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

June 2001

BUDGET ACTIVITY
3 - ADV TECHNOLOGY DEV

PE NUMBER AND TITLE
0603710A - Night Vision Advanced 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		38613	42746	37081	0	0	0	0	0	0	0
C65	DC65	2318	2338	2870	0	0	0	0	0	0	0
C67	DC67	3051	6252	9184	0	0	0	0	0	0	0
K70	NIGHT VISION ADV TECH	18053	22113	20428	0	0	0	0	0	0	0
K86	NIGHT VISION, ABN SYS	15191	12043	4599	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) matures and demonstrates tactical night vision and electronic sensor technologies to improve the Objective Force ability to operate in, and own the dark. Technologies and applications under this PE focus on reconnaissance, surveillance and target acquisition (RSTA), 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). Multispectral and hyperspectral sensors will provide the capability to detect obscured, concealed, and reduced signature threats. Multi-sensor TA suites will provide rapid, automatic, TA, and generate battlefield information/data. Improved seamless interfaces to command, control, communications, computers, and intelligence (C4I) systems and networks will support the dissemination of information. Enhanced wide field-of-view (FOV) sensor technology will support dismounted, as well as air operations (e.g. nap-of-the-earth). Advance tactical reconnaissance and surveillance technologies will provide real-time/near-real-time capabilities for imagery intelligence (IMINT), and measurement and signature intelligence (MASINT) applications. Technology advances achieved under this PE have Tri-Service applications. Work in this PE is consistent with the Army Science and Technology Master Plan (ASTMP), 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 (CDERDEC), 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, McLean, VA; Omar McCall, Beltsville, MD; ThermoTrex Corporation; Nytech, Irvine, CA; Indigo, Santa Barbara, CA; Wescam, Sonoma, CA; and Mitex, San Antonio, TX.

B. Program Change Summary	FY 2000	FY 2001	FY 2002	FY 2003
Previous President's Budget (FY2001 PB)	42262	33341	37741	0
Appropriated Value	42628	43141	0	
Adjustments to Appropriated Value	0	0	0	
a. Congressional General Reductions	0	0	0	
b. SBIR / STTR	-1049	0	0	
c. Omnibus or Other Above Threshold Reductions	-161	0	0	
d. Below Threshold Reprogramming	-2600	0	0	
e. Rescissions	-205	-395	0	
Adjustments to Budget Years Since FY2001 PB	0	0	-660	
Current Budget Submit (FY 2002/2003 PB)	38613	42746	37081	0

Change Summary Explanation: Funding - FY 2001: Congressional adds were received for Helmet Mounted infrared (IR) Sensor Development (+3800) and Backpack Unmanned Aerial Vehicle (UAV) (+6000).
- (+3800) Matures a Helmet Mounted IR Sensor System which will significantly improve situational awareness (SA) in smoke filled environments, as well as for search and rescue missions.
- (+6000) For maturation and evaluation of a Backpack UAV to enhance the SA of the Objective Force.

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

June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - ADV TECHNOLOGY DEV	**0603710A - Night Vision Advanced Technology**	**K70**

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
K70 NIGHT VISION ADV TECH	18053	22113	20428	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: This project matures and demonstrates high-performance sensor/multi-sensor technologies to increase target detection, extend target identification range, and reduce TA timelines. It supports the Objective Force and Future Combat Systems (FCS) scout, fire support, and air defense missions. 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. The Multi-Function Staring Sensor Suite (MFS3) Advanced Technology Demonstration (ATD) will demonstrate applications of a modular, reconfigurable sensor suite integrating advanced, broadband, staring infrared (IR) sensor technologies, with eye safe laser, and acoustic technologies. This project will mature a next generation, hardened, militarized, low power, and advanced, uncooled IR sensor with applications for the Thermal Weapons Sights (TWS), Objective Crew Served Weapon (OCSW), and the Objective Individual Combat Weapon (OICW). Additionally, this project supports the Cost Effective Targeting Systems (CETS) by demonstrating combinations of advanced, uncooled forward looking IR (FLIR), short wave IR (SWIR), and laser rangefinder/illuminator technologies. Other efforts include a commander's head-tracked sensor suite, to provide increased mobility, and 360 degrees SA, to commanders/squad leaders during closed hatch vehicle operations. It also provides connectivity during dismounted infantry operations in both open and complex terrain. This program supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 13095 - Fabricated signal processing backplane, and sensor gimbal and stabilization assembly required to implement panoramic search capability.

  - Fabricated the MFS3 broadband staring thermal imaging sensor to satisfy the objective surveillance and target acquisition requirements of future scout, fire support, and air defense systems.
  - Transitioned performance and engineering data to support the FCS/Objective Force affordability in-process review.
  - Conducted MFS3 data collections, using surrogate thermal imaging sensor, to support training of the Automatic Target Recognition (ATR) software needed for high probability of detection/recognition, wide-area search modes.

- 3021 - Completed performance and design requirements, system concept modeling and field experimentation for a modular sensor incorporating improved IR technology, and smart power management architecture. Provided improved performance and reduced weight and power burden.

FY 2000 Accomplishments (Continued)

- Conducted system design analysis, and field data collection, of cost effective targeting system. The system provided multi-sensor alternatives and flash laser illumination for target identification.

- Defined focal plane, image processing, and image stabilization requirements for multiple sensor applications. Included TWS, OCSW, OICW, and future CETS.

- Specified power management architecture, and low power electronics to reduce power consumption. Achieved a level such that a 72-hour operational mission can be executed using one primary battery.

• 1937 -This Congressional special interest effort fabricated fire fighting, and damage control systems. Systems included helmet mounted IR camera, power supply, image projection device, transmitter/receiver, and computer, with interface and software to support voice activated system control.

Total 18053

FY 2001 Planned Program

• 13967 - Complete MFS3 system operational mode simulation with Mounted Maneuver Battlelab to optimize user interface.

- Conduct user demonstrations and evaluations of manually operated, 3 FOV, broadband and mid-wave sensors. Characterize target recognition and identification performance. Specific emphasis placed on demonstrating utility of the ultra narrow FOV for long range target identification.

- Integrate eyesafe laser rangefinder hardware into the MFS3.

- Complete development of ATR algorithm hardware/software (multispectral detection, moving target indication, and mid wave spatial detection/recognition). Integrate into the MFS3.

• 3893 - Militarize a 640x480, uncooled, focal plane array (FPA) with increased sensitivity to enable man-portable, long range applications.

- Complete design of low power electronics and power management. Reduce power consumption by 60% compared to currently fielded systems such as the TWS.

- Complete 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.

- Complete performance and design requirements and system concept modeling for the CETS.

- Perform data collection with long wave IR and SWIR sensors to support ATR algorithm development for unmanned ground vehicle (UGV) applications.

FY 2001 Planned Program (Continued)

- Conduct field tests. Demonstrate the laser illumination viewing and ranging (LIVAR) system to the Dismounted Battlespace Battle Lab.

• 3653 - Complete Congressional special interest effort for fire fighting and damage control systems.

- Demonstrate and conduct user evaluations of fire fighting and damage control systems, with military and civilian forces.

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

Total 22113

FY 2002 Planned Program

• 7800 - Use man-in-the-loop simulation, and field experimentation, to determine optimal mix of unattended sensors for early warning of local threat to Objective Force operations.

- Integrate sensor information from suite of surrogate mini-unmanned air vehicle (UAV), UGV and unattended ground sensors to provide instantaneous information of local surrounding and hostile locations.

- Construct planning tools to maximize deployment of unattended sensor systems based on current SA data provided from higher level intelligence assets.

- Complete preliminary design for CETS. Incorporate advanced, uncooled FLIR, SWIR and microlaser technologies to produce an affordable targeting approach for mid-tier ground platforms.

- Design sensor components, optics, and stabilized gimbal assembly to meet Sensors for the Objective Force CETS cost goals.

- Perform data collection with latest sensor configurations for ATR algorithm development. Design processing architecture for UGV platform implementation.

• 3975 - Conduct demonstration of wide area, automatic target detection/recognition algorithm using multispectral sensor suite.

- Complete hardware and algorithm development of acoustic sensors. Demonstrate the performance.

• 6020 Demonstrate imagery technology through laboratory characterization, and data collection, with prototype, high pixel density, thermal imaging module.

FY 2002 Planned Program (Continued)

- 1783 - Establish performance and design requirements, system interoperability, and system modeling / simulation specifications for a head tracked SA sensor suite. Incorporates state of the art thermal imaging, image intensifier, fusion, and laser technologies for closed hatch operations to increase SA, and performance. Minimize workload to the operator.

  - Perform simulation of the distributed aperture and gimbal mounted technologies of the head tracked system. Insert into the Objective Force demonstration.

  - Complete design of the head-tracked breadboard.

- 850 - Construct architecture for sensor integration, access, and management schema (SIAMS) to enable seamless access to tactical sensor data from Army and joint C4I 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.

Total 20428

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - ADV TECHNOLOGY DEV	**0603710A - Night Vision Advanced Technology**	**K86**

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
K86 NIGHT VISION, ABN SYS	15191	12043	4599	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: This project matures, and demonstrates intelligence, surveillance, and reconnaissance (ISR), 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. Specifically, the technology efforts focus on improved night pilotage sensors, high-resolution heads-up displays (HUD), sensor fusion, and ATR capabilities for current and future helicopters (attack, scout, cargo, and utility). Additionally, this project will enhance distributed ground sensor networks by maturing a mini-class UAV platform. Technologies will address automated flight control, and ultra-light payloads. The ALERT ATD will demonstrate an on-the-move search, using a FLIR/laser sensor suite. The aviators night vision goggles (ANVG) ATD demonstrates a lightweight FOV (20 x 100 degrees), low cost, and panoramic night pilotage capability for the air warrior. The Multi-mission UAV sensor ATD will demonstrate an affordable, high performance EO/IR payload, for transition to Program Manager (PM), Tactical UAV /PM, Night Vision Reconnaissance, Surveillance and TA (PM TUAV/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 program supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 2155 - Conducted initial maturation efforts under the ANVG program. Demonstrated high resolution, wide FOV, helmet mounted sensor.
  - Conducted horizontal technology insertion (HTI) sensor/system approach for both aviation and infantry application. Provided improved performance for pilotage, driving and dismounted operations under darkness/obscurant battlefield conditions. Identified HTI design tradeoffs.
  - Performed human interface study for aviation and infantry applications.
  - Matured image intensification tube enhancements for improved performance.
- 4991 - Completed maturation and fabrication of high performance staring electro-optic (EO)/IR modular sensor payload. Designed multi-spectral capability for mine detection applications.
  - Completed environmental testing (e.g. shock, vibration, temperature, altitude, etc.) to ensure the EO/IR UAV payloads are ready for aircraft integration and flight tests.
  - Conducted test and analysis of mechanical/electrical interfaces, and core components, for rapid and simple "plug in/plug out" modularity, in support of the tactical-UAV "plug and play" selection process.

FY 2000 Accomplishments (Continued)

- 4184 - Demonstrated FLIR performance upgrade. Performed image data collections for algorithm enhancements.
  - Completed coding of algorithm modifications to achieve enhanced detection, and classification performance, against stationary and moving targets.
- 2896 - This one year Congressional special interest project matured, and demonstrated, a wire detection, and obstacle avoidance system.
- 965 - This Congressional special interest project matured a prototype mini- UAV platform with Government Furnished Equipment (GFE) sensor, launch system, ground station capability, and automated flight control.

Total 15191

FY 2001 Planned Program

- 1480 - Fabricate sensor mockups for cockpit/equipment integration evaluations of the ANVG.
  - Complete critical design, and initiate fabrication of air warrior version of ANVG sensor package.
- 1925 - Integrate multi-mission UAV sensors on manned platform. Conduct instrumented flight-testing under dynamic flight conditions. Verify functionality of the payloads, and down links.
  - Integrate high performance EO/IR, and multi/hyperspectral sensor payloads on tactical UAV/manned reconnaissance platforms. Conduct operational demonstration, and user warfighting experiments to support military assessments.
  - Mature and transition performance and technical design data to PM NVRSTA and PM TUAV. Support final development of operational requirements and engineering specifications for TUAV Block 2 procurement.
- 2560 - Complete integration of air/land enhanced reconnaissance, and targeting technologies with demonstration aircraft. Conduct airborne flight evaluations to demonstrate increased operational benefits derived from laser and ATR algorithm enhancements when performing search on-the-move, acquiring targets in defilade, obscured, or at extended range.
  - Integrate multi-function laser with EO target acquisition sensor onto aircraft platform. Conduct performance demonstration and data collection.
  - Demonstrate rapid target insertion / algorithm training process to achieve automatic detection and cueing against new/emerging target threats.
  - Mature, and transition, performance and technical design data to support technology insertions decision by PEO Aviation platform managers (Comanche and Apache).

FY 2001 Planned Program (Continued)

- Demonstrate and evaluate candidate FCS high performance on-board sensor combination.

• 5768 - Complete design and fabrication of man-portable UAV and sensors for congressional interest effort. Conduct demonstration.

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

Total 12043

FY 2002 Planned Program

• 3751 - Conduct initial development, and integration, of FLIR with ANVG for ground applications.

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

• 848 - Implement SIAMS architecture in a simulation environment. Demonstrate capability to access, and query platform sensor data from Army, and joint C4I systems.

- Document SIAMS protocol, database management, and interface specifications.

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

- Provide improved resolution sensor simulations to support development of JISR information agent software. Support JISR demonstration and evaluation in warfighter simulation exercises.

Total 4599