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

February 2003

BUDGET ACTIVITY
3 - Advanced technology development

PE NUMBER AND TITLE
0603710A - NIGHT VISION ADVANCED TECHNOLOGY

	COST (In Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
	Total Program Element (PE) Cost	54913	73609	47088	54635	62227	61928	50942	48330
590	OVERWATCH ACTD	0	0	1867	5889	1373	490	0	0
C65	DC65	2767	2738	9295	10346	6357	4544	3391	3466
C67	DC67	8774	5619	0	0	0	0	0	0
K70	NIGHT VISION ADV TECH	30740	40946	27689	20013	25346	28220	32403	32377
K86	NIGHT VISION, ABN SYS	9277	24306	8237	18387	29151	28674	15148	12487
NA1	THROUGH WALL SURVEILLANCE RADAR TECHNOLOGY	3355	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: This Program Element (PE) matures and demonstrates critical sensor technology that will provide the Army with the capability for reconnaissance, surveillance, and target acquisition beyond today's tactical lines-of-sight and enhance the Army's ability to operate in the dark, i.e., "own the night." Major efforts within this PE are designed to increase survivability and lethality by providing capabilities to acquire, engage, and destroy targets at longer ranges in complex environments and conditions (e.g. day/night, obscured, smoke, adverse weather). The Network Sensors for the Objective Force program will provide a system of networked, low-cost, distributed unmanned sensors for close-in battlefield situational awareness and beyond-line-of-sight targeting in areas shadowed by terrain features. A Disposable Sensors Network program will demonstrate new lightweight low-cost unattended ground sensors that will provide increased situational awareness and force protection capabilities for the Future Combat Systems (FCS) and Objective Force Warrior (OFW). This program also demonstrates mission equipment packages for Unmanned Aerial Vehicles that enable small, lightweight, interchangeable payloads of varying sizes to support target detection, identification, and location for the Unit of Action. The Hyperspectral Airborne Multi-Mission Exploitation and Reconnaissance (HAMMER) effort demonstrates sensors and algorithms designed to detect mines and targets in camouflage, concealment and deception. The head tracked sensor suites program will demonstrate situational awareness for FCS infantry carriers operating in close-in complex terrain. The low power infrared (IR) sensors program will demonstrate lightweight, affordable day/night imaging capability for the OFW. The Overwatch ACTD will mature and demonstrate detection, location, and classification of small arms, mortars, and rocket propelled grenades (RPGs) in complex terrain and provide situational awareness information to the warfighter for action. Work in this PE is consistent with the Army Science and Technology Master Plan, the Army Modernization Plan and Project Reliance. 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. This system supports the Objective Force transition path of the Transformation Campaign Plan. No Defense Emergency Response Funds were provided to the program/project.

B. Program Change Summary	FY 2002	FY 2003	FY 2004	FY 2005
Previous President's Budget (FY 2003)	49389	36494	39336	36831
Current Budget (FY 2004/2005 PB)	54913	73609	47088	54635
Total Adjustments	5524	37115	7752	17804
Congressional program reductions				
Congressional rescissions		-1489		
Congressional increases		41050		
Reprogrammings	6821	-422		
SBIR/STTR Transfer	-1297	-2024		
Adjustments to Budget Years			7752	17804

Significant Changes:
FY04-05: Funds increased investments in networked sensors for the Objective Force ATD, mission equipment package for the Organic UAV, and a new hyperspectral airborne multi-mission and reconnaissance effort.

FY03 Congressional Adds:
Passive Millimeter Wave Imager, Project K86 ($6000); BUSTER UAV, Project K86 ($10000); Personal Miniature Thermal Vision System, Project K70 ($1000); Multi-Color, Multi-Functional Focal Plane Array, Project K70 ($2500); Sensor Technology for Force Protection, Project K70 ($11050); Firefighter and Warfighter Helmet mounted thermal imaging Camera, Project K70 ($1000); Night Vision Fusion, Project K70 ($3150); Warfighter/Firefighter Position, Location and Tracking, Project K70 ($2100)
- ($4250) AN/TAS-4 Upgrade Program, K70.

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced technology development	**0603710A - NIGHT VISION ADVANCED TECHNOLOGY**	**590**

COST (In Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
590 OVERWATCH ACTD	0	0	1867	5889	1373	490	0	0

A. Mission Description and Budget Item Justification: This project matures the technology and capability to provide real-time detection, location, and classification of small arms, mortars, and rocket propelled grenades (RPGs) in complex terrain and demonstrates the capability within an Advanced Concept Technology Demonstration (ACTD) by providing the information to the warfighter for action. This ACTD focuses on assessing the military utility and developing concepts of operation addressing mobile force protection for unit of action forces involved in operations across the spectrum of conflict, from close combat to peacekeeping operations by locating enemy activity and real-time reporting of counter targeting information. The ACTD will mature and integrate a sensor/processor suite containing mid-wave infrared sensor, long-wave infrared imaging sensor, laser ranger/designator on a HMMWV and an unmanned ground vehicle (UGV) along with the appropriate C4I interfaces to disseminate information. Final product for the ACTD is a technology demonstrator to determine operational utility and deliver system performance specifications in support of the Future Combat Systems and Objective Force requirements. Other agencies participating include the Office of the Secretary of Defense and USMC (in-kind contributions). This program supports the Objective Force transition path of the Transformation Campaign Plan.
No Defense Emergency Response Funds were provided to the program.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
- In FY04, mature Overwatch ACTD threat signature database to support real time classification algorithms for small caliber weapons; mature infrared sensor data read-out performance and integrate sensor/processor/laser rangefinder/network interfaces for initial full scale functionality test on a HMMWV. In FY05, complete real time operational software, sensor shooter interfaces, communications hardware integration and demonstrate sensor/processor on a HMMWV. Continue hardware/software maturity and conduct initial full scale functionality test on an unmanned ground vehicle.	0	0	1867	5889
Totals	0	0	1867	5889

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February 2003

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

COST (In Thousands)		FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
K70	NIGHT VISION ADV TECH	30740	40946	27689	20013	25346	28220	32403	32377

A. Mission Description and Budget Item Justification: This project matures and demonstrates high-performance integrated sensor/multi-sensor technologies to increase target detection range, extend target identification range, and reduce target acquisition (TA) timelines for threats that are beyond today's tactical lines-of-sight or are partially obscured by terrain features. This capability, linked to the limited situational awareness from the overhead/strategic available assets, is critical to the survivability, utility, and maneuver planning of the Army's Objective Force. This project will demonstrate ground-based aided target detection/recognition and long range laser target identification utilizing short wave infrared components integrated into a surrogate target acquisition sensor suite including gimbaled-scanned, second generation forward looking infrared (FLIR), day TV and laser range finder. The Multi-function Staring Sensor Suite (MFS3) effort will demonstrate a compact, affordable sensor suite for long-range noncooperative target identification applicable to ground vehicles, amphibious assault vehicles and surface ships. The Networked Sensors for the Objective Force (NSfOF) Advanced Technology Demonstration (ATD) will demonstrate beyond-line-of-sight day/night targeting and situational awareness by developing sensors and software that complement higher echelon surveillance for the Objective Force (OF). The NSfOF effort will demonstrate next-generation, distributed, unattended ground sensor systems (UGS) incorporating low-power infrared imaging and robust networking/communication technologies; a new generation of low cost distributed unmanned networked sensor systems organic to the reconnaissance, surveillance and target acquisition (RSTA) team; and remote monitoring of an area of interest out to ~10km. The Target Acquisition Sensor Suite (TASS) effort will demonstrate ground-based aided target detection/recognition utilizing short wave infrared components. The Disposable Sensors Network effort will mature and demonstrate a new class of lightweight, low-cost, disposable UGS systems that can be remotely delivered or hand emplaced and utilize various sensor technologies (acoustic, seismic, magnetic, infrared, imaging, environmental, and electronic/radio frequency) and algorithms to improve target detection, target identification, multi-target tracking, and information management. The Head Tracked Sensor Suite effort will demonstrate a day/night 360 degree x 90 degree dome of situational awareness coverage, enabling connectivity with the dismounted infantry during closed hatch operations. This system supports the Objective Force transition path of the Transformation Campaign Plan. No Defense Emergency Response Funds were provided to the project.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
Network Sensors for the Objective Force. In FY02, conducted flight test of FCS threshold sensor concept on a surrogate small unmanned aerial vehicle (SUAV). In FY03, evaluate sensor cross-cueing through emerging command and control (C2) tools. Analyze operational feedback and integrate into Program Manager-FCS system architecture. In FY04, complete and integrate low-cost targeting sensor system on the unmanned ground vehicle and advanced sensor package on the SUAV and demonstrate a self-healing network w/ >50 UGS nodes. In FY05, integrate sensor management into surrogate demonstrator platform.	7500	8313	16562	9000
Commanders Head Tracked Sensor Suite STO (III.IS.2002.02). In FY02, established performance and design requirements, system interoperability, and system modeling/simulation specifications for a vehicle mounted head tracked situational awareness (SA) sensor suite. In FY03, demonstrate capability of critical components used in the head tracked system for achieving closed hatch SA and connectivity for coordinated fights. In FY04, integrate laser coding, intrusion detection, situational awareness network interface, and high performance FLIR into the Head Tracked Sensor System (HTSS). Integrate HTSS onto a combat vehicle and demonstrate HTSS image fusion, coded laser pointing and SA network integration. In FY05, conduct limited user test.	1599	2111	4926	3134
Low Power Uncooled Infrared Sensor. In FY02, fabricated uncooled thermal imaging modules with high pixel density. In FY03, complete maturation and laboratory characterization of high pixel density uncooled thermal imaging modules, thermal imaging cameras, and self-contained weapon sights. Perform and assess operational field test and user evaluations.	5685	4114	0	0
Helmet Mounted Infrared Sensor System. In FY02, demonstrated a helmet mounted infrared sensor system for search and rescue in this Congressionally added program. In FY03, mature technology and demonstrate capability in a relative environment.	1152	955	0	0
Multi-Function Staring Sensor Suite (MFS3). In FY02, demonstrated automatic wide area search, aided target detection/recognition algorithm and multiple hypothesis tracking. In FY03, demonstrate 2.5x ID range and 10x increase in azimuth field of regard. Complete integration of MFS3 hardware into testbed platform and conduct exit criteria demonstration.	3975	2098	0	0
Joint Intelligence, Surveillance, and Reconnaissance (JISR) Program. In FY02, constructed an architecture for sensor interface and management systems (SIAMS) to enable seamless access to tactical sensor data from Army and joint Command, Control, Communications, Computers and Intelligence systems. In FY03, will provide sensor and SIAMS simulation support to JISR demonstration and evaluation in warfighter exercises.	850	398	0	0
Digital Fusion. In FY02, this two–year Congressional add demonstrated combined/fusion image intensification and thermal imagery. In FY03, demonstrate technology in a relative environment. No additional funding is required to complete this project.	2879	3007	0	0

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
Disposable Sensors Network. In FY04, conduct Market Survey & Trade Study Analysis to assess maturity and availability of applicable emerging technologies. Focus will be on MEMS-based transducers and low-cost communications. Establish disposable sensor testbed to explore novel system concepts and algorithms for detection, classification, and location of targets/events. In FY05, demonstrate novel system concepts and measure/predict performance parameters. Initiate design and proof-of-principle hardware development for promising disposable sensor system concepts.	0	0	2643	3747
Target Acquisition Sensor Suite (TASS) Technology Maturity Demonstrator. In FY04, complete system modeling and design, sub-system interface definition, and forward looking infrared-aided target recognition (FLIR-ATR) interface definition for FCS Reconnaissance, Surveillance, Target Acquisition (RSTA). In FY 05, complete system integration and conduct imagery data collection at various test sites.	0	0	2677	2258
3rd Generation Infrared Technology. In FY04, begin modification to the original Multifunction Staring Sensor Suite (MFS3) for insertion of a two-color manufacturing technology (Man Tech) dewar assembly. In FY05, integrate UAV detection and tracking and add the sensor to shooter linkage into network systems.	0	0	881	1874
Sensor Technology for Force Protection Project: The objective of this one-year Congressional add is to demonstrate an advanced mobile force protection system designed to protect high threat CONUS (Homeland Security) or in theater assets. The demonstration will be conducted like an ACTD field evaluation. No additional funding is required to complete this project.	0	10548	0	0
AN/TAS-4 Upgrade Project: The objective of this one-year Congressional add is to improve performance with use of new staring focal plane array and to reduce operational and support cost for the currently fielded systems. No additional funding is required to complete this project.	0	4057	0	0
Focal Plane Array (FPA) for Targeting and Fire Control Project: The objective of this one-year Congressional add is to demonstrate a multi-color, multi-functional, and multi-spectral FPA to support FCS Block II targeting requirements. No additional funding is required to complete this project.	0	2386	0	0
Warfighter/Firefighter Position, Location, and Tracking Project: The objective of this one-year Congressional add is to demonstrate a system to locate friendly units in military operations in urban terrain (MOUT) and complex urban terrain. This project supports the Homeland Security initiative and OFW. No additional funding is required to complete this project.	0	2004	0	0
Personal Miniature Thermal Vision System: The objective of this one-year Congressional add is to develop and demonstrate a miniature 320x240 uncooled IR camera. This effort supports the Counter-Terrorism initiative and OFW. No additional funding is required to complete this project.	0	955	0	0

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
Camera Assisted Monitoring System (CAMS): The objective of this one-year Congressional add was to develop and demonstrate a capability for tactical surveillance, force protection, and potential homeland security applications. In FY02, demonstrated a mobile sensor system that includes on-board sensors, unattended ground sensors, and thermal imaging devices.	7100	0	0	0
Totals	30740	40946	27689	20013

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3 - Advanced technology development	**0603710A - NIGHT VISION ADVANCED TECHNOLOGY**	**K86**

COST (In Thousands)		FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
K86	NIGHT VISION, ABN SYS	9277	24306	8237	18387	29151	28674	15148	12487

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 aviation and netted systems. The goal is to provide the Army's Objective Force the capability to detect and identify partially obscured targets from manned and lightweight, low cost unmanned air platforms and to perform reconnaissance, surveillance, and target acquisition beyond today's tactical line-of-sight. This capability is critical to the survivability of the Objective Forces' light maneuver forces. 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). The Networked Sensors for the Objective Force Advanced Technology Demonstration (ATD) project will mature day/night targeting sensors and software for an Organic Air Vehicle (OAV) and Micro Air Vehicle (MAV) for the Objective Force. Technologies to be addressed include automated flight control and ultra-light payloads for UAVs. The mission equipment package for an organic unmanned aerial vehicle will demonstrate small, lightweight, interchangeable payloads (electro-optical/infrared, laser radar) to support target detection, identification, and location for the Unit of Action. The mission equipment package for MAV will demonstrate very small, very lightweight, interchangeable payloads (electro-optic, thermal, acoustic, chemical) to support intelligence, surveillance, and reconnaissance requirements for the Unit of Action. The advanced night vision goggles (ANVG) ATD demonstrates a lightweight, low cost, and panoramic night pilotage and driving capability for the soldier. The Hyperspectral Airborne Multi-Mission Exploitation and Reconnaissance (HAMMER) effort will conduct sensor and algorithm development to provide countermine and camouflage, concealment and deception (CC&D) detection and targeting. The Long Range Identification for Aviation effort will improve survivability and lethality by providing identification at detection ranges. 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 system supports the Objective Force transition path of the Transformation Campaign Plan. No Defense Emergency Response Funds were provided to the program/project.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
Advanced Night Vision Goggle (ANVG). In FY02, conducted initial development and integration of forward looking infrared (FLIR) with ANVG for ground applications, built prototypes and conducted field-of-view test. In FY03, build and test FLIR/image intensifier configuration; conduct flight test on air ANVG. Conduct pre-system development and demonstration activities for ANVG.	3600	2586	0	0

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
Hyperspectral Airborne Multi-Mission Exploitation and Reconnaissance (HAMMER) Program. In FY03, experimental data and phenomenology analysis will be conducted to determine sensor parameters. In FY04, sensor design modifications will be finalized. In FY05, continue development of countermine and target exploitation algorithms and implement in real time code. Demonstrate a 50-80% probability of detection for CC&D targets and a 75-90% probability of detection for minefields.	0	868	978	1500
Network Sensors for the Objective Force ATD: In FY03, integrate and demonstrate day/night targeting sensors and geo-registered imaging software. In FY04, integrate sensor prototypes, networked communication and sensor data management to form a network of distributed sensors. In FY05, demonstrate network system in an operational environment.	0	5585	2357	5637
Mission Equipment Packages for Organic Aerial Vehicle (OAV). In FY 04, establish sensor concepts and designs maximizing OAV utility. In FY05, begin development of selected payload designs including ISR and foliage penetration.	0	0	3444	8925
Lightweight Man-portable (Backpack) Unmanned Aerial Vehicle. In FY02, this two-year Congressional add demonstrated a backpack unmanned aerial vehicle. In FY03, develop miniaturized sensors, mature sensor payloads, and conduct performance and reliability test and evaluations. No additional funding is required to complete this project.	4832	9542	0	0
Long Range ID for Aviation. In FY04, evaluate and quantify the applicability of advanced technologies based on visible, laser augmented short wave IR, mid wave IR and Gen III thermal imaging for improved long range identification in airborne applications. In FY05 initiate detail design work for winning approaches.	0	0	1458	2325
Joint, Intelligence, Surveillance and Reconnaissance (JISR). In FY02, constructed architecture for sensor interface and management systems (SIAMS). Provided sensor and SIAMS simulation support to JISR demonstration and evaluation in warfighter exercises.	845	0	0	0
Passive Millimeter Wave Imager Project: The objective of this one-year Congressional Add is to demonstrate a passive see-through fog imaging capability to support a USSOCOM aviation requirement. No additional funding is required to complete this project.	0	5725	0	0
Totals	9277	24306	8237	18387