Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Army											Date: February 2018	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602712A / *Countermine Systems*							
COST ($ in Millions)	**Prior Years**	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
Total Program Element	-	29.495	26.190	21.244	-	21.244	22.914	23.366	23.895	24.326	0.000	171.430
H24: *Countermine Tech*	-	20.038	20.453	15.248	-	15.248	16.126	16.484	16.823	17.112	0.000	122.284
H35: *Camouflage & Counter-Recon Tech*	-	5.457	5.737	5.996	-	5.996	6.788	6.882	7.072	7.214	0.000	45.146
HB2: *COUNTERMINE COMPONENT TECHNOLOGY (CA)*	-	4.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.000

A. Mission Description and Budget Item Justification

This Program Element (PE) investigates, designs, and develops technologies to improve counter explosive hazard detection, signature management, and counter-sensor capabilities. Focus areas are sensor components, sub-components, and software algorithms to improve detection of mines and explosive threats; novel methods to defeat mines and explosive threats; and signature management technologies to reduce the reconnaissance capabilities of enemy forces. The technologies being investigated are for both mounted and dismounted applications. Project H24 investigates state of the art counter explosive hazard technologies to accurately detect and neutralize threats with a high probability, reduce false alarms, and enable an increased operational tempo. Project H35 designs and develops advanced sensor protection, signature management, and deception techniques for masking friendly force capabilities and intentions. Project HB2 funds Congressional special interest items.

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), and 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 United States (U.S.) Army Research, Development and Engineering Command (RDECOM).

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Army	Date: February 2018
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602712A *I Countermine Systems*

B. Program Change Summary ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	26.497	26.190	25.111	-	25.111
Current President's Budget	29.495	26.190	21.244	-	21.244
Total Adjustments	2.998	0.000	-3.867	-	-3.867
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	4.000	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.989	-			
• Adjustments to Budget Years	-	-	-3.867	-	-3.867
• FFRDC	-0.013	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2017	FY 2018
Project: HB2: *COUNTERMINE COMPONENT TECHNOLOGY (CA)*		
Congressional Add: *Program Increase*	4.000	-
Congressional Add Subtotals for Project: HB2	4.000	-
Congressional Add Totals for all Projects	4.000	-

Change Summary Explanation

Reduce countermine technology research in H24 and camouflage technologies in H35 to fund higher Army priorities in communications and networks.

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602712A / *Countermine Systems*	Project (Number/Name) H24 / *Countermine Tech*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
H24: *Countermine Tech*	-	20.038	20.453	15.248	-	15.248	16.126	16.484	16.823	17.112	0.000	122.284

A. Mission Description and Budget Item Justification

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

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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Title: Standoff Sensors for Explosive Hazard Detection	10.116	11.155	11.126
Description: This effort addresses the challenges of sensing and confirming potential in-road and roadside threats at standoff ranges. The effort focuses on understanding the phenomenologies that impact sensor design concepts and steer novel technologies that provide the primary means for detecting anomalies. The result is higher-confidence target detection and improved clutter/background filtering. Examples of candidate technologies include Forward Looking (FL) Electro-Optic/Infrared (EO/IR) and Ground Penetrating Radar (GPR) sensors, which are used to detect surface threats. ***FY 2018 Plans:*** Explore and develop novel sensing methods using multiple geometric configurations to enhance FL sensor modalities, including multi-look GPR, Long-wave Infrared (LWIR) and Visible; mature processing techniques by combining datasets from multiple sensor technologies in order to improve probability of detecting threats in complex environments; investigate new sensors for confirmation of threats for modular platforms; validate techniques to detect wires from standoff distances. ***FY 2019 Plans:*** Will design and validate novel sensors and processing approaches using advances in correlated FL and multistate GPR, vibration, and EO/IR sensors; will combine fused signal processing methods to better detect targets in the presence of clutter in the natural environment; will develop new processing techniques to improve detection capability of complementary sensors in varying environments; will investigate modular sensor components including unique radars, EO/IR sensors, wire detection techniques, and sensitive radio frequency technologies to remotely detect explosive hazards and indicators of emplacement such as command wires and initiation devices for application to small unmanned air and ground platforms. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Minor funding decrease due to personnel adjustments			
Title: Dismounted Explosive Hazard Detection Technology	7.218	6.508	-

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602712A / *Countermine Systems*	**Project (Number/Name)** H24 / *Countermine Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Description: This effort investigates emerging component technologies to enhance detection of explosive hazards, including metallic and non-metallic landmines, Improvised Explosive Devices (IEDs), Home Made Explosives (HMEs), and Explosively Formed Penetrators (EFPs). Emphasis is on increased coverage area, higher detection rates, and increased discrimination probabilities. Technologies that provide low Size, Weight, and Power (SWaP) solutions are considered and studied to ensure solutions are viable for Soldier-portable applications. This effort also investigates advanced signal processing and detection algorithms for increased real-time feedback for threat detection and identification, and it collects data to inform studies investigating methods to reduce the operator's cognitive burden. ***FY 2018 Plans:*** Finalize combinations of novel components and sensors to support real-time detection and identification of buried explosive hazard threats in relevant outdoor environments; conduct experiments to confirm component designs and mature signal processing techniques; mature visualization components to enhance clutter rejection and improve operator interfaces; conduct limited user assessment of integrated breadboard design. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** This effort is ending in FY18			
Title: Counter Explosive Hazard Phenomonology ***Description:*** This effort investigates potential long term solutions to nonconventional explosive hazard threats. It leverages recent lessons learned to investigate new ideas and emerging counter explosive hazard (CEH) technologies by gaining a better understanding of how to detect, neutralize, and mitigate the threat. The effort includes a series of innovative exploration and discovery events focused on the identification of new ideas and concepts in a structured and organized framework, enabling the Army to identify/investigate opportunities to leverage technologies traditionally associated with other arenas, such as the intelligence community, big data, and the financial industry. ***FY 2018 Plans:*** Evaluate and validate nonconventional CEH technologies for buried or concealed explosive hazard detection, such as novel neutron sources and gamma detectors for identification of buried explosive, and radio frequency (RF) atomic magnetometers for discrimination of buried man-made objects; continue the ongoing series of innovative investigation and informational events with industry and academia to collect information on previously unexplored phenomenologies. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** This effort was ended in FY18 to move funds to higher priority efforts.	2.704	2.790	-
Title: Neutralization and Breaching Technology	-	-	4.122

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602712A / *Countermine Systems*	**Project (Number/Name)** H24 / *Countermine Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Description: This effort addresses the challenges of selectively neutralizing individual explosive hazards at standoff ranges as well as the challenges of scaling up such capabilities to neutralize multiple explosive hazards for effective complex obstacle breaches. This effort focuses on validation of techniques to confirm the location of buried threats and on the design and development of technology components to defeat the confirmed target. The result is matured components to facilitate follow-on efforts to develop an integrated explosive hazard neutralization and breaching capability. Examples of candidate technologies for neutralization include high energy devices (lasers and radio frequency) and explosives. ***FY 2019 Plans:*** Will investigate standoff confirmation sensor techniques to determine discrimination thresholds and to set parameters for the design of neutralization techniques; will investigate laser, radio frequency, and microwave sources to determine maturity; determine options for use of explosive techniques. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** This is a new start in FY19			
Accomplishments/Planned Programs Subtotals	20.038	20.453	15.248

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army										Date: February 2018		
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602712A / *Countermine Systems*				Project (Number/Name) H35 / *Camouflage & Counter-Recon Tech*			
COST ($ in Millions)	**Prior Years**	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
H35: *Camouflage & Counter-Recon Tech*	-	5.457	5.737	5.996	-	5.996	6.788	6.882	7.072	7.214	0.000	45.146

A. Mission Description and Budget Item Justification

This Project investigates, designs, and develops techniques for masking friendly force capabilities and intentions. The Project pursues technologies to reduce the susceptibility of sensor systems to detection and targeting by threat forces, as well as to inform the development of next generation camouflage coatings and paints. Novel technologies are investigated, such as novel optics designs combined with signal processing, spectral filtering, and threat sensing algorithms.

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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Title: Camouflage and Counter-Reconnaissance Technology for Advanced Spectral Sensors	5.457	5.737	5.996
Description: This effort investigates and advances new techniques to reduce susceptibility of sensors to detection by lasers, Electro-Optic (EO) sensor systems, and Infrared (IR) sensor systems. This effort also researches signature reduction approaches for camouflage nets. ***FY 2018 Plans:*** Validate through experimentation optical cross section reduction methods for day television (TV) sensors; continue to investigate sensor vulnerabilities to future laser threats; research new materials, devices, and strategies to counter these threats; develop sensor protection technologies that can be applied to new day TV sensors employed on multiple platforms. Define signature reduction characteristics for urban and artic camouflage solutions for both vehicles and dismounts. ***FY 2019 Plans:*** Will investigate new protective coatings for dual band IR systems that have high out of band rejection, very high in-band transmission, and laser durability while still meeting camera window environmental performance requirements; will continue to support signature characteristics testing for urban and arctic camouflage solutions for both vehicles and dismounted Soldiers. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Increase in FY19 funds due to inflation.			
Accomplishments/Planned Programs Subtotals	5.457	5.737	5.996

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602712A / *Countermine Systems*	**Project (Number/Name)** H35 / *Camouflage & Counter-Recon Tech*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602712A / *Countermine Systems*	Project (Number/Name) HB2 / *COUNTERMINE COMPONENT TECHNOLOGY (CA)*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
HB2: *COUNTERMINE COMPONENT TECHNOLOGY (CA)*	-	4.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.000

Note

Congressional increase for Program increase

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Countermine Systems applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018
Congressional Add: Program Increase	4.000	-
FY 2017 Accomplishments: N/A		
Congressional Adds Subtotals	4.000	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A