Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Army											DATE: April 2013	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*					R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*							
COST ($ in Millions)	**All Prior Years**	**FY 2012**	**FY 2013#**	**FY 2014 Base**	**FY 2014 OCO ##**	**FY 2014 Total**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**	**Cost To Complete**	**Total Cost**
Total Program Element	-	32.226	18.850	20.574	-	20.574	21.542	25.247	26.659	27.011	Continuing	Continuing
H24: *Countermine Tech*	-	16.893	15.834	17.508	-	17.508	18.431	21.585	22.944	23.238	Continuing	Continuing
H35: *Camouflage & Counter-Recon Tech*	-	2.853	3.016	3.066	-	3.066	3.111	3.662	3.715	3.773	Continuing	Continuing
HB2: *COUNTERMINE COMPONENT TECHNOLOGY (CA)*	-	12.480	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

This program element (PE) investigates, designs, and evaluates technologies to improve countermine, signature management and counter-sensors capabilities. The focus is on sensor components, sub-components and software algorithms to improve detection of mines, explosive threats and directed energy; ballistic methods to defeat mines and explosive threats; and signature management technologies to reduce reconnaissance capabilities of the enemies. This PE also supports DoD's Center of Excellence for Unexploded Ordnance which coordinates and standardizes land mine signature models; maintains a catalogue of mine signatures; supports the evaluation of mine detection sensors and algorithms; and working in conjunction with the US Army Engineering, Research and Development Center (ERDC), examines countermine phenomenology of surface and buried mines, and explosive threats. Project H24 advances state of the art Countermine technologies to accurately detect threats with a high probability, reduce false alarms, and enable an increased operational tempo. Project H35 evaluates and develops advanced signature management and deception techniques for masking friendly force capabilities and intentions.

Work in this PE is related to and fully coordinated with PE 0602120A (Sensors and Electronic Survivability), PE 0602622A (Chemical, Smoke and Equipment Defeating Technology), PE 0602624A (Weapons and Munitions Technology), PE 0602709A (Night Vision Technology), PE 0602784A (Military Engineering Technology), PE 0603004A (Weapons and Munitions Advanced Technology), PE 0603606A (Landmine Warfare and Barrier Advanced Technology), PE 0603710A (Night Vision Advanced Technology).

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

Work in this PE is performed by the Army Research, Development and Engineering Command (RDECOM), Communications-Electronics Research, Development and Engineering Center (CERDEC), Fort Belvoir, VA.

Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Army					DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*		R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*			
B. Program Change Summary ($ in Millions)	**FY 2012**	**FY 2013**	**FY 2014 Base**	**FY 2014 OCO**	**FY 2014 Total**
Previous President's Budget	32.728	18.850	20.574	-	20.574
Current President's Budget	32.226	18.850	20.574	-	20.574
Total Adjustments	-0.502	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.502	-			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT H24: *Countermine Tech*	

COST ($ in Millions)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
H24: *Countermine Tech*	-	16.893	15.834	17.508	-	17.508	18.431	21.585	22.944	23.238	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

This project investigates, designs and evaluates new countermine components, sub-components and software algorithms for detection, discrimination and neutralization of individual mines, minefields and other explosive threats. The goal of this project is to accurately detect threats with a high probability, reduce false alarms and enable an increased operational tempo.

This project supports Army science and technology efforts in the Ground, Command, Control, Communications and Intelligence, Air and Soldier portfolios. Work in this Project is related to and fully coordinated with PE 0602120A (Sensors and Electronic Survivability), PE 0602622A (Chemical, Smoke and Equipment Defeating Technology), PE 0602624A (Weapons and Munitions Technology), PE 0602709A (Night Vision Technology), PE 0602784A (Military Engineering Technology), PE 0603004A (Weapons and Munitions Advanced Technology), PE 0603606A (Landmine Warfare and Barrier Advanced Technology), PE 0603710A (Night Vision Advanced Technology).

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

Work in this project is performed by the Army Research, Development and Engineering Command (RDECOM)/Communications-Electronics Research, Development and Engineering Center (CERDEC), Fort Belvoir, VA.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Title: Department of Defense Unexploded Ordnance (UXO) Center of Excellence (UXOCOE)	0.480	0.487	0.453
Description: The Army serves as executive agent of the Unexploded Ordnance (UXO) Center of Excellence (COE), which provides for the coordination of UXO across the Department of Defense (DoD) Army, Navy, Air Force and Marine Corps programs. The UXOCOE serves as the focal point for research, development, testing and evaluation (RDT&E) for UXO detection, clearance technologies, remediation and sensor/signature/DOD program database development. Technologies investigated for mitigating UXO are oriented to land and underwater approaches.			
FY 2012 Accomplishments: Researched and evaluated the UXO RDT&E detection and clearance information and coordinated across the DoD.			
FY 2013 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT H24: *Countermine Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Investigate various UXO detection sensors, perform field data collections against UXO surrogates and real targets in realistic background environments and update signature database. ***FY 2014 Plans:*** Will research a high power laser neutralization source that enables safe standoff removal of wire obstacles while on the move.			
Title: Standoff Mine/Defeat Neutralization Technology ***Description:*** This effort investigates and evaluates the ability to pre-detonate and neutralize mines, improvised explosive devices (IEDs) and emerging explosive threats at tactically relevant standoff ranges with munition and laser-based technologies. Starting in FY12, technical efforts will focus on enabling controllable neutralization effects, primarily with lasers. With the technology transition of the munition-based technology for continued 6.3 developments, funding levels are reduced and commensurate with pursuing laser-based approaches. Achieving low/high order neutralization, including deflagration, effects will be the principal objective of the effort. ***FY 2012 Accomplishments:*** Investigated and integrated diode based laser pump technology into a neutralization brassboard; evaluated the power and energy output with regards to requirements to defeat mine and threat explosives.	3.466	0.000	0.000
Title: Standoff Explosive Compound Detection Technology ***Description:*** This effort investigates ground based detection and confirmation technologies of explosives compounds from tactically relevant standoff distances. The effort is complimentary to the work being accomplished under PE 0602622A/project 552. ***FY 2012 Accomplishments:*** Conducted data collection of domestic and foreign explosive compounds in order to populate and categorize signatures and utilize the data in conjunction with algorithm development; researched potential to increase detection sensitivity with newly designed algorithms versus the sensitivity of current technology; investigated explosive detection sensors that have potential to reduce false alarms in high clutter areas.	3.635	0.000	0.000
Title: Advanced Electro-Magnetic (EM) and Electro Optic (EO) Sensors for Detection of Emerging Threat Devices ***Description:*** This effort investigates all-terrain standoff detection using novel detection sensor and detection algorithm approaches in order to locate mine and other emerging explosive hazard threat devices with minimal false alarms. This effort also investigates detection of emerging explosive hazards at deeper burial depths (up to 1.5 meters deep). ***FY 2012 Accomplishments:***	4.601	7.695	7.568

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT H24: *Countermine Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Designed and developed a brassboard with data collection capabilities incorporating EM , Electromagnetic Interference (EMI) and EO advancements; evaluated EO sensing and EM detection concepts for detection of emerging threats; integrated and combined emerging Defense Advanced Research Projects Agency standoff vibration detection technology with the EM, EMI and EO based sensors and with a downward looking active EO laser and/or Laser Detection and Ranging (for ground surface profiling) technology. ***FY 2013 Plans:*** Design and fabricate a multi-band ground penetrating radar (GPR) demonstrator integrating both downward looking and forward projecting antennas; begin field data collections and evaluations using GPR demonstrator and based on the results, refine hardware and improve software target recognition algorithms to improve probability of detection and lower false alarm rates. Investigate phenomenological standoff vibration technology in combination with the EM, EMI and EO based sensors for detection of shallow and more deeply buried explosive hazards; improve software to automatically adapt to available sensor inputs in real time. ***FY 2014 Plans:*** Will validate designs of component antenna arrays and conduct experiments for a multi-band forward looking GPR demonstrator; investigate EO forward projecting laser radar (LADAR) to assist forward looking radar; develop advanced detection algorithms utilizing high resolution surface terrain information obtained from the integration of LADAR; conduct field data collections of standoff vibration technology in combination with the EM, EMI and EO based sensor for detection of shallow and more deeply buried explosive hazards; enhance visualization workstation software to incorporate available sensor inputs in real time.			
Title: Detection of Home Made Explosive (HME) Production Facilities and Threats ***Description:*** This effort investigates emerging chemically-specific explosive hazards (to include Home Made Explosives (HMEs)) and detection technologies to address Warfighter needs. The effort will provide technologies for standoff detection and confirmation of emerging threats and production facilities and is complimentary to the work being accomplished under PE 0602622A/project 552. ***FY 2012 Accomplishments:*** Investigated short wave infrared and long wave infrared hyperspectral imaging techniques for detecting homemade explosive threats; determined and analyzed concentrations of HME required for reliable detection in different air and ground scenarios (e.g., production and drying facilities, spill sights, residue on vehicles and other objects); researched algorithm techniques for separation of HME signatures from background clutter leading to algorithms for automated HME detection. ***FY 2013 Plans:*** Investigate and validate emerging technologies capable of detecting explosive related threats including HME production facilities; conduct technical experiments in technologies for HME detection to include Ultraviolet (UV) laser-based Raman spectroscopy	4.711	4.907	6.000

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT H24: *Countermine Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
to exploit conventional and HME signatures in complex backgrounds and polymer-based sensors to exploit residues and vapors at ultra trace amounts; investigate and validate point confirmation technologies that exploit conventional and HME residues and vapors at ultra-trace amounts for classification and identification purposes. ***FY 2014 Plans:*** Will investigate and validate standoff spectroscopic technologies capable of detecting explosive hazards and HME production facilities; conduct technical experiments using eye safe, low-SWaP, Quantum Cascade Laser (QCL) technology to effectively sample the residues for trace amounts of explosives for identification and standoff illumination for disturbed earth detection.			
Title: Short Range Man Portable Explosive Hazard Detector Technology ***Description:*** This effort investigates emerging technologies enabling the dismounted Soldier to detect explosive hazards in addition to landmine threats, explosive hazards include: IEDs, HMEs, explosively formed penetrators (EFPs) and antitank/ antipersonnel landmines (metal and non-metallic). Emphasis will be on rate-of-advance, high detection probability and low false alarm rates. SWaP issues will be considered and studied to ensure solutions are viable for Soldier-portable applications. ***FY 2013 Plans:*** Investigate emerging electromagnetically-based sensor technology and novel helmet-mounted electro-optical sensors; explore front-end physical and explosive materials sampling approaches oriented towards enhancing short-range standoff explosive hazard detection technologies as a component of a conceptual plug-and-play sensor suite for dismounted operations; leverage emerging technologies such as advanced ground penetrating radar antennas, hyperspectral imaging electro-optics, target polarization detection, compact metal detection with target identification, sensor position measurement techniques, explosives sensing materials and virtual display concepts in combination as part of a portable handheld sensor suite for detection of a broad spectrum of explosive hazards. ***FY 2014 Plans:*** Will optimize and validate emerging technologies such as advanced ground penetrating radar antennas; compact metal detectors with target identification; position measurement sensors and see-thru displays as part of a portable handheld sensor suite for detection of explosive hazards.	0.000	2.745	3.487
Accomplishments/Planned Programs Subtotals	16.893	15.834	17.508

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT H24: *Countermine Tech*

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT H35: *Camouflage & Counter-Recon Tech*	

COST ($ in Millions)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
H35: *Camouflage & Counter-Recon Tech*	-	2.853	3.016	3.066	-	3.066	3.111	3.662	3.715	3.773	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

This project investigates, designs and evaluates advanced signature management and deception techniques for masking friendly force capabilities and intentions.Technologies pursued under this effort reduce the cross section of sensor systems. Technologies such as decentered field lens, wavefront coding and spectral filtering and threat sensing algorithms are investigated along with next generation camouflage coatings and paints.

This project supports Army science and technology efforts in the Command, Control, Communications and Intelligence and Ground portfolios.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

Work in this project is performed by the Army Research, Development and Engineering Command (RDECOM)/Communications-Electronics Research, Development and Engineering Center (CERDEC), Fort Belvoir, VA.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Title: Camouflage and Counter-Reconnaissance Technology for Advanced Spectral Sensors:	2.853	3.016	3.066
Description: This effort investigates and advances new techniques to reduce electro-optical susceptibility of sensors and camouflage. The two primary objectives are (1) to reduce the optical cross section of currently fielded and emerging electro-optical and infrared (EOIR) sensors and (2) investigate technologies that will enable enhanced spectral signature reduction for next generation camouflage.			
FY 2012 Accomplishments: Continued investigation of the susceptibility of foreign and friendly systems to hyperspectral detection methods; conducted experiments and evaluated multiple technologies to ensure signature reduction was achieved and incorporated results into sensor models for advanced characterization; collaborated with industry to develop near-term improvements to camouflage paints, coatings and systems in both the visible and other wavelength regions.			
FY 2013 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT H35: *Camouflage & Counter-Recon Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Leverage previous funded efforts to design new approaches to reduce the optical cross section of emerging staring sensors including large format arrays in the visible, near infrared (IR), shortwave IR, thermal and uncooled longwave IR; conduct thermal signature studies for future development of IR signature reduction techniques, approaches include modified optics, computational imaging, polarization control and antireflection coatings. Investigate two sided camouflage netting for the Ultra Lightweight Camouflage and Netting System program; perform laboratory and field evaluations from FY12 developed prototypes and develop specifications for the next generation Army netting. ***FY 2014 Plans:*** Will continue development of solutions to reduce optical cross section of large format electro-optical (EO) and infrared (IR) arrays; develop and investigate hardware/software, filters and coatings for currently fielded large format EO and uncooled IR sensors; camouflage effort will focus on implementation of thermal signature reduction coatings and methodologies suitable for nets and uniforms.			
Accomplishments/Planned Programs Subtotals	2.853	3.016	3.066

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT HB2: *COUNTERMINE COMPONENT TECHNOLOGY (CA)*	

COST ($ in Millions)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
HB2: *COUNTERMINE COMPONENT TECHNOLOGY (CA)*	-	12.480	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Countermine Systems applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Title: Unexploded Ordinance and Landmine Detection Research	12.480	0.000	0.000
Description: This is a Congressional Interest Item. This effort investigated advanced sensor and component technologies for vehicular mounted explosive hazard detection, using fast response standoff sensors to increase rates of advance. Sensors exploited disturbed earth and explosive specific signatures while on-the-move. This effort also investigated advanced technologies that enable low size, weight, and power sensors for Soldier portable, handheld, and dismounted explosive hazard detection for current and future unexploded ordnance (UXO) threats incorporating position sensing, augmented displays, wire detection, and advanced explosive specific sensors. ***FY 2012 Accomplishments:*** Congressional add funding for Unexploded Ordinance and Landmine Detection Research. Investigated incorporation of wire detection and sensor positioning information in support of Short Range Man Portable Explosive Hazard Detector Technology through in-house laboratory work; conducted in-house investigation of comprehensive display technology for helmet mounted display for Short Range Man Portable Explosive Hazard Detector Technology; researched video rate 2D Hyperspectral Imager for extended SWIR band for homemade explosive (HME) and UXO detection at standoff distances; designed novel optical technology and delivered a video rate 2D Hyperspectral Imager for high resolution LWIR band for HME/ UXO false alarm reduction at standoff distances; provided test site support and facility development for the University of Rhode Island for investigation of standoff explosive sensors at long ranges; investigated Quantum Cascade Laser (QCL) technologies as potential sources to reduce SWaP and false alarms in LWIR band of spectrum.			
Accomplishments/Planned Programs Subtotals	12.480	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT HB2: *COUNTERMINE COMPONENT TECHNOLOGY (CA)*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.