

UNCLASSIFIED

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)	DATE February 1999
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602712A Countermine Applied Research
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COST (In Thousands)	FY1998 Actual	FY 1999 Estimate	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	9928	10547	10321	10453	10717	11008	11475	12044	Continuing	Continuing
AH24 Countermine Technology	8851	8168	8212	8031	8238	8468	8771	9208	Continuing	Continuing
AH35 Camouflage Technology	749	2028	2109	2422	2479	2540	2704	2836	Continuing	Continuing
AC61 AC61	328	351	0	0	0	0	0	0	0	1992

A. Mission Description and Budget Item Justification: This program element provides for countermine, electronic deception and advanced signature management technologies. The specific countermine efforts include close in detection of individual mines utilizing manportable technologies, detection and neutralization from moving vehicles, and remote detection of minefields. Advanced robotics technologies will be emphasized to minimize threats to weapons systems and personnel. Detection and neutralization techniques will be developed for both conventional and electronically activated mines. A Center of Excellence (CoE) for land mine detection will coordinate and standardize development of mine signature simulations, provide a catalogue of mine signatures, and support evaluation of mine detection algorithms. Electronic deception and advanced signature management techniques will provide combat units (e.g. Digital Tactical Operations Command, Small Unit Operations, Special Forces, Theater Missile Defense, Armored Systems) with an integrated system of electronic devices that deliberately alter the adversary's perception of friendly force capabilities and intentions. 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. Work in this program element is related to and fully coordinated with PE0602709A (Night Vision and Electro-Optics Technology), PE 0603606A (Countermine and Barrier Development), and PE0603710A (Night Vision Advanced 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 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
Previous President's Budget (<u>FY 1999</u> PB)	10272	10715	10485	10574
Appropriated Value	10598	10715		
Adjustments to Appropriated Value				
a. Congressional General Reductions	-326	-168		
b. SBIR / STTR	-257			
c. Omnibus or Other Above Threshold Reductions	-87			
d. Below Threshold Reprogramming				
e. Rescissions				
Adjustments to Budget Years Since <u>FY 1999</u> PB			-164	-121
Current Budget Submit (<u>FY 2000 / 2001</u> PB)	9928	10547	10321	10453

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BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602712A Countermine Applied Research				PROJECT AH24		
COST (In Thousands)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
AH24 Countermine Technology	8851	8168	8212	8031	8238	8468	8771	9208	Continuing	Continuing
<p>A. Mission Description and Justification: Countermine research will focus on remote detection of minefields and detection and neutralization of individual mines from vehicular and man portable platforms. Neutralization techniques will be developed for both conventional and electronically activated mines that can be detected and neutralized at a standoff distance. Will develop and utilize data collection platforms for continual sensor and algorithm phenomenology assessments as mine detection technologies. Mine detection and neutralization technologies and techniques will provide enhancements addressing improved probability of detection, reduction in false alarms and improved operational tempo. A COE for land mine detection will coordinate and standardize development of mine signature simulations, provide a catalogue of mine signatures, and support evaluation of mine detection algorithms.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 750 – Investigated a variety of new component and focal plane array (FPA) technologies, such as 3-5 micron staring FPAs, multi/hyperspectral, passive polarization, active sources and electronic stabilization to support a lightweight, airborne standoff mine detection capability. • 4864 – Evaluated alternative precision neutralizer devices in cooperation with the Armaments Research, Development, and Engineering Center. Eliminated direct-fire cannon technology as viable alternative. Redirected neutralization technologies toward point neutralizers to be deployed by remote delivery techniques. <ul style="list-style-type: none"> – Down-selected sensor technologies developed under the vehicular mounted mine detector program for application to the mine hunter/killer. – Established sensor fusion/automatic target recognition (ATR) processing procedures and techniques to improve detection performance while reducing occurrence of false alarms. – Developed and evaluated initial forward-looking mine detection technologies for implementation to providing standoff detection capabilities. • 1750 – Evaluated advanced infrared (IR), ultra-wide band ground penetrating radar, acoustic, electromagnetic induction eddy current analysis, passive microwave, magnetoresistive, microbial/bioluminescent detection technologies to significantly improve detection capability and increase probability of detection and reduction of false alarms against antipersonnel (AP) and antitank (AT) mines. • 1487 – Developed mine signature simulations, populated database with mine signatures, and established methodology for evaluation of detection algorithms in support of land mine detection COE. <p>Total 8851</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 1400 – Complete design and performance trade-off analysis and evaluation of alternative multispectral imaging sensor technologies for a lightweight airborne minefield detection capability. <ul style="list-style-type: none"> – Develop and test critical component modules for the lightweight airborne mine detection sensor. 										
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<p align="center">- Collect mine signature data to support finalization of phenomenology studies and mine detection algorithm development.</p> <p>FY 1999 Planned Program: (continued)</p> <ul style="list-style-type: none"> • 4659 – Develop and evaluate the fundamental phenomenology for advanced mine detection sensor technologies. <ul style="list-style-type: none"> – Complete test and evaluation of alternative neutralization technologies and down select to most effective approach. – Evaluate preliminary development of advanced sensor fusion/ATR processing and integrate with vehicle mounted mine detector sensors. • 1500 – Complete preliminary research on eddy current decay analysis techniques to reduce false alarms and provide detection and classification capabilities for surface and buried metallic mines. <ul style="list-style-type: none"> – Asses high dynamic range radar, giant magneto-resistive arrays, and acoustic mine detection techniques capabilities to improve detection performance of hand-held and vehicular mounted mine detectors. • 484 – Enhance mine signature simulations, cataloguing of mine signatures, and assessments of mine detection algorithms in support of land mine detection COE. • 125 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs <p>Total 8168</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 1480 – Design mine phenomenology data collections that will support the defining of hyperspectral sensor approaches for airborne mine detection implementation. <ul style="list-style-type: none"> – Evaluate airborne multispectral and hyperspectral testbed sensor data and supporting ground truth with the goal of defining conditions and observable phenomena to optimize the multi-sensor fusion approach. • 1877 – Conduct phenomenology study to evaluate existing DARPA, NVESD and other technologies and techniques and benchmark through field experiments. <ul style="list-style-type: none"> – Setup standards and techniques for evaluation of these confirmation technologies at various test sites. • 1880 – Evaluate and assess the advanced mine detection sensors by down selecting to the most promising technologies and techniques. Collect and analyze data to evaluate improvements in probability of detection and reduction of false alarm rates. <ul style="list-style-type: none"> – Complete design and trade off analyses of a acoustic laser Doppler vibrometer breadboard prototype to determine system parameters for detecting mines at greater standoff distances with possible application into the forward looking or confirmation technology areas. – Evaluate industry/academia concepts and technologies with potential to increase probability of detection, reduce false alarms or increase standoff distances as means to enhance force mobility and survivability. • 500 – Enhance mine signature simulations, update database of mine signatures, and established methodology for evaluation of detection algorithms in support of land mine detection COE. • 2475 – Evaluate forward looking detection sensor designs (GPR and IR) through testing in temperate environments of surface and buried AT mines with the goal of demonstrating improved probability of detection and reduced false alarm rates for on and off route mission scenarios. 		
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<p align="center">ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)</p>		<p>DATE February 1999</p>
<p>BUDGET ACTIVITY 2 - Applied Research</p>	<p>PE NUMBER AND TITLE 0602712A Countermine Applied Research</p> <p align="right">PROJECT AH24</p>	
<p align="center">- Evaluate forward looking detection sensor technologies with the goal of improved probability of detection and reduced false alarm rates while increasing operational speed.</p>		
<p>FY 2000 Planned Program: (continued)</p>		
<p align="center">- Transition technologies into data collection devices for continual evaluation and assessment of sensors and algorithms.</p>		
<p>Total</p>	<p align="center">8212</p>	
<p>FY 2001 Planned Program:</p>		
<p>•</p>	<p>2781 - Complete development and fabrication of explosive specific confirmatory sensor brassboard prototypes for field experiments and evaluation. - Complete field experiments using realistic explosive concentrations to establish the prototype's operational envelopes as a function of target type, environment, and operational speed. - Complete maturation of higher risk technologies from DARPA's chemical detection program and select the most promising approach that yields lower false alarm rates and faster operational speeds.</p>	
<p>•</p>	<p>1775 - Evaluate potential of acoustic advanced mine detection sensors for inclusion in on going downward and forward looking mine detection programs as primary detection sensor. - Complete proof of concept experiments for new technologies and transition successful advanced mine detection technologies for future insertion into mine detection systems.</p>	
<p>•</p>	<p>500 - Enhance mine signature simulations, update database of mine signatures, and establish methodology for evaluation of detection algorithms in support of land mine detection COE.</p>	
<p>•</p>	<p>2975 - Evaluate brassboard forward looking detection systems for detection of surface and buried AT mines that will improve probability of detection and reduce false alarms. - Evaluate initial ATR and sensor fusion algorithms for forward looking detection sensors, which will improve the probability of detection and reduce false alarm rates, while increasing operational speeds.</p>	
<p>Total</p>	<p align="center">8031</p>	

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BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602712A Countermine Applied Research					PROJECT AH35	
COST (In Thousands)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
AH35 Camouflage Technology	749	2028	2109	2422	2479	2540	2704	2836	Continuing	Continuing
<p>A. <u>Mission Description and Justification:</u> Develop electronic deception and advanced signature management technologies that alter the threat perception of friendly force capabilities and intentions and deny acquisition of friendly force assets from threat sensors. Demonstrations will be supported by spectrum characterization, modeling and simulation conducted under the integrated sensor modeling and simulation effort, situation awareness sensors through warrior extended battlespace sensor effort, and hyperspectral sensor development efforts. These deception systems provide combat units with capability to camouflage friendly assets and project a deceptive image of friendly forces, thereby improving survivability of combat units in global battlefield conditions.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 749 – Completed feasibility studies for advanced camouflage and deception technologies using holography and digital radio frequency memory (DRFM) technologies. <p>Total 749</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 1985 – Develop holographic techniques, materials, and processes to support development of visual and infrared deception system modules. <ul style="list-style-type: none"> – Evaluate DRFM technologies feasibility to support development of radar deception system module. – Complete feasibility studies including evaluation of communications, situation awareness sensors, and projection technologies required for an integrated modular electronic deception system (IMEDS). – Design modeling and simulation efforts to support design and evaluation of concepts, systems, and operational effectiveness for electronic deception systems. • 43 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs <p>Total 2028</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 2109 – Evaluate holographic techniques, materials, and processes for visual and infrared deception devices. <ul style="list-style-type: none"> – Design, model and simulate architecture for the IMEDS – Develop technologies to support the development of deception modules for radar, acoustic, seismic, and communication band deception modules for the IMEDS – Demonstrate radar and communications capabilities for IMEDS modules. <p>Total 2109</p>										
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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	0602712A Countermine Applied Research	AH35
FY 2001 Planned Program:		
•	2422 - Demonstrate holographic techniques for improved deception capabilities for combat units.	
	- Evaluate IMEDS architecture for situational awareness and project technology capabilities.	
	- Demonstrate techniques that combine physical and electronic decoys with signature management technologies to improve survivability of combat and combat support units.	
Total	2422	
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