

UNCLASSIFIED

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)	DATE February 2000
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603606A Landmine Warfare and Barrier Advanced Technology
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COST <i>(In Thousands)</i>	FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	22651	47117	20894	22976	23544	26810	30759	Continuing	Continuing
D608 Countermine & Barrier Development	20725	27536	18250	20041	20615	21939	22983	Continuing	Continuing
D624 Ground Penetrating Radar Technology	1926	0	0	0	0	0	0	0	8531
D683 Anti-Personnel Landmine (APL) Alternatives	0	19581	2644	2935	2929	4871	7776	Continuing	Continuing

A. Mission Description and Justification: This program element develops and demonstrates robust countermine technologies. Operation Desert Storm and operations in Bosnia have highlighted the need for new equipment to detect and neutralize land mines. The Army's highest priority Countermine requirements are in-stride detection and breaching, close-in detection, area clearance and neutralization of landmines. Advanced Technology Demonstrations (ATDs), advanced warfighting experiments, and modeling and simulation activities will be performed to assess maturity of technology and system concepts. Specific efforts include remote detection of minefields and detection of individual mines from handheld, ground vehicles and aerial platforms, all of which must work against both metallic mines and low/non-metallic mines. Multi-sensor fusion will be used in vehicle-mounted mine detectors with confirmation sensors to significantly increase operational tempo (OPTEMPO) while achieving high mine detection rates with extremely low false alarm rates. Airborne multispectral/hyperspectral minefield detectors will be assessed for contingency applications and developed for a light weight plug and play approach for mission specific applications to optimally sense surface-laid and buried mines in varying vegetative, soil and diurnal conditions. Alternative systems for anti-personnel landmines and innovative concepts for minefield clearance also will be explored. The Army has focused its resources and is expediting these programs in coordination with the US Marine Corps. The work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and adheres to Tri-Service Reliance Agreements on conventional air/surface weapons and ground vehicles. Anti-Personnel Landmine Alternatives (APLA) efforts continue the work started in PE 603121D8Z and the concept exploration study congressional plus up in 604808A. Work in this program element is related to and fully coordinated with PE 0603691A (Landmine Warfare and Barrier Advanced Development), PE 0602784A (Military Engineering Technology), PE 0602712A (Countermine Technology), and PE 0602709A (Night Vision and Electro-Optics Technology). This program is managed primarily by the Communications-Electronics Research, Development and Engineering Center (CERDEC), Night Vision Electronic Sensors Directorate (NVESD), Fort Belvoir, VA.

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B. Program Change Summary	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
Previous President's Budget (<u>FY 2000/2001</u> PB)	23777	47456	44935
Appropriated Value	23944	47456	
Adjustments to Appropriated Value			
a. Congressional General Reductions	-167		
b. SBIR / STTR	-572		
c. Omnibus or Other Above Threshold Reductions		-184	
d. Below Threshold Reprogramming	-460		
e. Rescissions	-94	-155	
Adjustments to Budget Years Since (<u>FY 2000/2001</u> PB)			-24041
Current Budget Submit (<u>FY 2001</u> PB)	22651	47117	20894

Change Summary Explanation: Funding – FY 2001: funding transferred to PE 0604808 for near term anti-personnel landmine alternatives.

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BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603606A Landmine Warfare and Barrier Advanced Technology				PROJECT D608		
COST (In Thousands)		FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D608 Countermine & Barrier Development		20725	27536	18250	20041	20615	21939	22983	Continuing	Continuing
<p>Mission Description and Justification: This project provides advanced technology demonstrations of countermine capabilities. The specific efforts include remote detection of minefields, detection of individual mines from ground vehicles and aerial platforms, all of which must work against both traditional (metallic) mines and mines made from advanced materials. Teleoperated sensors for standoff and integrated neutralization concepts will be evaluated in the Mine Hunter/Killer ATD. The Mine Hunter/Killer will be capable of detecting and destroying mines at maneuver speeds. Multi-sensor fusion will be combined with confirmation sensor technologies to allow a significant reduction in false alarms affording a considerable increase in operational tempo. Airborne multispectral/hyperspectral minefield detectors will be assessed for contingency applications and developed for a light weight airborne minefield detector plug and play approach for mission specific applications to optimally sense surface-laid and buried mines in varying vegetative, soil and diurnal conditions. The preliminary approach for area clearance will be identified. These projects support advanced technology demonstrations, advanced warfighting experiments, and modeling and simulation assessments which include the Navy, Army, and USMC joint countermine Advanced Concept Technology Demonstration (ACTD).</p> <p>FY 1999 Accomplishments:</p> <ul style="list-style-type: none"> • 1743 – Developed models and simulations for joint countermine ACTD technologies and integrated new architecture into the service models. Received favorable final user report on novel system military suitability. <ul style="list-style-type: none"> – Conducted assault-on-objective battle lab experiment and assessed contribution of new countermine technology to survivability and mobility of assault forces. • 9085 – Integrated prototype detection and neutralization technologies into Mine Hunter/Killer ATD. <ul style="list-style-type: none"> – Conducted baseline evaluation of sensor fusion algorithms – Evaluated precision neutralization technology against surface and buried AT mines in various soils, overburdens, and environmental conditions. • 9897 – Completed requirements analysis and technology trade-offs for lightweight imaging multispectral airborne minefield detection technology. <ul style="list-style-type: none"> – Collected mine signature data to support finalization of phenomenology studies and mine detection algorithm development. – Identified critical sensor technologies for airborne minefield detection. <p>Total 20725</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 9236 – Evaluate mine hunter/killer integration of close-in detection and neutralization capability with a goal of dramatically improving the rate at which maneuver/transport lanes are cleared versus current capabilities. <ul style="list-style-type: none"> – Evaluate tele-operation capability of mine hunter/killer for an on-route mission scenario. 										
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603606A Landmine Warfare and Barrier Advanced Technology	PROJECT D608
<p>FY 2000 Planned Program: (continued)</p> <ul style="list-style-type: none"> <ul style="list-style-type: none"> - Identify and evaluate downselected precision neutralization technology against surface and buried AT mines in various soils, overburden and environmental conditions with the goal of demonstrating greater than a 90% probability of kill for a neutralization capability. • 14100 - Develop minefield detection aided target recognition (ATR) algorithms to improve airborne minefield detection performance (increase probabilities of detection and reduce false detection rates). <ul style="list-style-type: none"> - Perform ground and airborne data collections against buried and surfaced emplaced mines using multiple sensors that will provide data to support phenomenology investigations, multi/hyperspectral ATR algorithm development, and algorithm performance evaluations for ground and airborne mine/minefield detection sensors. - Develop system and component requirements/specifications of a lightweight multispectral detection sensor optimized for surface minefield detection. Sensor will be compatible with future tactical/short range UAVs (weight goal less than 65 lbs.) and capable of performing in a broad range of environments. - Perform benchmark demonstration of the multi/hyperspectral minefield detection capability to establish multi/hyperspectral minefield detection performance baseline. • 910 - Analyze data from Joint Countermine ACTD demo II and apply lessons learned to detection and area clearance technology programs. <ul style="list-style-type: none"> - Provide support for JCM C4I transition efforts. . • 2618 - Obtain ACTD approval from OSD and initiate Joint Area Clearance (JAC) ACTD planning <ul style="list-style-type: none"> - Develop mission scenarios for Warfighter Exercises - Obtain test components and develop assessment strategy. - Initiate component evaluation. • 672 - Funds reprogrammed for SBIR/STTR programs in accordance with the Small Business Innovation Research Authorization Act of 1992. <p>Total 27536</p> <p>FY 2001 Planned Program:</p> <ul style="list-style-type: none"> • 3490 - Evaluate candidate confirmation technologies in support of the False Alarm Reduction for Improved OPTEMPO STO. <ul style="list-style-type: none"> - Establish initial confirmation sensor technical benchmark • 13839 - Transition of the Lightweight Airborne Multispectral Mine Detection (LAMM) EMD contingency package to PM-MCD. <ul style="list-style-type: none"> - Design a lightweight multispectral detection sensor for surface minefield detection that is compatible with current/future tactical/short range UAVs and capable of performing in a broad range of environments and initiate development of prototype system demonstrator. - Initiate development of advanced minefield detection ATR algorithms and enhance fusion approaches to improve airborne minefield detection of buried and surface emplaced mines (increase probabilities of detection and reduce false detection rates). 		
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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603606A Landmine Warfare and Barrier Advanced Technology	February 2000 D608
FY 2001 Planned Program: (continued)		
	– Develop and design a test and evaluation strategy that will fully test the ability of lightweight multi/hyperspectral technology to achieve the Army's airborne minefield detection requirements.	
• 921	– Finalize JAC ACTD demo planning with warfighter.	
	– Develop user operational concept and perform component evaluation.	
	– Conduct initial Warfighter Exercises	
Total	18250	

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BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603606A Landmine Warfare and Barrier Advanced Technology				PROJECT D624		
COST <i>(In Thousands)</i>	FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost	
D624 Ground Penetrating Radar Technology	1926	0	0	0	0	0	0	0	8531	
<p><u>Mission Description and Justification:</u> This one year, Congressional special interest program developed and evaluated stand-off ground penetrating radar (GPR) technologies for mine detection.</p> <p>FY 1999 Accomplishments:</p> <ul style="list-style-type: none"> • 1926 – Initiated upgrade of Phase I system into the Phase II forward looking system. <ul style="list-style-type: none"> – Enhanced power amplifiers for better antenna gain, improved digitizers for increased processing capability, and new processors for high rate of advance and yielding enhanced detection capability. – Enhanced and integrated differential Global Positioning System (D-GPS) system to enable inertial navigation and improved mine location. – Evaluated and added software to enhance sensor fusion performance using both the GPR and FLIR sensors. <p>Total 1926</p> <p>FY 2000 Planned Program: Program not funded in FY 2000</p> <p>FY 2001 Planned Program: Program not funded in FY 2001</p>										
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BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603606A Landmine Warfare and Barrier Advanced Technology				PROJECT D683				
COST (In Thousands)				FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D683 Anti-Personnel Landmine (APL) Alternatives				0	19581	2644	2935	2929	4871	7776	Continuing	Continuing
<p>Mission Description and Justification: This project provides advanced technology demonstrations of alternative systems for anti-personnel landmines (APLs). This includes alternatives to anti-personnel submunitions used in mixed anti-tank (AT) landmine systems and possibly the entire mixed landmine system themselves. The alternative systems will include surveillance systems, command and control systems, and overwatch fires which will be evaluated and developed in parallel to provide similar capabilities that are now provided by APLs and APL submunitions in mixed AT systems. Distributed simulation will be used to evaluate new concepts and modify tactics and procedures. Prototype components and system architectures will be constructed and evaluated in system field tests. This effort continues the work started in PE 603121D8Z and concept exploration study congressional plus up in 604808A.</p> <p>FY 1999 Accomplishments: Project not funded in FY 1999</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 4530 - Complete Concept exploration studies • 7524 - Evaluate the use of low cost sensors for remote detection, assessment and early warning of targets/penetrations. Leverage commercial and current military sensors and build prototypes for field test. <ul style="list-style-type: none"> - Evaluate current command, control, communications, and computer (C4) components and optimize implementation for use in landmine alternative system architecture. Include assessment of communications vulnerability, investigate novel low cost, short range communications devices for minefield components and sensor networking, and digitize minefield operations to provide situational awareness. Build prototypes for field test. - Evaluate the use of advanced deterrent and fuzing systems including wide area munitions and nonlethal technology for insertion to landmines for anti-handling capability and/or to provide man-in-the-loop overwatch fire capability. Build prototypes for field tests. • 3000 - Evaluate modifying current mixed delivery systems for use with landmine alternative system concepts • 2000 - Use distributed modeling to modify tactics and procedures for landmine alternative system • 2000 - Model and develop advance technology sensors, communications and next generation scatterable munition components and subsystems for mid term mixed mine alternative solutions. • 527 - Funds reprogrammed for SBIR/STTR programs in accordance with the Small Business Innovation Research Authorization Act of 1992. <p>Total 19581</p>												
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