ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2006

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

COST (In Thousands)	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
Total Program Element (PE) Cost	26267	29171	22088	21965	21961	22160	22333
H24 COUNTERMINE TECH	17222	16436	19300	19127	19089	19263	19414
H35 CAMOUFLAGE & COUNTER-RECON TECH	2529	2582	2788	2838	2872	2897	2919
HB2 COUNTERMINE COMPONENT TECHNOLOGY (CA)	6516	10153	0	0	0	0	0

A. Mission Description and Budget Item Justification: This Program Element (PE) studies and examines applied technologies to improve countermine, signature management and counter sensors capabilities for the Future Force and where feasible, exploits opportunities to enhance Current Force capabilities. Project H24 focuses on concepts and technologies with potential to improve detection and neutralization of mines and improvised explosive devices (IEDs) from a safe distance using ground and air platforms. The goal of this project is to increase mine and improvised explosive device detection search rates, reduce false alarm rates, and achieve precision neutralization capabilities in support of sustaining the high operational tempo needed in Future Force operations. Working in conjunction with the US Army Engineering, Research and Development Center (ERDC), this project examines countermine phenomenology of surface and buried mines, booby-traps, and improvised explosive devices. In addition, this project matures wide area airborne countermine sensor concepts for higher altitude, wider area coverage, higher probability of detection, and lower false alarm rate for airborne minefield and IED detection operations. This PE addresses emerging mine/IED threats in both the conventional and electronically activated categories, supports DoD's Center of Excellence for Unexploded Ordnance which coordinates and standardizes land mine signature models; maintains a catalogue of mine signatures; and supports the evaluation of mine detection sensors and algorithms. Project H35 examines signature management techniques for tactical operation centers and counter sensor techniques to reduce the reconnaissance capabilities of our adversaries. Project HB2 funds Congressional special interest items.

Work in this PE is related to and is fully coordinated with PE 0602709A (Night Vision and Electro-Optics Technology), PE 0603606A (Countermine and Barrier Development), PE 0603710A (Night Vision Advanced Technology), ERDC, and the US Marine Corps. This PE contains no duplication of effort within the Army, other Services, or the Department of Defense. The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). Work in this PE will be performed by the Army Research, Development and Engineering Command/Communications-Electronics Research, Development and Engineering Center/ Night Vision & Electronic Sensors Directorate (NVESD), Fort Belvoir, Virginia; the Army Corps of Engineer, R&D Center, Vicksburg, Mississippi; and the Armaments Research, Development, and Engineering Center, Picatinny, New Jersey.

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B. Program Change Summary	FY 2005	FY 2006	FY 2007
Previous President's Budget (FY 2006)	26279	19293	23037
Current BES/President's Budget (FY 2007)	26267	29171	22088
Total Adjustments	-12	9878	-949
Congressional Program Reductions		-128	
Congressional Rescissions		-294	
Congressional Increases		10300	
Reprogrammings	-12		
SBIR/STTR Transfer			
Adjustments to Budget Years			-949

Five FY06 Congressional adds totaling $10300 were added to this PE.

FY06 Congressional adds with no R-2A (appropriated amount is shown):
($2800) Biological Detection of Unexploded Ordnance and Land Mines
($1500) Explosive Detonation and Mitigation-INL
($4000) Quantum Research Facility
($1000) Small Synthetic Aperture Radar (SAR) Buried Mine Detection
($1000) Stoichiometric Explosive Detector System

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

COST (In Thousands)	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
H24 COUNTERMINE TECH	17222	16436	19300	19127	19089	19263	19414

A. Mission Description and Budget Item Justification: This project examines new countermine technologies using man-portable, ground-vehicular, and airborne platforms for detection, discrimination and neutralization of individual mines, minefields, and improvised explosive devices (IEDs). These technologies support the Future Force, and where feasible, exploit opportunities to enhance Current Force capabilities. This goal of this project is to detect mines and IEDs with high probability, reduce false alarms, and increase operational tempo by performing data collection to assess the ability of various sensor combinations and signal processing/fusion algorithms. This 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 support the work effort on the countermine environment with the Corps of Engineers. The Wide Area Airborne Minefield Detection effort will characterize a variety of airborne sensor technologies, tested in a variety of environmental conditions, to support wide area minefield detection. The Precision Mine Neutralization and Localization effort will increase the potential for sustained rapid movement of tactical forces using stand-off neutralization technologies. The Off Route Mine Detection and Neutralization effort will provide forward-looking mine and IED detection and neutralization, including side-attack detection, in an off-route environment within required rate-of-advance for Brigade Combat Team minefield reconnaissance missions. The Countermine Phenomenology Studies effort will provide the ability to predict and improve the performance of airborne and vehicular countermine systems across all operational environments using models that predict countermine sensor performance and Automatic Target Recognition (ATR) performance. The Sensors for Explosive Detection effort will provide short range standoff capability to detect explosives (such as IEDs, mines, and car bombs) using chemical sensing methods in urban environments and route clearance scenarios.

The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). Work in this PE is performed by the Army Research, Development and Engineering Command/Communications-Electronics Research, Development and Engineering Center (CERDEC)/Night Vision & Electronic Sensors Directorate (NVESD), Fort Belvoir, Virginia; the Corps of Engineers RD&E Center, Vicksburg, Mississippi; the Armaments Research, Development, and Engineering Center, Picatinny, New Jersey; and the CERDEC Intelligence and Information Warfare Directorate, Fort Monmouth, New Jersey.

Accomplishments/Planned Program	FY 2005	FY 2006	FY 2007
Center of Excellence for Unexploded Ordnance (UXO). In FY05, prepared the annual UXO Research and Development Plan; developed the UXO RDT&E Strategic Road Map; tested various "real-time" explosive specific detection technologies. In FY06, prepare report on "real-time" explosive specific detection technologies with recommendations on technologies for varying environments; coordinate requirements, integrate programs from the mission areas, and leverage the capabilities in other Government agencies, industry, academia, and the international community. In FY07, will continue to establish standards for testing, modeling, and evaluating Counter UXO technologies and ensure that requirements are current and accurate, opportunities for leveraging technologies are identified and exercised, duplicative programs are identified and eliminated, and information on programs and progress is shared.	486	500	500
Wide Area Airborne Minefield Detection. In FY05, collected and analyzed measurements using brassboard sensor, a wide variety of environmental conditions (soil conditions, temperature, humidity, ambient lighting, etc.) and collected extensive clutter data for building, testing and refining mine and IED detection algorithms. In FY06, modify and evaluate the brassboard sensor design on multiple	5078	5670	7547

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COUNTERMINE TECH

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backgrounds; perform additional data collections with modified sensors; continue maturing optimized mini clutter detection algorithms and modules. In FY07, will complete design and build a multispectral countermine sensor; will test the sensor in a manned flight and collect data over a variety of mines and IEDs in different deployments and in a variety of clutter backgrounds; will apply an automatic target recognition algorithm to the data to assess the technical and operational performance of the sensor and provide recommendations for a sensor design/specification for the subsequent sensor/system prototype; will analyze data from three different data collections for the ground penetrating radar and hyperspectral sensors to determine performance for detecting IEDs.			
Precision Mine Neutralization with Localization. In FY05, designed and built precision neutralization breadboard components and subsystems; performed initial field experiments; conducted analysis on collected data; began building and testing point neutralization breadboard systems based on evaluation and assessment of prior field experiments. In FY06, assemble cross-country acoustic-based mine confirmation and localization sensor data collection system(s); investigate landmine confirmation and localization signal processing and associated target recognition algorithms; conduct joint field data collections with precision mine neutralization breadboard systems and confirmation and localization sensor data collection systems. In FY07, will combine multiple standoff mine localization, and neutralization technologies onto a single, or integrated platform; will conduct field experiments against mines and IEDs in realistic on- and off-route environments; will perform assessment of combined technologies.	3290	4637	4474
Countermine Phenomenology Studies. In FY05, conducted a field study to gather data to feed an environmental model and sensor performance model that will be used to predict and reduce false alarms; completed countermine testbed model including a detailed background environmental model with target mine/IED model. In FY06, conduct site characterization and mine/IED sensing field experiments to determine predictive capabilities of improved geo-environmental models and assemble database of mines in background signatures. In FY07, will conduct blind countermine experiments at well characterized sites to evaluate model performance and clutter rejection improvements.	3554	4266	4732
Sensors for Explosive Detection. In FY05, conducted initial studies on signatures of explosives and their behavior in various environments; transitioned amplified fluorescence quenching polymer based sensor technology to the Joint IED Task Force following extensive data collection. In FY06, investigate field portable explosive detection sensor technology for data collection and focus on spectroscopic sensor development as well as signature studies of roadside and vehicle borne improvised explosive devices. In FY07, will conduct lab and field experiments of new portable sensors and evaluate performance.	960	1363	2047
Off Route Mine Detection and Neutralization. In FY05, continued to examine and conduct evaluations of off route detection capabilities designed to provide increased operational tempo and enhanced vehicle and soldier survivability; conducted a successful field test demonstrating 35 kph rate of advance, 50m detection standoff and < 0.3 m location accuracy with a Pd >85% & FAR of .01/m2 in a complex background.	3854	0	0
Total	17222	16436	19300

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BUDGET ACTIVITY **2 - Applied Research**	PE NUMBER AND TITLE **0602712A - Countermine Systems**	PROJECT **H35**

COST (In Thousands)	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
H35 CAMOUFLAGE & COUNTER-RECON TECH	2529	2582	2788	2838	2872	2897	2919

A. Mission Description and Budget Item Justification: This project designs, develops, and investigates advanced signature management and deception technologies for masking friendly force capabilities and intentions. These technologies support the Future Force, and where feasible, exploit opportunities to enhance Current Force capabilities. The Low Cost Counter Reconnaissance Technology effort will investigate advanced materials and processes for countering visual, infrared (IR), and spectral sensors; optical and electronic techniques for reducing the signatures of uncooled IR sensors used in the Future Force; modeling and simulation of the vulnerability of sensors to laser blinding; and new technologies to exploit or deny the enemy's use of reconnaissance sensors against friendly forces. The Advanced Electronic Deception Techniques effort will investigate spectral characteristics of targets and backgrounds to determine optimum filter bands; spatial resolution requirements; spatial and spectral registration requirements; and sensor noise effects.

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

Accomplishments/Planned Program	FY 2005	FY 2006	FY 2007
Low Cost Counter Reconnaissance Technology. In FY05, continued modifications of experimental focal plane arrays (FPAs) and measurements of these FPAs; demonstrated signature reduction in one prototype infrared lens. In FY06, integrate new focal plane arrays and optics into a prototype uncooled infrared sensor and fabricate advanced paints and patterns incorporating spectral signature reduction, perform field experiments to validate optical augmentation and spectral signature reductions.	2529	2582	0
Low Observable 3rd Gen Sensors. In FY07, will investigate spectral characteristics of targets and backgrounds to determine optimum filter bands, spatial resolution requirements, spatial and spectral registration requirements and sensor noise effects in an effort to enhance concealment of friendly forces.	0	0	2788
Total	2529	2582	2788

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CAMOUFLAGE & COUNTER-RECON TECH

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