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

February 2003

BUDGET ACTIVITY	PE NUMBER AND TITLE
3 - Advanced technology development	**0603606A - Landmine Warfare and Barrier 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	24718	28595	24552	25476	26640	27677	28667	32556
608	COUNTERMINE & BAR DEV	21873	25799	21537	22480	23259	23696	24207	27713
683	ANTI-PERSONNEL LANDMINE (APL) ALTERNATIVES	2845	2796	3015	2996	3381	3981	4460	4843

A. Mission Description and Budget Item Justification: The primary goal of this PE is to mature and demonstrate the sensor technologies required to detect minefields and obstacles to enable assured mobility for the high OPTEMPO Objective Force. It will also provide the US Army the capability for in-stride detection and breaching, close-in detection, area clearance, and neutralization of landmines. This PE demonstrates the remote detection of minefields as well as individual landmine detection from handheld, ground, and aerial sensor systems. Detection of both types of landmines, metallic and low/non-metallic, will be evaluated. The use of wide-area multi-sensor fusion detection systems, coupled with small-area confirmation sensors, also will be emphasized. This multi-sensor approach has the potential to yield a high probability of landmine detection at very low false alarm rates. In addition, airborne mine detectors will be assessed for contingency applications and matured for lightweight plug-and-play use in mission specific applications. Alternative systems for anti-personnel landmines and innovative concepts for minefield clearance will be explored. Advanced Concept Technology Demonstrations, Advanced Warfighting Experiments, and modeling and simulation activities will be conducted to assess the effectiveness of system concepts. Efforts within this PE are closely coordinated with the U.S. Marine Corps. The work in this program follows the Army Science and Technology Master Plan, the Army Modernization Plan and Project Reliance. The program also 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 0603619A (Landmine Warfare and Barrier Advanced Development), PE 0602712A (Countermine Systems) and PE 0602709A (Night Vision 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 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)	25640	24104	27296	31221
Current Budget (FY 2004/2005 PB)	24718	28595	24552	25476
Total Adjustments	-922	4491	-2744	-5745
Congressional program reductions				
Congressional rescissions		-938		
Congressional increases		6300		
Reprogrammings	-323	-164		
SBIR/STTR Transfer	-599	-707		
Adjustments to Budget Years			-2744	-5745

Change Summary Explanation:
Significant Changes: FY04/05 - Funds realigned to higher priority requirements.

FY03 Congressional Adds:
Electromagnetic Wave Detection and Imaging Transceiver Landmine Detection, Project 608 ($1800); Advance Demining Technology, Project 608 ($3500); Landmine Detection System using Terahertz Radiation Technology, Project 608 ($1000)

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

February 2003

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced technology development	**0603606A - Landmine Warfare and Barrier Advanced Technology**	**608**

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
608	COUNTERMINE & BAR DEV	21873	25799	21537	22480	23259	23696	24207	27713

A. Mission Description and Budget Item Justification: This project matures countermine technologies for integration into future Army systems. Specific activities include remote detection of minefields by aerial sensor systems and individual landmine detection by handheld and vehicle-based sensor systems and neutralization of individual mines. The landmines being addressed include both metallic and low/non-metallic construction. This project will evaluate the potential for wide-area multi-sensor fusion detection systems, coupled with small-area confirmation sensors, to yield a high probability of mine detection at very low false alarm rates. Airborne multispectral mine detection sensors will be evaluated and matured for lightweight plug-and-play use in mission specific applications. The expectation is for robust approaches to finding surface-laid and buried mines in varying vegetation, soil and diurnal conditions. This project has the potential to provide advanced countermine capabilities to the mounted and dismounted soldier by adapting commercial or emerging technologies for standoff mine detection and neutralization. Detection technologies include , but are not limited to, wide band radar, acoustic, laser, explosive detection sensors, infrared and visual imagery, radio frequency, signal processing, electronic and physical mine marking. Neutralization technologies include chemical reactants, electromagnetic energy, and kinetic energy. The intent is to provide increased operational tempo and survivability for US Forces prior to their entry into harm's way. This project also evaluates area clearance systems under the Joint Area Clearance (JAC) Advanced Concept Technology Demonstration (ACTD) as a means to determine the best system to procure for rear area and supply route clearance operations. These efforts support ACTDs, Army Warfighting Experiment, modeling and simulation assessments and defines potential system effectiveness. This project supports the Objective Force transition path of the TCP. No Defense Emergency Response Funds (DERF) were provided to the project.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
Lightweight Airborne Multispectral Mine Detection System (LAMD) Program: In FY02, develop both active and passive imaging "plug and play" sensors for tactical unmanned aerial vehicle (TUAV) to support the lightweight airborne standoff antitank minefield and obstacle detection requirements of the Objective Force. Emphasis is on detection of surface and recently buried mines/minefields. No standoff airborne minefield detection capability currently exists. This two-pronged approach will leverage the advanced electro-optical infrared (EOIR) ATD, mid-wavelength infrared (MWIR) sensor developed to be compatible with the TUAV sensor payload, by adding a filter wheel with selectable bands optimum for minefield detection. This approach will meet Airborne Standoff Minefield Detection System (ASTAMIDS) patterned minefield detection requirements for surface and recently buried mines/minefields during select diurnal periods. The active approach, laser illuminator and gated camera with long wavelength infrared (LWIR) for false alarm mitigation will be more effective than the first approach for scatterable surface minefield detection. In FY03, the mine detection aided target recognition (ATR) (leveraged from the Cobra minefield detection program), hardware, workstations, and communication protocols will also be matured to support the ASTAMIDS acquisition program managed by PM-CSS. The active sensor is a plug and play candidate for ASTAMIDS upgrades for scatterable surface minefield detection and false alarm mitigation.	8659	5328	0	0
Autonomous Mine Detection Sensors Program: In FY02, this program addressed the very high-risk environment that dismounted soldiers operate in during mine clearing missions. Current capabilities require troops to be within danger-close proximity of mines and they become vulnerable to sniper fire and booby traps. In FY03, this task will develop and evaluate sensors that permit standoff operations in mine detection and clearing missions. In FY04, it will investigate and demonstrate potential robotic standoff and forward looking dismounted technologies for antitank mines; mature those technologies that have the greatest potential to meet requirements; demonstrate each technology for performance and application; build prototypes based on previous demonstrations; and integrate technologies on TRADOC identified robotic platforms. In FY05 continue maturation efforts and demonstrate system prototypes in relevant environments.	1229	3005	4908	4964

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
FCS Standoff Mine Detection System: In FY03, this task will begin demonstration of revolutionary improvements of OPTEMPO in mined areas with the use of forward looking airborne sensors that detect mines and provide, through downlink, data to Objective Force vehicles using forward looking bolt on sensors. In FY04, the task will transition the two-band, 6.2 airborne sensor; integrate the sensor on a stabilized vertical takeoff and landing (VTOL) platform; demonstrate performance; and transition the sensor to FCS. In FY04 it will advance ATRs and integrate them on Organic UAV (OUAV) for demonstration. In FY05 and later years, transition 6.2 bolt-on vehicle sensor and fusion ATRs and establish baseline performance; improve fusion ATRs; and link airborne sensors with ground vehicle suite to demonstrate performance of the combined mine detection approach.	0	990	5807	5491
False alarm reduction (FAR) for Improved OPTEMPO: In FY02, this program addressed the warfighter need to eliminate false alarms from mine detection systems. FAR is mission critical in order to provide the significant rates of advance required for the Objective Force. In FY03, this continuing task will evaluate scanning technologies and mine detection confirmation technologies to include wide band frequency radar and quadruple resonance sensors for false alarm reduction performance on small overpass unmanned ground vehicles. In FY04 mature and evaluate these sensor mine detection technologies, ATR's, and signal processing techniques associated with each technology. The most promising false alarm reduction technologies or combination scanning/confirmation capabilities will be integrated on a surrogate recon vehicle to demonstrate overpass capability and false alarm reduction performance.	6245	8051	9446	0
The Joint Area Clearance (JAC) ACTD: Program will evaluate the military utility of mine clearance systems for route and rear area operations. In FY02, conducted hardware demonstrations for Army and Marine Corps user representatives. In FY03, conduct operational demonstrations and a military assessment of candidate clearance systems. In FY05, complete maturation efforts and transition hardware with technical support to operational combat units for further evaluation. The payoff for this program is to provide safe, effective, and efficient mine clearance systems that demonstrated a utility for integrated military operations.	3045	2393	500	0
Advanced Demining Technology: This two-year Congressional add demonstrates a remotely operated, mine detection and mine clearing system. Efforts in FY03 will mature the system and demonstrate its capability in a relative environment.	2695	3351	0	0

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
FCS Standoff Mine Neutralization for Route Clearance: This effort will demonstrate capabilities and methodologies to provide operational standoff while clearing mines from desired routes of travel. Current methods for removing landmines located in routes of advance include 1) unearthing the mine to render the mine safe or 2) placing a charge on top of the unearthed mine and detonating. Both methods are hazardous, time consuming, and require significant logistical support to repair equipment or a road crater after a mine detonation. In FY05, this effort will build standoff prototype systems to neutralize mines on the route of travel. This effort will include electronically fused mines without causing high order detonation (road craters). The task will leverage applicable technologies such as the Navy Dart program; build two or more prototype precision neutralizers to include mine deflagration by chemical reactants and mine destruction by high velocity kinetic projectiles; and integrate neutralization components with surrogate delivery platforms to demonstrate in relevant environments.	0	0	0	4080
Detection & Neutralization of Off Route Mines Program: In FY04, mature and develop detection and neutralization technologies to counter the emerging threat of off route mines to include break wires, trip wires, and side attack mines. This effort will improve survivability of the Objective Force against off route mines. The task will transition and establish baseline performance of 6.2 off route short-wavelength infrared (SWIR) mine detection sensors, ATR's, and neutralization technologies to include microwave, laser neutralization approaches, precision top attack munitions, and a robotic deliverable deflagration approach. In FY05, continue maturation of off route detection and neutralization technologies, signal processing, and ATRs. Demonstrate and evaluate developed capabilities of the mine detection and neutralization system approach in a relevant environment.	0	0	876	3669
Airborne System for Buried Minefield Detection: In FY05, this task will build upon the LAMD efforts and will demonstrate a buried antitank minefield detection capability that does not have the diurnal constraints of the LAMD program. This task will investigate technologies optimum for buried minefield detection; build a TUAV compatible plug and play capability; investigate wide area search approaches; and demonstrate, on a TUAV platform, buried minefield detection capability and evaluate the applicability of this system for surface minefield detection. This task will address the battlefield threat of buried mines/minefields to the Objective Force.	0	0	0	4276
Eletromagnetic-wave Detection and Imaging Transceiver Landmine Detection: This one-year Congressional add will demonstrate the combat utility of a handheld detector integrated with the newly developed Micro-electromechanical Systems (MEMS) accelerometer for self contained sensor-head tracking. No additional funding is required to complete this project.	0	1723	0	0

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
Landmine Detection Using Terahertz Radiation Technology: This one-year Congressional add will develop and demonstrate a high power (peak and average) compact and portable, particle accelerator based, THz radiation source that will produce THz imagery. Potential applications for this technology are Chemical/Biological hazard identification, detection of plastic explosives, and detection of landmines in dry conditions. No additional funding is required to complete this project.	0	958	0	0
Totals	21873	25799	21537	22480

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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
683	ANTI-PERSONNEL LANDMINE (APL) ALTERNATIVES	2845	2796	3015	2996	3381	3981	4460	4843

A. Mission Description and Budget Item Justification: This project is part of the Presidential mandated Antipersonnel Landmine Alternatives (APLA) effort and provides technology demonstrations of alternative systems that minimize the risk of injury or loss to non-combatants from exposure to anti-personnel landmines (APLs). This includes alternatives to anti-personnel sub-munitions used in mixed anti-tank (AT) landmine systems. The alternatives will include surveillance systems (autonomous seismic, acoustic, and day/night imaging sensor systems), command and control systems (networked, wireless, sensor communications, and information management tools), and overwatch fires. These will be evaluated and matured in parallel in order to provide similar capabilities that are currently provided by APLs and APL sub-munitions in mixed Anti-Tank systems. Distributed simulation will be used to evaluate new concepts and modify doctrine. Modeling components and system architectures will be constructed and evaluated at the system level in field tests. This project supports the Objective Force transition path of the TCP. No Defense Emergency Funds (DERF) were provided to the project.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
Anti-Personnel Landmine Alternatives: In FY02, developed component technology (sensors, communications and munitions) for inclusion into the PM -Close Combat Support Track 1 and Track 3 APL-A program. In FY03, mature component technology and address Track integration and interoperability issues. In FY04, efforts will be towards development of secure inter-field and intra-field radios, establishing detection and identification distances against dismounted troops, and increasing the lethality of anti-personnel munitions. In FY05, continue maturation of capability and demonstrate at system level in a relevant environment.	2845	2796	3015	2996
Totals	2845	2796	3015	2996