to provide close-in battlefield situational awareness and beyond-line-of-sight targeting in areas shadowed by terrain features. Improved seamless sensor interfaces to command, control, communications, computers, and intelligence systems and networks will support the dissemination of information. Multispectral and hyperspectral sensors will provide the capability to detect obscured, concealed, and reduced signature threats. Multi-sensor suites will provide rapid, automatic target acquisition and will generate battlefield information/data. Enhanced wide field-of-view sensor technology will support dismounted, as well as air operations (e.g. nap-of-the-earth). Commander's head tracked sensor suites provide situational awareness for future combat system infantry carriers operating in close-in complex terrain. Advanced tactical reconnaissance and surveillance technologies will provide real-time/near-real-time capabilities for imagery intelligence, measurement and signature intelligence applications. Low power infrared (IR) sensors will provide lightweight, affordable day/night imaging capability to the soldier. Work in this PE is consistent with the Army Science and Technology Master Plan, the Army Modernization Plan. It adheres to Tri-Service Reliance agreements on sensors and electronic devices, with oversight, and coordination provided by the Joint Directors of Laboratories. This PE contains no duplication with any effort within the Military Departments and is related to and fully coordinated with efforts in PE 0602709A (Night Vision and Electro-Optics Technology), PE 0602270A (Electronic Warfare Technology), PE 0603774A (Night Vision Systems Advanced Development), and PE 0604710A (Night Vision Systems Engineering Development). Work in this PE is managed by the US Army Communications-Electronics Research, Development and Engineering Center, Fort Monmouth, NJ. Contractors include: Raytheon, Dallas, TX; Raytheon, El Segundo, CA; Fibertek, Herndon, VA; Questech, Falls Church, VA; Northrop-Grumman, Linthicum, MD; Lockheed-Martin Corp., Orlando, FL; Lockheed-Martin, Lexington, MA; Alliant, Hopkins, MA; EOIR, Spotsylvania, VA; Booz Allen Hamilton, McLean, VA; Omar McCall, Beltsville, MD; ThermoTrex Corporation; Nytech, Irvine, CA; Indigo, Santa Barbara, CA; Wescam, Sonoma, CA; and Mitex, San Antonio, TX. This program supports the Objective Force transition path of the TCP.

B. Program Change Summary	FY 2001	FY 2002	FY 2003
Previous President's Budget (FY2002 PB)	42746	37081	36147
Appropriated Value	43141	49781	0
Adjustments to Appropriated Value	0	0	0
a. Congressional General Reductions	0	-392	0
b. SBIR / STTR	-1166	0	0
c. Omnibus or Other Above Threshold Reductions	0	0	0
d. Below Threshold Reprogramming	0	0	0
e. Rescissions	-377	0	0
Adjustments to Budget Years Since FY2002 PB	0	0	347
Current Budget Submit (FY 2003 PB)	41598	49389	36494

Change Summary Explanation:

Significant changes:

FY02 Congressional adds totaling $12700 (as noted below) were added to this PE.

FY02 Congressional Adds:
- Project NA1 ($3500) Through Wall Surveillance Radar Technology. The objective of this one year Congressional add is to demonstrate surveillance through walls and other urban obscurants.
- Project K86 ($5000) BUSTER Backpack UAV. The objective of this one year Congressional add is to mature and evaluate a man-packed unmanned aerial vehicle. No additional funding is required to complete this project.
- Project K70 ($1200) Helmet Mounted Infrared Sensor. The objective of this one year Congressional add is to improve situational awareness where visibility is obstructed as well as for use during search and rescue missions. No additional funding is required to complete this project.
- Project K70 ($3000) Night-Vision Advanced Tech-Digital Fusion. The objective of this one year Congressional add is to mature small component image intensification technology, combined with thermal imagery. No additional funding is required to complete this project.

Project with no R-2A:
- Project NA1 ($3500) Through Wall Surveillance Radar Technology.

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

February 2002

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced technology development	**0603710A - NIGHT VISION ADVANCED TECHNOLOGY**	**K70**

COST (In Thousands)		FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate
K70	NIGHT VISION ADV TECH	21531	24418	18129	22957	20856	22632	24856

A. Mission Description and Budget Item Justification: This project matures and demonstrates high-performance sensor/multi-sensor technologies in order to increase target detection range, extend target identification range, and reduce target acquisition (TA) timelines. The intent is to provide ground combat and amphibious assault vehicles with affordable compact sensor options for wide-area, long range, non-cooperative TA, and air defense. This project will demonstrate next-generation, distributed unattended ground sensor systems and will incorporate low-power infrared imaging and robust networking/communication technologies. The Multi-Function Staring Sensor Suite (MFS3) Advanced Technology Demonstration will demonstrate applications of a modular, reconfigurable sensor suite. MFS3 will integrate advanced, broadband, staring infrared (IR) sensor technologies with eye safe laser and acoustic technologies. This project also will mature a next generation, low power, and advanced uncooled IR sensor with applications for the Thermal Weapons Sights (TWS), Objective Crew Served Weapon (OCSW), Future Combat System troop carrier, Commander's Head Tracked Sensor Suite, Cost Effective Targeting System, and the Objective Individual Combat Weapon. This project evaluates cost effective targeting systems by demonstrating a combination of advanced, uncooled forward looking infrared (FLIR), short wave infrared (SWIR), and laser rangefinder/illuminator technologies for use on unmanned ground vehicles (UGVs). Additionally, the helmet mounted IR sensor development demonstrates a capability for Department of Defense firefighters to operate effectively in a smoke-filled environment. Other efforts include a commander's head-tracked sensor suite in order to provide increased mobility and 360 degrees situational awareness (SA) to commander/squad leaders during closed hatch vehicle operations. It also provides connectivity during dismounted infantry operations in both open and complex terrain. This project supports the Objective Force transition path of the TCP.

FY 2001 Accomplishments:

- 13976 - Completed MFS3 system operational mode simulation with Mounted Maneuver Battlelab to optimize user interface.

  - Conducted user demonstrations and evaluations of manually operated, 3 field of view (FOV), broadband and mid-wave sensors. Characterized target recognition and identification performance. Specific emphasis was placed on demonstrating utility of the ultra narrow FOV for long range target identification. The United Kingdom Ministry of Defense participated in the planning and the conducting of the test.

  - Completed multispectral aided target recognition (ATR) data collection.

  - Matured aided target recognition (ATR) algorithm hardware/software (multispectral detection, moving target indication, and mid wave spatial detection/recognition).

- 3902 - Fabricated 640x480, uncooled focal plane arrays with increased sensitivity to enable man-portable and long range applications.

FY 2001 Accomplishments: (Continued)

- Completed design of low power electronics and power management. Reduced power consumption by 60% compared to currently fielded systems such as the TWS.
- Completed design of lightweight optics, electronic, and mechanical interfaces to enable low power, uncooled IR sensor technology to be readily reconfigured for applications such as the individual soldier TWS or OCSW.
- Completed performance and design requirements and system concept modeling for cost effective targeting concepts.
- Performed data collection with long wave IR and SWIR sensors to support ATR algorithm development for unmanned ground vehicle (UGV) applications.
- Conducted field tests and demonstrated the Laser Illumination Viewing and Ranging system to the Dismounted Battlespace Battle Lab.

• 3653
- Fabricated a model Congressional special interest effort for fire fighting and damage control systems.
- Demonstrated and conducted user evaluations of fire fighting and damage control systems with military and civilian forces.

Total 21531

FY 2002 Planned Program

• 7740
- Integrate networked sensors into two man-in-the-loop simulations at the Mounted Maneuver Battle Lab and use with field experimentation to determine optimal mix of unattended sensors in order to provide beyond line of sight situational awareness and targeting.
- Integrate sensor information from suite of sensors deployed on unmanned platforms including surrogate small unmanned air vehicles (UAVs), UGV and unattended ground sensors that provide situational awareness and targeting data to tactical commanders.
- Construct command and control tools in order to optimize sensor deployment and data management.
- Complete preliminary design for cost effective targeting concepts by incorporating advanced, uncooled FLIR, SWIR, and microlaser technologies for UGVs.
- Design sensor components, optics, and stabilized gimbal assemblies in order to meet cost effective targeting concept cost goals.
- Perform data collection with latest sensor configurations for ATR algorithm development. Design processing architecture for UGV platform implementation.

• 3945
- Conduct demonstration of wide area, automatic target detection/recognition algorithm and hypothesis tracker using multispectral sensor suite.

FY 2002 Planned Program (Continued)

- Complete hardware and algorithm development of acoustic sensors and demonstrate the performance.
- Integrate eye safe laser rangefinder and wide area search modes.

• 5960 - Fabricate model thermal imaging modules with high pixel density.
- Demonstrate imagery technology through laboratory characterization and data collection.

• 1753 - Establish performance and design requirements, system interoperability, and system modeling/simulation specifications for a head tracked SA sensor suite. Incorporate state of the art thermal imaging, image intensifier, fusion, and laser technologies for closed hatch operations to order to increase SA.

- Perform simulation of the gimbal mounted technologies of the head tracked system.
- Complete design of the head-tracked breadboard.

• 820 - Construct architecture for sensor integration, access, and management schema (SIAMS) to enable seamless access to tactical sensor data from Army and joint Command, Control, Communications, Computers and Intelligence systems using joint intelligence, surveillance, and reconnaissance (JISR) information agent technology.
- Provide sensor simulations to support development of JISR information agent software and warfighter simulation exercises.

• 1200 - This one year Congressional add is to mature a helmet mounted infrared sensor system. No additional funding is required to complete this project.

• 3000 - This one year Congressional add demonstrates combined/fused image intensification and thermal imagery. No additional funding is required to complete this project.

Total 24418

FY 2003 Planned Program

• 9122 - Design and begin fabrication of next generation unattended ground sensors with day/night imaging capabilities.
- Complete system trades and define baseline sensor architecture and data management systems for Objective Force sensors network.
- Investigate improved information processing to reduce false alarms and increase target acquisition probabilities for sensor networks.

- Complete detailed design and modeling of cost effective targeting concept of gimbal configuration for ground platform applications in support of Sensors for the Objective Force.

FY 2003 Planned Program (Continued)

- Fabricate and test cost effective targeting concepts for sensor component hardware.
- Build and test sensor models on surrogate small UAVs and UGVs.
- Increase number of nodes in unattended ground sensor network. Demonstrate cross-cueing and C2 tools.

• 2206 - Complete integration of MFS3 hardware into testbed platforms.

- Conduct demonstration of MFS3 testbed in order to validate exit criteria for wide area search with multispectral ATR and long range passive target identification.

• 4188 - Complete maturation of a model high pixel density thermal imaging camera and self contained weapon sight.

- Demonstrate imagery technology through laboratory characterization and field data collection including live fire.

• 2160 - Demonstrate capability of critical components used in the head tracked system for achieving closed hatch SA and connectivity for coordinated fights.

- Complete head tracked breadboard technology and prove out user demonstration.

• 453 - Provide sensor and SIAMS simulation support to JISR demonstration and evaluation in warfighter exercises.

Total 18129

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

February 2002

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced technology development	**0603710A - NIGHT VISION ADVANCED TECHNOLOGY**	**K86**

COST (In Thousands)		FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate
K86	NIGHT VISION, ABN SYS	11733	9523	9596	9570	9434	11851	12417

A. Mission Description and Budget Item Justification: This project matures and demonstrates intelligence, surveillance, reconnaissance, targeting, and pilotage technologies in support of the Army's Objective Force airborne platforms. The goal is to significantly increase Army aviation survivability during nap-of-the-earth flights, day/night operations, and operations under adverse weather conditions. The technology efforts focus on improved night pilotage sensors, high-resolution heads-up displays, sensor fusion, and aided target recognition (ATR) capabilities for current and future helicopters (attack, scout, cargo, and utility). This project will potentially enhance distributed ground sensor networks by maturing a mini-class unmanned air vehicle (UAV) platform. Technologies will address automated flight control and ultra-light payloads. The air/land enhanced reconnaissance and targeting advanced technology demonstration (ATD) will display an on-the-move search, using a forward looking infrared (FLIR)/laser sensor suite. The advanced night vision goggles (ANVG) ATD demonstrates a lightweight, low cost, and panoramic night pilotage and driving capability for the soldier. The multi-mission common module UAV sensor ATD demonstrates a high performance electro-optic/infrared (EO/IR) payload, for transition to Program Manager, Program Manager Tactical UAV (PM TUAV), Night Vision Reconnaissance, Surveillance and Tactical Awareness (PM NVRSTA). Technologies matured under this project are also applicable to night flying requirements of the other Services and the Special Operations Command's rotary wing aircraft. This project supports the Objective Force transition path of the TCP.

FY 2001 Accomplishments:

- 1480 - Fabricated sensor mockups for cockpit/equipment integration evaluations of the ANVG.
  - Completed critical design and began fabrication of air warrior version of ANVG sensor package.
  - Completed concept design of ground version of ANVG with thermal insert.
- 1925 - Integrated multi-mission UAV sensors on manned platform. Conducted instrumented flight-testing under dynamic flight conditions. Verified functionality of the payloads and down links.
  - Integrated high performance EO/IR and multi-hyperspectral sensor payloads on tactical UAV/manned reconnaissance platforms. Conducted operational demonstration and user warfighting experiments to support military assessments.
  - Matured and transitioned performance and technical design data to PM NVRSTA and PM TUAV. Supported final development of operational requirements and engineering specifications for TUAV Block 2 procurement.

FY 2001 Accomplishments: (Continued)

- 2560 - Completed integration of air/land enhanced reconnaissance and targeting technologies with demonstration aircraft. Conducted airborne flight evaluations to demonstrate increased operational benefits derived from ATR algorithm enhancements when performing search on-the-move, target acquisition, defilade/obscured and extended range target cueing.

  - Integrated multi-function laser with electro optic target acquisition sensor onto aircraft platform. Conducted performance demonstration and data collection.

  - Demonstrated rapid target insertion/algorithm training process to achieve automatic cueing against new/emerging target threats.

  - Matured and transitioned, performance and technical design data to support technology insertions decision by Program Evaluation Office Aviation platform managers.

  - Demonstrated and evaluated candidate future combat system (FCS) high performance on-board sensor combination.

- 5768 - Completed design and fabrication of man-portable small unmanned aerial vehicle (SUAV) platform for a Congressional interest effort.

  - Completed development and fabrication of launcher and ground control station for SUAV system.

  - Conducted assessment on infrared cameras for SUAV application.

  - Conducted field assessment and studies of SUAV operations to assess overall capabilities required for system integration into FCS concept strategy.

Total 11733

FY 2002 Planned Program

- 3713 - Conduct initial development and integration of FLIR with ANVG for ground applications.

  - Conduct field studies to quantify the value of additional field of view for ground applications and the benefits of infrared overlay.

  - Conduct flight test and evaluation of air version of ANVG.

- 810 - Implement sensor integration, access and management schema (SIAMS) architecture in a simulation environment. Demonstrate the capability to access and query, platform sensor data from the Army and Joint Command, Control, Communications, Computers and Intelligence systems.

  - Document SIAMS protocol, database management and interface specifications.

  - Integrate and demonstrate SIAMS in the improved remotely emplaced battlefield acoustic, seismic, sensor and firefinder radar.

FY 2002 Planned Program (Continued)

- Provide improved resolution sensor simulations to support the development of Joint Intelligence, Surveillance and Reconnaissance (JISR) information agent software. Support JISR demonstration and evaluation in warfighter simulation exercises.

• 5000 - This one year Congressional add demonstrates a backpack unmanned aerial vehicle. No additional funding is required to complete this project.

Total 9523

FY 2003 Planned Program

• 2635 - Conduct pre-System Development and Demonstration activities for ANVG.

- Conduct miniaturization/retrofit of ground version of ANVG with thermal insert.

- Perform ground test and evaluation of integrated FLIR and image intensifiers ANVG for infantry applications.

• 6034 - Integrate sensor prototypes, networked communication and sensor data management to form a network of distributed sensors deployed on unmanned air and ground platforms.

- Execute a field demonstration of beyond-line-of-sight situational awareness and target acquisition capabilities using distributed sensor platforms with networked communications and command and control tools for optimized sensor and data management.

• 927 - Perform system design and sensor trade studies for a real time surveillance and tactical awareness system. Demonstrate an advanced sensor and ATR system providing targeting information at real time rates for manned and unmanned rotorcraft for the Objective Force.

Total 9596