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

February 2002

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

COST (In Thousands)		FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate
	Total Program Element (PE) Cost	17228	22889	13186	15804	14111	12550	12807
H24	COUNTERMINE TECH	14907	20437	10612	13082	11265	9606	9805
H35	CAMOUFLAGE TECHNOLOGY	2321	2452	2574	2722	2846	2944	3002

A. Mission Description and Budget Item Justification: This Program Element (PE) researches and investigates advanced technologies to improve countermine, signature management and deception capabilities for the Army's Transformation to the Objective Force. Countermine research focuses on system concepts and technologies that improve mine detection and neutralization from standoff man-portable, ground and air platforms. The goal is to increase mine detection probability, while also reducing false alarm rate, to maintain high operational tempo in the Objective Force. In addition, wide area airborne countermine sensor concepts are being developed for higher altitude, wide area coverage and higher probability of detection and lower false alarm rate for airborne mine detection. This PE addresses emerging mine threats in both the conventional and electronically activated categories. A Center of Excellence for Landmines has been established to coordinate and standardize land mine signature models; maintain a catalogue of mine signatures; and support the evaluation of mine detection sensors and algorithms. This PE also researches deception and robust signature management techniques that will potentially alter an adversary's perception of friendly force capabilities and intentions. This effort is completely coordinated with the Marine Corps. The work in this PE is consistent with the Army Science and Technology Master Plan, the Army Modernization Plan, and Project Reliance. It 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 0602709A (Night Vision and Electro-Optics Technology), PE 0603606A (Countermine and Barrier Development) and PE 0603710A (Night Vision Advanced Technology). This PE is managed by the Night Vision Electronic Sensors Directorate, Communications-Electronics Research, Development and Engineering Center. (Contractors include: EOIR, Spotsylvania, VA; IMT, San Jose, CA; SAIC, San Diego, CA; and TRW, Fairfax, VA. This program supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

B. Program Change Summary	FY 2001	FY 2002	FY 2003
Previous President's Budget (FY2002 PB)	17721	16689	12944
Appropriated Value	17886	23089	0
Adjustments to Appropriated Value	0	0	0
a. Congressional General Reductions	0	-200	0
b. SBIR / STTR	-494	0	0
c. Omnibus or Other Above Threshold Reductions	0	0	0
d. Below Threshold Reprogramming	0	0	0
e. Rescissions	-164	0	0
Adjustments to Budget Years Since FY2002 PB	0	0	242
Current Budget Submit (FY 2003 PB)	17228	22889	13186

Change Summary Explanation:

Significant changes:

FY02: Congressional adds totaling $6.4M (as noted below) were added to this PE.

FY02 - Congressional adds were made for Acoustic Mine Detection, Project H24 ($2000); Integrated Countermine Testbed and Training Project, Project H24 ($1400); Standoff Mine Detection, Project H24 ($2000); Landmine Detection Tech/Seismic Energy, Project H24 ($1000).

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

February 2002

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

COST (In Thousands)		FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate
H24	COUNTERMINE TECH	14907	20437	10612	13082	11265	9606	9805

A. Mission Description and Budget Item Justification: This project supports the Objective Force by researching new countermine technologies for standoff detection and discrimination of individual mines and minefields from man-portable, ground-vehicular, and airborne platforms. Mines include both conventional and electronically activated mines. Data collections will be used to assess the ability of various sensor combinations and signal processing/fusion algorithms to consistently detect mines with reduced false alarms for increased force operational tempo. Forward-looking mine detection and neutralization technologies will be emphasized to allow for rapid movement of forces. Additionally, this project develops sensors for the detection of off-route mines. The project sponsors the Center of Excellence for Unexploded Ordnance established to coordinate and standardize land mine signature modeling, maintain a catalogue of mine signatures, and support the evaluation of mine detection sensors and algorithms. This program supports the Objective Force transition path of the TCP.

FY 2001 Accomplishments:

- 3800 - Investigated and evaluated algorithms and sensor fusion processing for mine data collection systems in field experiments and evaluation.

  - Conducted and evaluated experiments using chemical sensors against realistic explosive concentrations to establish the prototype's operational envelopes as a function of target type, environment, and operational speed.

  - Tested and evaluated acoustic/laser, ground penetrating - synthetic aperture radar (SAR), and advanced electromagnetic detection sensors for increased mine detection and discrimination capabilities.

- 292 - Enhanced mine signature simulations, updated database of mine signatures, and established methodology for evaluation of detection algorithms in support of landmine detection of the Joint Unexploded Ordnance Coordinating Office (JUXOCO).

- 5528 - Evaluated brassboard forward-looking sensors for the detection of surface and buried anti-tank mines to improve probability of detection and reduce false alarms to provide faster rates of advance and survivability for the Objective Force.

  - Evaluated aided target recognition (ATR) and sensor fusion algorithms for forward looking detection sensors, which improve the probability of detection and reduce false alarm rates while increasing operational tempo.

FY 2001 Accomplishments: (Continued)

- Evaluated potential of acoustic and time domain electromagnetic induction sensors and advanced mine detection sensors for inclusion in ongoing downward and forward looking mine detection programs as primary detection sensor.
- Performed analysis on candidate standoff mine neutralization technologies to identify promising approaches for maturing spot (rather than area) neutralization, providing enhanced survivability while reducing size, weight and logistics burdens.

• 965 - Investigated, modeled and applied nonlinear acoustic techniques for phenomenology assessment of imaging surface and buried anti-tank/anti-personnel land mines.

• 2401 - Investigated, modeled and applied acoustic/seismic energy for detection and discrimination of anti-tank/anti-personnel landmines from downward and forward-looking sensor modalities.

• 1921 - Assessed forward looking radar technologies for detection and discrimination of anti-tank landmines at distances of greater than 10 meters on routes.

Total 14907

FY 2002 Planned Program

• 7223 - Investigate and evaluate electronically scanned ground penetrating-synthetic aperture radar (GP-SAR) and forward looking acoustic sensors for phenomenology assessment of mine detection data collection systems.
- Investigate and evaluate algorithms and sensor/data for the GP-SAR, infrared, and acoustic sensors for fusion processing to reduce false alarms while increasing the probability of detection.
- Conduct field experiments using forward looking mine detection data collection systems to evaluate target type, environment, and operational speed to enhance rate-of-advance and survivability of the Objective Force.
- Modify, evaluate and validate modeling of forward looking mine detection sensors.
- Investigate candidate standoff neutralization technologies for precision neutralization of surface and buried mines.

• 508 - Continue to enhance mine signature simulations and update database of mine signatures.- Establish methodology for evaluation of detection algorithms in support of landmine detection of JUXOCO.
- Establish methodology for evaluation of detection algorithms in support of landmine detection of JUXOCO.

• 2306 - Apply and investigate sensor technologies for trip wire, off-route, and side-attack mine detection.

FY 2002 Planned Program (Continued)

- Investigate nonlinear and imaging acoustics for anti-tank and anti-personnel mine detection for ground vehicles and robotic platforms.

• 4000 - Investigate and assess sensor technologies and collect sensor data for signal processing/clutter rejection to support trip wire, off-route, and side attack wide area minefield detection and surveillance from airborne platforms.

- Candidate sensor technologies include multi-spectral long wave infrared fused with short wave infrared laser polarization, hyper-spectral infrared, and ultra-wideband GP-SAR.

• 2000 - This one year Congressional add researches linear/non-linear acoustic sensor technologies for detection of anti-personnel/anti-tank landmines. No additional funding is required to complete this project.

• 1400 - This one year Congressional add researches neutralization and robotic technologies for detection of anti-personnel/anti-tank landmines. No additional funding is required to complete this project.

• 2000 - This one year Congressional add researches forward looking ground penetrating radar sensor technologies for detection of anti-personnel/anti-tank landmines. No additional funding is required to complete this project.

• 1000 - This one year Congressional add researches non-linear, downward looking/close-in sensor technologies for detection of anti-personnel/anti-tank landmines. No additional funding is required to complete this project.

Total 20437

FY 2003 Planned Program

• 7791 - Refine algorithms and sensor fusion assessments of forward looking mine detection data collection systems in field experiments to support the Objective Force.

- Conduct and evaluate field experiments using forward looking mine detection data collection systems to establish metrics for probability of detection, false alarm rates and rates of advance as a function of target type, environment, and operational speed.

- Modify, evaluate and validate modeling of forward looking mine detection sensors.

- Conduct field testing of standoff neutralization technologies for assessment of probability of kill and location accuracy of land mines located by forward looking detection sensors.

- Transition forward looking mine detection and neutralization technologies to advanced development to demonstrate enhanced capability for the Objective Force.

FY 2003 Planned Program (Continued)

- 515 - Continue to enhance mine signature simulations, update database of mine signatures, and establish methodology for evaluation of detection algorithms in support of land mine detection.
- 2306 - Conduct and assess sensor, algorithms, and automatic target ATR technologies in field environments of trip wire, off-route, and side-attack mine detection.

Total 10612

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

COST (In Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate
H35 CAMOUFLAGE TECHNOLOGY	2321	2452	2574	2722	2846	2944	3002

A. Mission Description and Budget Item Justification: This project researches and investigates advanced signature management and deception technologies for masking friendly force capabilities and intentions, thereby increasing Objective Force unit survivability. Specific research areas include (1) advanced materials and processes for countering visual and infrared sensors, (2) simulation of key radar and communications signatures using electronic deception modules, (3) advanced modeling and simulation of proposed signature management and deception technologies, and (4) advanced materials, coatings, patterns and appliqués for suppressing electro-optical signatures of combat units. This program supports the Objective Force transition path of the TCP.

FY 2001 Accomplishments:

• 2321 - Matured three-dimensional image projection techniques in the laboratory to improve deception capabilities for combat units.

- Evaluated effectiveness of signature management and deception system design alternatives through modeling and simulation in laboratory experiments and force-on-force simulations.
- Evaluated effectiveness of improved signature management coatings, materials and patterns in visual and thermal bands through lab and field testing.
- Investigated signature management materials having improved spectral performance against advanced threat multi-spectral sensors.
- Evaluated requirements and technologies for communications deception systems to defeat threat electronic intelligence collection assets.

Total 2321

FY 2002 Planned Program

• 2452 - Incorporate improved visual, thermal and spectral coatings and materials into signature management components for field experiments.

- Evaluate performance of signature management and deception suites for the high value assets using predictive modeling and force-on-force simulations.

- Investigate techniques that combine physical decoys with signature management technologies to improve survivability of combat and combat support units.

Total 2452

FY 2003 Planned Program

• 2574 - Investigate technologies to reduce logistics and deployment burdens associated with camouflage and deception systems for use by the Objective Force.

- Investigate adaptable materials to extend performance envelopes of signature management treatments and improve effectiveness in multiple backgrounds.

- Investigate advanced deception technologies that replicate key multi-spectral signatures of high value assets and enable replacement of physical decoys with rapidly deployable low-weight and volume devices.

Total 2574