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

February 2003

BUDGET ACTIVITY	PE NUMBER AND TITLE
2 - Applied Research	**0602712A - Countermine Systems**

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		21995	16857	21291	21422	20840	27918	29190	29467
H24	COUNTERMINE TECH	19733	14440	18648	18687	18010	25037	26245	26455
H35	CAMOUFLAGE & COUNTER-RECON TECH	2262	2417	2643	2735	2830	2881	2945	3012

A. Mission Description and Budget Item Justification: This Program Element (PE) researches and investigates advanced technologies to improve countermine, signature management and counter sensors capabilities for the Army's Transformation to the Objective Force. Countermine research focuses on concepts and technologies that improve mine detection and neutralization using standoff man-portable, ground and air platforms. The goal is to increase mine detection probability, while reducing false alarm rate, and to maintain high operational tempo in the Objective Force. Countermine phenomenology of booby-traps, improvised explosive devices, and surface and buried mines will be investigated and models developed for exploiting novel sensing devices in conjunction with the Research, Development and Engineering (RD&E) Center and Corps of Engineers. In addition, wide area airborne countermine sensor concepts are being developed for higher altitude, wide area coverage and higher probability of detection and lower false alarm rate for airborne mine detection. This PE addresses emerging mine threats in both the conventional and electronically activated categories. A Center of Excellence for Countermines has been established to coordinate and standardize land mine signature models; maintain a catalogue of mine signatures; and support the evaluation of mine detection sensors and algorithms. This PE also researches deception signature management and counter sensor techniques that will potentially alter an adversary's perception of friendly force capabilities and intentions. This effort is coordinated with the Marine Corps. The 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/Project Reliance Agreements on conventional air/surface weapons and ground vehicles. This PE contains no duplication with any other effort within the Army, or the Department of Defense. It also is fully coordinated with PE 0602709A (Night Vision and Electro-Optics Technology), PE 0603606A (Countermine and Barrier Development) and PE 0603710A (Night Vision Advanced Technology). This PE is managed by the Night Vision Electronic Sensors Directorate, Communications-Electronics Research, Development and Engineering Center. This program supports the Objective Force transition path of the Transformation Campaign Plan (TCP). No Defense Emergency Response Funds (DERF) were provided to the program.

B. Program Change Summary	FY 2002	FY 2003	FY 2004	FY 2005
Previous President's Budget (FY 2003)	22889	13186	15804	14111
Current Budget (FY 2004/2005 PB)	21995	16857	21291	21422
Total Adjustments	-894	3671	5487	7311
Congressional program reductions				
Congressional rescissions		-507		
Congressional increases		4700		
Reprogrammings	-313	-97		
SBIR/STTR Transfer	-581	-425		
Adjustments to Budget Years			5487	7311

Change Summary Explanation:

FY04 (+5200) Added for Wide Area Airborne Countermine Technology
FY05 (+5200) Added for Wide Area Airborne Countermine Technology

FY03 Congressional Adds:
Polymer-based Landmine Detection, 62712 H24, ($1400);
Acoustic Landmine Detection, 62712 H24, ($3300)

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602712A - Countermine Systems**	**H24**

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
H24	COUNTERMINE TECH	19733	14440	18648	18687	18010	25037	26245	26455

A. Mission Description and Budget Item Justification: This project supports the Objective Force by researching new countermine technologies using man-portable, ground-vehicular, and airborne platforms for standoff detection and discrimination of individual mines and minefields. Mines include both conventional and electronically activated mines. Data collections will be used to assess the ability of various sensor combinations and signal processing/fusion algorithms to consistently detect mines with reduced false alarms for increased force operational tempo. Forward-looking mine detection and neutralization technologies will be emphasized to allow for rapid movement of forces. Investigate the phenomenology of booby-traps, improvised explosive devices, surface and buried mines, and develop models for exploiting novel sensing devices. Additionally, this project develops sensors for the detection of off-route mines. The project sponsors the Center of Excellence for Unexploded Ordnance established to coordinate and standardize land mine signature modeling, maintain a catalogue of mine signatures, support the evaluation of mine detection sensors and algorithms and work on the countermine environment with the Corps of Engineers. No Defense Emergency Response Funds (DERF) were provided to the program/project. This program supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
Center of Excellence for Countermine Technologies: This DoD center provides continuous and global surveillance of possible detection and neutralization efforts. The mission is to identify possible Countermine Technologies for investigation by the Services for insertion into mission programs.	482	482	488	487
Wide Area Airborne Countermine Technologies: In FY02, investigated and assessed sensor technologies and collected sensor data for signal processing/clutter rejection to support trip wire, off-route, and side attack wide area minefield detection and surveillance from airborne platforms. In FY04, continue the testing and characterization of a variety of airborne sensor technologies and collect image data for signal processing/clutter rejection to support wide area minefield detection. Pacing technologies include multi-spectral Long Wave IR/Short Wave IR (LWIR/SWIR), ultra wideband ground penetrating synthetic aperture radar and development of autonomous target recognition algorithms for clutter rejection. In FY05, focus will be to obtain measurements in alternative environments and its analysis and conduct extensive clutter data.	3374	0	5101	5078

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
FCS Mine Detection and Neutralization: In FY02, investigated vehicle mounted standoff mine detection and neutralization capabilities that will provide the warfighter enhanced operational tempo during route clearance and mine avoidance missions. In FY03, continue research of forward-looking mine detection and neutralization technologies. The primary objective of this program in FY 04 is to continue research and investigations, and evaluate forward detection and neutralization of on-route surface and buried antitank mines. In FY05, continue evaluation of forward detection and neutralization of on-route surface and buried antitank mines.	7400	7259	6206	3237
Explosive Specific Sensors and Clutter Rejection: The objective of this effort is to develop and evaluate sensors capable of specifically detecting explosive signatures and assess their potential for deployment on handheld, vehicular mounted, robotic, and airborne platforms. This capability will allow rapid detection of explosive chemicals for immediate confirmation of landmine or unorthodox or novel explosive devices presence with the potential for dramatic reduction in false alarms. In FY05 chemical signature studies will be performed to increase the understanding of the evolution of a chemical signature as function of soil types, time, mine types, etc.	0	0	0	2123
Polymer-based Landmine Detection: The objective of this Congressionally directed, FY03 effort is to conduct research and investigate forward and downward looking, acoustic to seismic, landmine detection techniques and conduct modeling and data collection that will facilitate a better understanding of the phenomenology associated with these two applications. No additional funding is required to complete this project.	0	1338	0	0
Off Route Mine Detection and Neutralization: In FY02 and FY 03, this program will research and investigate technologies that will provide the warfighter new detection capabilities against the threats of off-route/side attack mines, booby traps, anti-helicopter mines, and improvised explosive devices through the exploitation of their distinctive signatures in the short wave infrared region and acoustic resonance. In FY 04, investigate threat negation through standoff circumferential RF jamming/neutralization technologies on the host vehicle. In FY05, continue to research and conduct evaluation of off route detection capabilities designed to provide FCS with increased OPTEMPO for both vehicle and soldier survivability.	2306	2205	3910	3856
Acoustic Mine Detection: In FY02 and FY03, this two-year Congressional Add will research and investigate phenomenology of linear/non-linear acoustics combined with ground penetrating radar for mine detection in downward and forward looking modes of AT mines in roads.	1922	3156	0	0

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
Countermine Phenomenology: In FY04 conduct research and investigations to model, characterize, and predict the effects of the environmental, surface, and shallow subsurface conditions on sensor response and signal interpretation. In FY 05, an investigation of clutter encountered with various sensor modalities will be used to predict and reduce false alarms.	0	0	2943	3906
Integrated CM Test-bed & Training: This one year Congressional add researched neutralization and robotic technologies for detection of anti-personnel/anti-tank landmines. No additional funding was required to complete this project	1343	0	0	0
Standoff Mine Detection: This one year Congressional add researched forward looking ground penetrating radar sensor technologies for detection of anti-personnel/anti-tank landmines. No additional funding was required to complete this project.	1946	0	0	0
Landmine Detection/Seismic Energy: This one year Congressional add researched novel seismic sensor technologies for detection of anti-personnel/anti-tank landmines. No additional funding was required to complete this project.	960	0	0	0
Totals	19733	14440	18648	18687

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2 - Applied Research	**0602712A - Countermine Systems**	**H35**

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
H35 CAMOUFLAGE & COUNTER-RECON TECH	2262	2417	2643	2735	2830	2881	2945	3012

A. Mission Description and Budget Item Justification: This project researches and investigates advanced signature management and deception technologies for masking friendly force capabilities and intentions, thereby increasing Objective Force unit survivability. Specific research areas include (1) advanced materials and processes for countering visual, infrared (IR), and spectral sensors, (2) optical and electronic techniques for reducing the signatures of uncooled IR sensors used in FCS/Objective Force, (3) modeling and simulation of the vulnerability of sensors to laser blinding, and (4) new technologies to exploit or deny the enemy's use of reconnaissance sensors against Objective Force. This program supports the Objective Force transition path of the Transformation Campaign Plan (TCP). No Defense Emergency Funds (DERF) were provided to the project.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
Advanced Signature Management & Deception: Completed development of a signature management camouflage net that utilizes advanced coatings and deception techniques, and evaluated survivability improvements from the new technologies. The warfighting payoff will be a significant increase in survivability due to reduction in IR signature (> 30% reduction in the short wave infrared (SWIR) band), as supported by field demonstrations and simulations using Combined Arms and Support Task Force Evaluation Model (CASTFOREM) and the Paint the Night synthetic sensor simulation.	2262	0	0	0
Low Cost Counter Reconnaissance Technology: This effort develops new technologies to counter threat reconnaissance capabilities and to reduce the laser susceptibility of our own sensors, provides susceptibility data for countermeasure systems, and extends camouflage paint technology for hyper-spectral threats. The critical technologies developed will include low cost measures to defeat advanced surveillance sensors such as hyper-spectral imagers and measures to reduce the signature of uncooled IR sensors. In FY 03, select uncooled IR cameras and analyze their signature characteristics, determine the primary spectral sensing bands that threaten Objective Force assets. In FY04, fabricate new reduced signature uncooled IR focal plane arrays (FPAs), determine the laser vulnerabilities of advanced uncooled IR sensors. In FY05, integrate new FPAs and optics into a prototype hardened, uncooled IR sensor and fabricate advanced paints and patterns incorporating spectral signature reduction.	0	2417	2643	2735

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
Totals	2262	2417	2643	2735