

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2008

BUDGET ACTIVITY	PE NUMBER AND TITLE						
3 - Advanced technology development	0603606A - Landmine Warfare and Barrier Advanced Technology						
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
Total Program Element (PE) Cost	29406	30700	30797	32541	32776	33512	34260
608 COUNTERMINE & BAR DEV	21213	22200	27455	27607	27744	28362	29000
64C COUNTERMINE DEMONSTRATIONS (CA)	4842	5564					
683 Area Denial Sensors	3351	2936	3342	4934	5032	5150	5260

A. Mission Description and Budget Item Justification: This program element (PE) matures and demonstrates sensor and neutralization technologies required to detect, identify, and then mitigate the effects of landmines, minefields, and obstacles. This work enables assured mobility for the high operational tempo (OPTEMPO) of the Future Force, and where feasible, exploit opportunities to enhance Current Force capabilities. This PE also conducts modeling and simulation activities to assess the effectiveness of system concepts. Project 608 focuses on concepts and technologies that enable in-stride detection and breaching, close-in detection, area clearance, and neutralization of threats. This project demonstrates the ability to detect landmines and booby traps from handheld, ground, and aerial sensor systems; evaluates detection of both conventional and command detonated types of threats, metallic, and low/non-metallic threats; and emphasizes the use of wide-area multi-sensor fusion detection systems, coupled with small-area confirmation sensors. This multi-sensor approach has the potential to yield a high probability of threat detection with very low false alarm rates. Efforts within this project also assess available airborne sensors for use in landmine and booby trap detection missions for the current force. Project 608 also demonstrates novel explosive, electronic, and kinetic energy techniques to neutralize individual threats and to breach minefields. Project 683 explores alternative systems for anti-personnel landmines and innovative concepts for minefield clearance. Project 64C funds congressional special interest items.

Work in this PE is related to and fully coordinated with PE 0602120A, (Sensors and Electronic Survivability), PE 0602624A, (Weapons and Munitions Technology), PE 0602712A, (Countermining Systems), PE 0602784A (Military Engineering Technology), PE 0603710A, (Night Vision Advanced Technology), and the US Marine Corps. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work in this PE is performed by the Army Research, Development, and Engineering Command/Communications-Electronics Research, Development, and Engineering Center/Night Vision and Electronic Sensors Directorate (NVESD), Fort Belvoir, VA.

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<u>B. Program Change Summary</u>	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2008/2009)	30218	25315	30935
Current BES/President's Budget (FY 2009)	29406	30700	30797
Total Adjustments	-812	5385	-138
Congressional Program Reductions		-215	
Congressional Rescissions			
Congressional Increases		5600	
Reprogrammings	-126		
SBIR/STTR Transfer	-686		
Adjustments to Budget Years			-138

Two FY08 congressional adds totaling \$5600 were added to this PE.

(\$1600) Enhanced Landmine and IED Detection Technology

(\$4000) Advanced Demining Technology

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BUDGET ACTIVITY 3 - Advanced technology development	PE NUMBER AND TITLE 0603606A - Landmine Warfare and Barrier Advanced Technology					PROJECT 608	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
608 COUNTERMINE & BAR DEV	21213	22200	27455	27607	27744	28362	29000

A. Mission Description and Budget Item Justification: This project matures and demonstrates countermine technologies for integration into future Army systems, and where feasible, exploit opportunities to enhance Current Force capabilities. The projects goal is to mature and demonstrate robust approaches to finding surface-laid and buried threats in temporally and spatially varying vegetation, soil, weather, and diurnal conditions. This effort focuses on enabling assured mobility for the Future Force. Specific activities include remote detection of minefields by aerial sensor systems, detection of individual threats by handheld and vehicle-based sensor systems, and neutralization of individual booby traps, landmines, and minefields. The threats being addressed include conventional, command detonated, and metallic and low/non-metallic anti-tank and anti-personnel threats. This project evaluates the effectiveness of wide-area multi-sensor fusion detection systems, coupled with slower small-area confirmation sensors, to yield a high probability of detection (Pd) at very low false alarm rates (FAR). This project evaluates airborne multispectral threat detection sensors and matures them for lightweight plug-and-play use on unmanned aerial systems (UASs) in mission specific applications. Efforts are supported by modeling and simulation assessments to define potential system effectiveness. Efforts in standoff mine detection provide mine detection capabilities for faster rate of advance (ROA) in high threat areas, using teamed sensors on both ground vehicles (at greater distances from the threat) and UASs. Autonomous mine detection sensor efforts provide the ability to detect anti-personnel mines at faster ROA by integrating mine detection sensors onto robotic platforms which precede the Soldier thereby keeping the Soldier away from danger. Ground penetrating radar development efforts provide faster ROA for on-route and off-route mine detection capability with high Pd and low FAR. Airborne threat detection efforts demonstrate automated processes and algorithms that improve upon the current change detection process used to detects landmines and booby traps. The Threat Detection and Neutralization for Route Clearance effort demonstrates vehicle mounted technologies for in-stride detection and neutralization of roadside and in-road threats. The Mine Detection Payload for UASs effort demonstrates an airborne sensor payload and a threat detection algorithm suite.

The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Minefield neutralization efforts are closely coordinated with Navy/USMC. Work in this PE is performed by the Army Research, Development, and Engineering Command/Communications-Electronics Research, Development, and Engineering Center/Night Vision and Electronic Sensors Directorate (NVESD), Ft. Belvoir, VA.

<u>Accomplishments/Planned Program:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Standoff Mine Detection System: In FY07, demonstrated forward looking sensor suite consisting of brassboard forward looking radar coupled with electro-optic/Infrared sensors integrated on a mine protected vehicle; developed and demonstrated two brassboards for standoff mine detection consisting of a magnetometer array and an early harmonic radar (detects electronic devices); evaluated variety of sensor technologies in desert conditions to determine their ability to detect deeply buried targets in road beds.	8275		
Autonomous Mine Detection Sensors (AMDS): In FY07, completed final prototype sensor build and automated target recognition /signal processing implementation on surrogate platform; conducted field tests in relevant environments. Transitioned AMDS to PM-Close Combat System (CCS).	2806		
Ground Penetrating Radar (GPR) Countermine On The Move: In FY07, completed automated target recognition development and GPR	4808		

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT	
3 - Advanced technology development	0603606A - Landmine Warfare and Barrier Advanced Technology	608	
integration onto a unmanned ground vehicle (UGV); conducted a series of on and off route demonstrations in a variety of operational scenarios and under representative environmental conditions; completed mobility evaluation. Transitioned GPR to PM-CCS.			
Threat Detection and Neutralization for Route Clearance: In FY08, mature vehicle mounted technologies and prototypes that provide standoff detection and neutralization of roadside and in-road threats to enable uninterrupted mobility and increase survivability for both convoy escort and route clearance mission. Detection sensors and sensor combinations may include conventional and non-linear radar, electromagnetic induction, and passive magnetometry, electro-optics, lasers, and chemical detection sensors. Neutralization techniques include directed energy and conventional ballistic approaches. In FY09, will continue development of detection and neutralization components; will conduct a series of component tests and select the most promising technologies/components for convoy escort and route clearance prototypes; will mature and demonstrate sensor fusion algorithms to reduce false alarm rates in high clutter/urban environments; will assess maturity of directed energy and conventional ballistic approaches for use against the full spectrum of the threats.		14971	19327
Airborne Mine Detection: In FY07, upgraded data collection assets to reduce the processing burden and automated, via software, the change detection activities between consecutive frames from the high altitude payload; completed cueing algorithm development and sensor integration; conducted system flight demonstrations in military like environment and assessed performance of the Change Detection Work Station.	5324		
Mine and Minefield Detection Payload for Tactical Unmanned Aerial Vehicle (TUAV): In FY08, conduct trade studies and modeling of sensor candidates to meet size, weight, and power constraints of a medium altitude TUAV airborne payload; mature sensors and algorithms tailored to sensor selection and mission; integrate sensor package for flight test. In FY09, will perform flight testing/data collections on manned aircraft, will mature algorithms based on sensor data collections and analysis.		6778	8128
Small Business Innovative Research/Small Business Technology Transfer Programs		451	
Total	21213	22200	27455

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BUDGET ACTIVITY 3 - Advanced technology development		PE NUMBER AND TITLE 0603606A - Landmine Warfare and Barrier Advanced Technology					PROJECT 683	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
683 Area Denial Sensors	3351	2936	3342	4934	5032	5150	5260	

A. Mission Description and Budget Item Justification: This project provides demonstrations of surveillance, command, and control technology components for alternative systems that minimize the risk of injury or loss to non-combatants from exposure to anti-personnel landmines (APLs). The technology components include distributed personnel surveillance systems (autonomous seismic, acoustic, and day/night imaging sensor systems) and command and control systems (ad hoc networked, wireless, sensor communications, and information management tools) to be used with man-in-the-loop overwatch fires. This project uses simulation to evaluate new concepts and modify doctrine. This project also constructs components, as well as, system architectures and conducts evaluations at the system level in field tests.

The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work in this PE is performed by the Army Research, Development, and Engineering Command/Communications-Electronics Research, Development, and Engineering Center/Night Vision and Electronic Sensors Directorate (NVESD), Fort Belvoir, VA.

Accomplishments/Planned Program:	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Area Denial Sensors: In FY07, matured ground sensor discrimination algorithms; demonstrated an unattended ground sensor (UGS) working with an intelligent mine system concept of operations for discriminating combatant from noncombatant. In FY08, continue maturation of discrimination algorithms; incorporate advanced personnel detection sensors into testbed UGS; demonstrate modeling and simulation of sensor and operator interface. In FY09, will demonstrate detection and combatant/noncombatant discrimination with testbed UGS; will begin development of next generation sensor and discrimination system.	3351	2871	3342
Small Business Innovative Research/Small Business Technology Transfer Programs		65	
Total	3351	2936	3342