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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 5: System Development & Demonstration (SDD)					R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	26.188	43.064	39.208	-	39.208	166.902	159.442	170.596	100.426	Continuing	Continuing
016: Close Combat Capabilities ENG DEV	-	8.387	9.860	21.298	-	21.298	11.127	1.397	2.096	2.400	0.000	56.565
415: Mine Neutral/Detection	-	12.537	33.204	17.910	-	17.910	0.727	0.645	5.000	4.630	0.000	74.653
434: Anti-Personnel Landmine Alternatives (NSD)	-	5.264	0.000	0.000	-	0.000	155.048	157.400	163.500	93.396	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program Element (PE) provides for the Engineering and Manufacturing Development (EMD) and demonstration of networked munitions, counter mine systems, Explosive Ordnance Disposal (EOD) render safe, and counter improvised explosive device capabilities. This PE also implements the National Landmine Policy to develop alternatives to the non-self-destructing counter mobility anti-personnel landmine systems. The PE contributes to area access and area denial (A2/AD) to support unified land operations and improve soldier survivability.

Project 016, Close Combat Capabilities, covers three programs: Dismounted Lane Breaching System (DLBS); Next Generation Advanced Bomb Suit (NGABS); and Explosive Ordnance Disposal Render Safe (EOD RS). It provides for the Engineering and Manufacturing Development (EMD) and demonstration of capabilities needed for Explosive Ordnance Disposal (EOD) teams to render safe (RS) US and foreign ordnance and improvised explosive devices, enabling ground force commanders to retain freedom of maneuver and secure lines of communications, as well as the Next Generation Advanced Bomb Suit (NGABS). EOD RS equips EOD teams with low light visual augmentation system, electronic countermeasures, buried IED detection, dismounted X-ray imager, X-ray generator, trace explosive, Chemical, Biological, Radiological, and Nuclear (CBRN), and drug detection, unmanned aerial system, power management, gamma and neutron search and detection, and render safe initiation. NGABS mission is to enhance the tactical utility and applicability of this bomb suit concept by incorporating modularity/scalability and sensor technologies. NGABS will increase the Warfighter lethality and mobility by optimizing Soldier protection for EOD personnel, while effectively managing all life cycle aspects of Personal Protective Equipment (PPE). The NGABS will benefit the U.S. industrial base through the NGABS integrated Heads-Up Display (HUD) development which requires extensive collaboration across Protective Equipment and Sensor program offices, industry participants, Military Services and Governmental Agencies. In FY 2018, this project also included improvements to legacy dismounted lane breaching, specifically the Anti-Personnel Obstacle Breaching System (APOBS), and in so doing, provided a pathway to the next generation of dismounted lane breaching systems such as the Rapid Assault Lane Line Charge (RALLC) and the Dismounted Explosive Breaching System (DEBS). The efforts addressed capability gaps identified during combat operations and focused on weight reduction, improved scalability, collateral damage reduction, metallic content elimination, deployment accuracy improvement, and increased effectiveness against the current threat.

Project 415, Mine Neutralization/Detection provides for development of next generation standoff, detection, and neutralization capability programs such as Husky Mounted Detection System (HMDS), Route Clearance & Interrogation System (RCIS), Vehicle Optics Sensor System (VOSS), Standoff Robotic Explosive Hazard Detection System (SREHD), formerly known as the Autonomous Mine Detection System (AMDS), Route Clearance Vehicles (RCV) and Enablers, Multi-Function Video Display (MVD) and Add on Armor (AoA) kits. It also supports development of Explosive Hazard Pre-Detonation (EHP) capability to neutralize/detonate a broad

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spectrum of improvised explosive hazards while on the move to support area access route clearance missions. Provides funding to the Tank Automotive Research Development Engineering Center (TARDEC) Software Engineering Center (SEC) to integrate enhancements and test Explosive Hazard Pre-Detonation (EHP) software releases incorporating support for MVD.						
For RCIS Type I, FY 2020 funding supports engineering, logistics development, Full Up System Level prototype delivery and ATEC testing, including the digitized, drive by wire HMEE with the Semi-Autonomous Control (SAC) kit..						
Project 434, Spider Increment 1A will build upon the existing M7 Spider system. The M7 Spider system is a hand-emplaced, remotely controlled (Man-In-The-Loop) system that provides highly responsive terrain-shaping and protection capabilities. M7 Spider replaces persistent anti-personnel landmines, is compliant with US National Landmine policy, and has been fielded to US forces in support of Operation Enduring Freedom and currently being fielded to Engineers and Brigade Combat Teams in the Active and Army National Guard components. Additional capabilities will be developed to enhance the Spider Remote Control Station and demonstrate the ability to employ legacy Government-Off-The-Shelf (GOTS) lethal and non-lethal anti-personnel (AP) munitions and counter mobility obstacles. Spider Increment 1A will utilize an open system architecture to facilitate future munition integration. FY 2020 funding resources the initiation of the Standoff Activated Volcano Obstacle (SAVO) program, which provide an interim Anti-Vehicle (AV) capability to address the Army's directed close tactical obstacle capability gap. SAVO supports a U.S. Army Europe (USAREUR) Operational Needs Statement (ONS) as well as a revision to the Multiple Delivery Mine System (Volcano) Joint Service Operational Requirement (JSOR). This capability will allow for the formation of pre-emplaced directed obstacles that can be initiated remotely via fielded wired or wireless initiation systems. If the emplaced obstacle is not initiated, SAVO can be recovered for future re-deployment. SAVO consists of a newly developed base from which the existing stock of National Landmine Policy compliant munitions (M87A1 Volcano canisters) can be launched. SAVO can be initiated through an interface with three fielded systems; the M7 Spider Networked Munition System, the MK152/M156 Remote Activation Munition Systems (RAMS), or the CD450-4J Blasting Machine. This Program Element (PE) proves for the engineering development of Terrain Shaping Obstacles. This PE develops alternatives to the Family of Scatterable Mines systems.						
B. Program Change Summary (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget		34.684	50.817	49.099	-	49.099
Current President's Budget		26.188	43.064	39.208	-	39.208
Total Adjustments		-8.496	-7.753	-9.891	-	-9.891
• Congressional General Reductions		-0.021	-0.053			
• Congressional Directed Reductions		-8.800	-7.700			
• Congressional Rescissions		-	-			
• Congressional Adds		-	-			
• Congressional Directed Transfers		-	-			
• Reprogrammings		1.326	-			
• SBIR/STTR Transfer		-1.001	-			
• Adjustments to Budget Years		-	-	-9.891	-	-9.891

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<u>Change Summary Explanation</u> FY 2020 decrease of \$9.891 million is attributed to an increase in Project 016, Close Combat Capabilities and the addition of the Explosive Ordnance Disposal (EOD) Render Safe (RS) development, and a decrease in Project 434.		

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Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev				Project (Number/Name) 016 / Close Combat Capabilities ENG DEV			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
016: Close Combat Capabilities ENG DEV	-	8.387	9.860	21.298	-	21.298	11.127	1.397	2.096	2.400	0.000	56.565
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 016, Close Combat Capabilities, covers three programs: Dismounted Lane Breaching System (DLBS); Next Generation Advanced Bomb Suit (NGABS); and Explosive Ordnance Disposal Render Safe (EOD RS). It provides for the Engineering and Manufacturing Development (EMD) and demonstration of capabilities needed for Explosive Ordnance Disposal (EOD) teams to render safe (RS) US and foreign ordnance and improvised explosive devices, enabling ground force commanders to retain freedom of maneuver and secure lines of communications, as well as the Next Generation Advanced Bomb Suit (NGABS). EOD RS equips EOD teams with low light visual augmentation system, electronic countermeasures, buried IED detection, dismounted X-ray imager, X-ray generator, trace explosive, Chemical, Biological, Radiological, and Nuclear (CBRN), and drug detection, unmanned aerial system, power management, gamma and neutron search and detection, and render safe initiation. NGABS mission is to enhance the tactical utility and applicability of this bomb suit concept by incorporating modularity/scalability and sensor technologies. NGABS will increase the Warfighter lethality and mobility by optimizing Soldier protection for EOD personnel, while effectively managing all life cycle aspects of Personal Protective Equipment (PPE).

In FY 2018, this project also included improvements to legacy dismounted lane breaching, specifically the Anti-Personnel Obstacle Breaching System (APOBS), and in so doing, provided a pathway to the next generation of dismounted lane breaching systems such as the Rapid Assault Lane Line Charge (RALLC) and the Dismounted Explosive Breaching System (DEBS). The efforts addressed capability gaps identified during combat operations and focused on weight reduction, improved scalability, collateral damage reduction, metallic content elimination, deployment accuracy improvement, and increased effectiveness against the current threat.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Dismounted Lane Breaching System	0.100	-	-	-	-
Description: Develops materiel solutions that address operational issues with APOBS related to its weight, lack of scalability, collateral damage, residual metallic debris, deployment accuracy, and effectiveness.					
Title: Next Generation Advanced Bomb Suit (NGABS)	8.287	9.434	13.766	-	13.766
Description: Funding line is new to Project Manager Soldier Protection and Individual Equipment (PM SPIE) in FY18. The objective of this effort is to increase the Warfighter lethality, modularity, and mobility, by optimizing Soldier protection for EOD personnel. The mission of this program is to enhance the tactical utility and applicability of this bomb suit concept by incorporating modularity/scalability and sensor technologies which					

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Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev		Project (Number/Name) 016 / Close Combat Capabilities ENG DEV		
B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
was not the case in legacy designs. This new tailorable, full body protective system will provide a significantly increased capability at a reduced weight.						
FY 2019 Plans: Continue in the Engineering and Manufacturing Development phase of the Next Generation Advanced Bomb Suit (NGABS) with the objective of developing for the EOD Soldiers a full body protective ensemble that integrates the latest technological advances in ergonomic design and material science to improve survivability from fragmentation, blast, impact, thermal hazards, and small arms fire based primarily on the design concepts of the Soldier Protection System. Award a competitive contract for the development of an integrated Suit & Helmet (S&H) and Sensors and Display (S&D) 4th QTR FY19.						
FY 2020 Base Plans: In FY 2020, the NGABS team will continue to evaluate and develop system and subsystem technologies for the NGABS system to assist in the protection from emerging ballistic/blast threats, and sensor technologies.						
FY 2019 to FY 2020 Increase/Decrease Statement: Funding change in Next Generation Advanced Bomb Suit portfolio is due to anticipated requirement changes in FY19 and FY20.						
Title: Explosive Ordnance Disposal (EOD) Render Safe (RS) Description: Render Safe (RS) procedures require technicians to employ a wide variety of capabilities and explosives.		-	-	7.532	-	7.532
FY 2020 Base Plans: Conduct evaluation, integration, and logistics demonstration of the following capabilities: low light visual augmentation, localized incident site protection, dismounted X-Ray processor/imager, trace explosive, CBRN and drug detection, unmanned aerial system, electric tools, gamma and neutron search and detection, final disposition, and render safe initiation.						
FY 2019 to FY 2020 Increase/Decrease Statement: Explosive Ordnance Disposal (EOD) Render Safe (RS) is a new start in FY 2020.						
Title: FY 2019 SBIR / STTR Transfer Description: FY 2019 SBIR / STTR Transfer.		-	0.426	-	-	-

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<i>FY 2019 Plans:</i> FY 2019 SBIR / STTR Transfer.					
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2019 SBIR / STTR Transfer					
Accomplishments/Planned Programs Subtotals	8.387	9.860	21.298	-	21.298

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• R63610: <i>Render Safe Sets kits Outfits</i>	-	-	18.684	84.000	102.684	118.400	30.251	-	-	Continuing	Continuing
Remarks											
D. Acquisition Strategy The DLBS acquisition strategy is for developing product improvements such as making the system lighter and more module to the Antipersonnel and Obstacle Breaching System. These improvements will then be incorporated into the technical data package for future procurements. The Next Generation Advanced Bomb Suit (NGABS) Program is a single-step to full capability acquisition program utilizing full and open competition to ensure best value to the Army. Acquisition strategy for this program is a traditional development program that include an Engineering and Manufacturing Development phase ranging in duration from 24 to 48 months due to the level of design complexity and testing required. Milestone (MS) B / Material Development Decision (MDD) occurred in FY2018 and MS C is scheduled for FY 2020. The Explosive Ordnance Disposal (EOD) Render Safe (RS) program strategy is to acquire commercial and government off-the-shelf systems using Defense Logistics Agency (DLA) contract vehicles and to assemble into a kit with a technical refresh of the kit every three years.											
E. Performance Metrics N/A											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev				Project (Number/Name) 016 / Close Combat Capabilities ENG DEV					
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Dismounted Lane Breaching System	MIPR	PM CCS : Picatinny Arsenal, NJ	0.100	-		-		-		-		-	0.000	0.100	-
NGABS	Allot	PM SPE : Fort Belvoir	-	0.901		0.943		1.000		-		1.000	0.000	2.844	Continuing
Explosive Ordnance Disposal (EOD) Render Safe (RS)	Allot	PM CCS : Picatinny Arsenal, NJ	-	-		-		0.500	Jan 2020	-		0.500	0.000	0.500	Continuing
Subtotal			0.100	0.901		0.943		1.500		-		1.500	0.000	3.444	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Dismounted Lane Breaching System - Preliminary Design Efforts	MIPR	ARDEC : Picatinny Arsenal, NJ	0.185	0.100		-		-		-		-	0.000	0.285	-
Dismounted Lane Breaching System - Rocket Design	MIPR	NSWC : Indian Head, MD	0.315	-		-		-		-		-	0.000	0.315	-
NGABS - Product Development	C/FFP	TBD : Various	-	5.675		7.191		3.250		-		3.250	0.000	16.116	Continuing
EOD RS	MIPR	Various : Various	-	-		-		3.700	Jan 2020	-		3.700	0.000	3.700	Continuing
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.426		-		-		-	0.000	0.426	-
Subtotal			0.500	5.775		7.617		6.950		-		6.950	0.000	20.842	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Dismounted Lane Breaching System - Trade	MIPR	ARDEC : Picatinny Arsenal, NJ	0.859	-		-		-		-		-	Continuing	Continuing	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
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Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Studies, SOW and Test Plan Prep															
Dismounted Lane Breaching System - Configuration Management	MIPR	NSWC : Dahlgren, VA	0.106	-		-		-		-		-	0.000	0.106	-
NGABS Support Costs	MIPR	TBD : Various	-	1.711		-		1.000		-		1.000	0.000	2.711	Continuing
EOD RS	MIPR	ARDEC : Picatinny Arsenal, NJ	-	-		-		0.922	Jan 2020	-		0.922	0.000	0.922	Continuing
EOD RS	MIPR	CERDEC I2WD : Aberdeen Proving Ground (APG), MD	-	-		-		0.600	Jan 2020	-		0.600	0.000	0.600	-
Subtotal			0.965	1.711		-		2.522		-		2.522	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Dismounted Lane Breaching System - Qualification Test	MIPR	Yuma Proving Ground : Yuma, AZ	0.322	-		-		-		-		-	0.000	0.322	-
NGABS Test & Evaluation	MIPR	TBD : Various	-	-		1.300		8.526		-		8.526	0.000	9.826	Continuing
EOD RS	MIPR	Various : Various	-	-		-		1.800	Jun 2020	-		1.800	0.000	1.800	Continuing
Subtotal			0.322	-		1.300		10.326		-		10.326	0.000	11.948	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			1.887	8.387		9.860		21.298		-		21.298	Continuing	Continuing	N/A
Remarks															

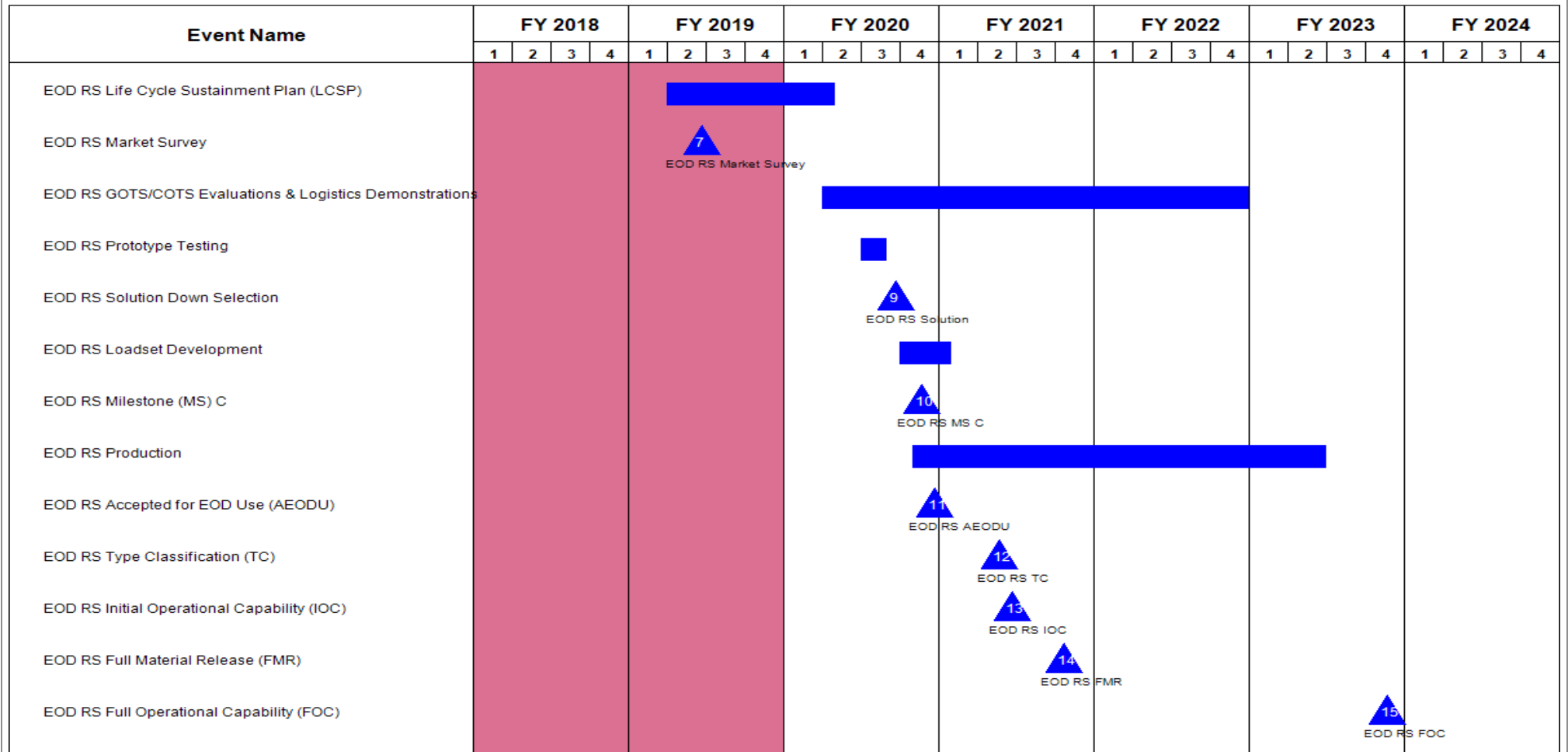
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev		Project (Number/Name) 016 / Close Combat Capabilities ENG DEV	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024							
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
Dismounted Lane Breaching System (DLBS)																																
DLBS Preliminary Design Review (PDR)	1																															
DLBS Detailed Design Effort																																
DLBS User Assessment					3																											
DLBS Critical Design Review (CDR)					5																											
DLBS Qualification Hardware Build																																
Next Generation Advanced Bomb Suit (NGABS)																																
NGABS Materiel Development Decision (MDD)	2																															
NGABS Milestone (MS) B					4																											
NGABS Developmental Testing																																
NGABS MS C													8																			
Explosive Ordnance Disposal (EOD) Render Safe (RS)																																
EOD RS Materiel Development Decision (MDD)					6																											

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army

Date: March 2019

Appropriation/Budget Activity

2040 / 5

R-1 Program Element (Number/Name)

PE 0604808A / Landmine Warfare/Barrier -
Eng Dev

Project (Number/Name)

016 / Close Combat Capabilities ENG DEV

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604808A / <i>Landmine Warfare/Barrier - Eng Dev</i>	Project (Number/Name) 016 / <i>Close Combat Capabilities ENG DEV</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Dismounted Lane Breaching System (DLBS)	1	2016	1	2020
DLBS Preliminary Design Review (PDR)	1	2018	1	2018
DLBS Detailed Design Effort	1	2018	4	2018
DLBS User Assessment	3	2018	3	2018
DLBS Critical Design Review (CDR)	4	2018	4	2018
DLBS Qualification Hardware Build	4	2018	1	2019
Next Generation Advanced Bomb Suit (NGABS)	1	2017	4	2024
NGABS Materiel Development Decision (MDD)	2	2018	2	2018
NGABS Milestone (MS) B	3	2018	3	2018
NGABS Developmental Testing	1	2019	4	2020
NGABS MS C	3	2020	3	2020
Explosive Ordnance Disposal (EOD) Render Safe (RS)	1	2020	4	2024
EOD RS Materiel Development Decision (MDD)	1	2019	1	2019
EOD RS Life Cycle Sustainment Plan (LCSP)	2	2019	2	2020
EOD RS Market Survey	2	2019	2	2019
EOD RS GOTS/COTS Evaluations & Logistics Demonstrations	2	2020	4	2022
EOD RS Prototype Testing	3	2020	3	2020
EOD RS Solution Down Selection	3	2020	3	2020
EOD RS Loadset Development	4	2020	1	2021
EOD RS Milestone (MS) C	4	2020	4	2020
EOD RS Production	4	2020	2	2023
EOD RS Accepted for EOD Use (AEODU)	4	2020	4	2020

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019	
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	Start		End	
Events	Quarter	Year	Quarter	Year
EOD RS Type Classification (TC)	2	2021	2	2021
EOD RS Initial Operational Capability (IOC)	2	2021	2	2021
EOD RS Full Material Release (FMR)	4	2021	4	2021
EOD RS Full Operational Capability (FOC)	4	2023	4	2023
EOD RS Technical Refresh	1	2024	4	2028

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Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev				Project (Number/Name) 415 / Mine Neutral/Detection			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
415: Mine Neutral/Detection	-	12.537	33.204	17.910	-	17.910	0.727	0.645	5.000	4.630	0.000	74.653
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project provides for Engineering Manufacturing and Development (EMD) for the next generation of capabilities to detect, identify and neutralize hybrid threats and explosive hazards such as Improvised Explosive Devices (IEDs) and landmines. These capabilities are a Family of Systems (FOS) encompassing handheld, vehicle mounted, small robotic mounted, aerial platform mounted and area access, and neutralization systems operating in manned, remotely controlled, semi-autonomous or fully autonomous modes. Continued development of this FOS is necessary to support Route Clearance Platoons located within both Engineer Companies and Brigade Engineering Battalion Brigade Combat Teams.

The Husky Mounted Detection System (HMDS) is a counter-explosive device capability that provides standoff detection and marking of metallic encased caches and metallic and low-metallic antitank landmines, unexploded ordnance, trigger mechanisms, and improvised explosive devices (IEDs) in support of route and area-clearance operations. HMDS is a mission equipment package mounted on the Husky route clearance vehicle. The program was restructured in September 2016 to align with emerging shallow buried Wire Detection (WD) capabilities integrated onto the HMDS Increment A1 configuration (includes Ground Penetrating Radar (GPR)). These changes are necessary to adapt to changing IED threats. WD Technology will be fully integrated through Engineering Change Proposals (ECPs) at the end of FY20. Prototypes developed under the concluded HMDS Increment A2 effort may be leveraged in development of future capabilities. Future capabilities may include detection of deep buried IEDs and caches, and semi-autonomous control of the Husky vehicle and HMDS from inside a follow-on vehicle.

Route Clearance & Interrogation System (RCIS) Type I consists of a semi-autonomous vehicle and includes designated control vehicles and Operator Control Units (OCUs) which provide a standoff capability to detect and neutralize the full spectrum of explosive hazards. Type I integrates a semi-autonomous kit onto a High Mobility Engineering Excavator (HMEE) for remote control from a Buffalo Mine Protected Clearance Vehicle (MPCV). RCIS Type I semi-autonomous kit will be integrated onto the HMEE and be capable of interrogating and classifying explosive hazards. An OCU will be integrated into a Buffalo MPCV for Type I. RCIS capabilities will be fielded to Route Clearance Squads and Engineer Platoons which includes Tele-operation, RADAR-based Follow-Me, LIDAR obstacle detection, onscreen predictive turning map, customizable camera views in order to achieve the RCIS mission.

For RCIS Type I, FY 2020 funding supports engineering, logistics development, Full Up System Level prototype delivery and ATEC testing, including the digitized, drive by wire HMEE with the Semi-Autonomous Control (SAC) kit. .

The Vehicle Optics Sensor System (VOSS) provides a telescoping, gyro-stabilized, high-resolution, triple sensor (daylight, night-vision, and thermal-imaging) surveillance system to optically detect from standoff distances, explosive hazards (IEDs and landmines) and their trigger sources. VOSS is mounted on the MMPV Type I for Explosive Ordnance Disposal (EOD) and MMPV Type II for Engineers. VOSS will not require RDT&E funding in FY2019 or beyond.

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<p>The Multifunction Video Display (MVD) provides view/control capability of the enablers (Interrogation Arms, VOSS, Man Transportable Robotic System (MTRS), Drivers Vision Enhancement, Vehicle Situational Awareness Cameras) in the MMPV Type II to all Operators. New capabilities will be added into that display to view and control future Unmanned Ground Vehicle Systems (UGVs) programs Route Clearance & Integration System (RCIS) and Husky Mounted Detection System (HMDS), Explosive Hazard Pre-Detonation (EHP) Roller and view Unmanned Aerial Vehicles video feeds. Additional software will need to be developed to add these capabilities. In addition, a new capability to push the video feeds of all of the enablers (Interrogation Arms, VOSS, Man Transportable Robotic System, Drivers Vision Enhancement and Vehicle Situational Awareness Cameras) from various vehicles within a Route Clearance Patrol will be developed.</p> <p>Force Protection Improvements/Add On Armor (AoA) to execute system level design cycle for Rocket Propelled Grenade (RPG) and explosive formed projectiles (EFP) AoA kits for Husky and Buffalo. Kits will be developed so that RPG and EFP protection can be installed at the same time. In order to do this lighter weight design solutions will be developed. Given the continued need for these AoA Kits, the schedule has been moved to the left.</p> <p>Standoff Robotic Explosive Hazard Detection System (SREHD), formerly known as the Autonomous Mine Detection System (AMDS), provides increased survivability through mine and explosive hazards stand-off detection, marking and neutralization capability for the dismounted soldier. It provides area access and freedom of movement for the Commander. SREHD consists of payload modules to be mounted on man-portable unmanned ground vehicles. The payloads are for surface laid and buried threats to include mines and explosive hazards. This capability allows a soldier to remain in a protective posture while detecting and neutralizing a wide variety of hybrid and conventional explosive threats. SREHD conducted a successful Milestone (MS) C in April 2018 and initiated Low Rate Initial Production (LRIP) in June 2018. Due to the realignment of funds FY 2020-2024 to higher Army priorities, the proponent withdrew support to the Standoff Robotic Explosive Hazard Detection System (SREHD) after Low Rate Initial Production (LRIP) award. Research, Development, Test and Evaluation (RDTE) tasks will conclude in FY 2019 under FY 2018 PE 0654808A, Project 415, Landmine Warfare/Barrier - Eng Dev, once corrective action plans and trainer re-development are completed. The program will conclude in June 2020 under FY 2018 OPA R68260 / AREA MINE DETECTION SYSTEM (AMDS) and PAA E50510 / DEMO KIT, BLASTING: Munition Array Charge, XM335 for system qualification and production and receipt of LRIP quantities for an orderly program closeout.</p> <p>FY 2020 Base funding in the amount of \$17.910 million includes \$10.900 million to support the continued development of the Husky Mounted Detection System (HMDS); \$7.010 million to support development and testing of RCIS Type I.</p>		
B. Accomplishments/Planned Programs (\$ in Millions)		
Title: HMDS Program Management Support		
Description: Husky Mounted Detection System (HMDS) Program Management Support		
FY 2019 Plans: Will fund PMO Core and Matrix Support		
FY 2020 Base Plans:		

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue execution and management of Engineering Change Proposal (ECP) for Wire Detection, Infrared Illumination and Information Assurance compliance in preparation for Modification Work Order (MWO) FY 2019 to FY 2020 Increase/Decrease Statement: Decrease due to magnitude of effort decreasing in the final year of executing the ECP and associated activities						
Title: HMDS GPR: Engineer Change Proposal (ECP) to add Wire Detection and Infrared Illumination Description: HMDS A1 Tactical GPR: Engineer Change Proposal (ECP) to add Wire Detection and Infrared Illumination FY 2019 Plans: Will continue with ongoing ECP efforts for Wire Detection, Infrared Illumination and Mission Computer Upgrade FY 2020 Base Plans: Will complete ongoing ECP efforts for Wire Detection, Infrared Illumination and Information Assurance compliance. FY 2019 to FY 2020 Increase/Decrease Statement: Decrease due to magnitude of effort decreasing in the final year of executing the ECP and associated activities		5.840	15.223	1.889	-	1.889
Title: HMDS Testing and Test Support activities Description: HMDS Testing and Test Support activities FY 2019 Plans: Will continue Risk Reduction and ECP testing FY 2020 Base Plans: Will complete Risk Reduction and ECP testing FY 2019 to FY 2020 Increase/Decrease Statement: Decrease is due to magnitude of testing effort decreasing in the final year of executing the ECP and associated activities		0.491	4.673	2.504	-	2.504
Title: HMDS A1 Auto-Height Improvements FY 2020 Base Plans:		-	-	2.702	-	2.702

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Complete auto-height development and produce prototypes to support testing						
FY 2019 to FY 2020 Increase/Decrease Statement: This portion of the ECP effort represents an increase from prior year and will be executed during FY20 only						
Title: HMDS Systems Training Product Development		-	0.892	0.764	-	0.764
Description: Training product development to support Developmental test and limited user testing						
FY 2019 Plans: Develop training materials to support developmental and limited user testing.						
FY 2020 Base Plans: Complete development activities to support Modification Work Order (MWO)						
FY 2019 to FY 2020 Increase/Decrease Statement: Increase due to training product development completion after testing is completed in FY2020						
Title: HMDS Program and Logistics Support		-	-	1.794	-	1.794
FY 2020 Base Plans: Development of final logistics products to support logistics demo and Modification Work Order (MWO)						
FY 2019 to FY 2020 Increase/Decrease Statement: Increase due to development of logistics products in preparation of the Modification Work Order (MWO)						
Title: RCIS Type I		0.131	7.503	7.010	-	7.010
Description: Route Clearance & Interrogation System (RCIS) Type I provides standoff capability to detect and neutralize the full spectrum of explosive hazards.						
FY 2019 Plans: RCIS Type I: Execute Start of Work Meeting with both EMD contractors; complete Preliminary and Critical Design Reviews; Execute (2) user juries; perform contractor verification testing; build EMD prototypes for ATEC testing.						
FY 2020 Base Plans:						

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Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev		Project (Number/Name) 415 / Mine Neutral/Detection		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
RCIS Type I: Continue the EMD phase - perform government safety testing with full up system level RCIS prototypes; perform cyber scans and analysis; continue logistics analysis; prep for MS C in FY21. FY 2019 to FY 2020 Increase/Decrease Statement: The system design portion of the Delta HMEE (digitization of the HMEE platform) will be completed in FY 2019.						
Title: VOSS Geo-Location Capability & Infrared Camera Replacement Description: Vehicle Optics Sensor System (VOSS) capability to determine location of explosive hazards and IR Camera Replacement		0.876	-	-	-	-
Title: Multifunction Video Display (MVD) Description: Multifunction Video Display (MVD). Digital display used to control and view RCV enablers FY 2019 Plans: Will continue Support for MVD SIL at Night Vision and Electronic Sensors Directorate (NVESD) for development of additional enabler (Interrogation Arm software development for control functionality). FY 2019 to FY 2020 Increase/Decrease Statement: No FY 2020 funding.is required.		0.750	0.500	-	-	-
Title: RCV & Enabler Improvements Description: Develop the hardware used to improve POR RCVs. FY 2019 Plans: Will continue to: - Develop Interrogation Arm upgrades for the Buffalo Mine Protected Clearance Vehicle (MPCV). Demonstration of these upgrades will be performed. - Develop product upgrades to the Medium Mine Protected Vehicle (MMPV) Type II Interrogation Arm so it can be operated by the MVD. - Next Generation HMDS A2 to include Deep Buried Detection on the Husky and semi-autonomous control capability on the Husky and MMPV Type II - Explosive Hazard Pre-Detonation (EHP) hardware upgrades FY 2019 to FY 2020 Increase/Decrease Statement:		-	0.425	-	-	-

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B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2020 funding is not required.												
Title: Add on Armor (AoA) Description: Development AoA efforts for Route Clearance Vehicles (RCV) to include Rocket Propelled Grenade (RPG) and Explosive Formed Projectiles (EFP) for Husky and Buffalo.								0.033	-	-	-	-
Title: Standoff Robotic Explosive Hazard Detection (SREHD) (Formerly AMDS) Description: Standoff Robotic Explosive Hazard Detection (SREHD) (AMDS) FY 2019 Plans: Program closeout FY 2019 to FY 2020 Increase/Decrease Statement: SREHD will conduct program closeout in FY 2019.								3.882	0.811	-	-	-
Title: FY 2019 SBIR / STTR Transfer FY 2019 Plans: SBIR/STTR tax FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer								-	1.359	-	-	-
Accomplishments/Planned Programs Subtotals								12.537	33.204	17.910	-	17.910
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost	
• R64001: HUSKY MOUNTED DETECTION SYSTEM (HMDS)	16.695	35.834	83.082	34.253	117.335	152.437	67.879	-	-	0.000	390.180	
• R68102: GRND STANDOFF MINE DETECTN SYSM (GSTAMIDS)BLK 1	27.442	42.001	37.025	4.500	41.525	28.617	13.568	-	-	0.000	153.153	
• DA0924: Modification Of In Svc Equip	146.587	256.642	58.946	28.000	86.946	49.250	46.050	-	-	0.000	585.475	

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C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• R68260: AREA MINE DETECTION SYSTEM (AMDS)	10.571	5.797	0.000	-	0.000	-	-	-	-	Continuing	Continuing
• 606: Cntrmn/Barrier Adv Dev	3.187	2.964	0.000	-	0.000	-	-	-	-	0.000	6.151
• M80400: Robotic Combat Support System (RCSS)	4.516	8.879	2.000	3.300	5.300	6.850	16.476	-	-	0.000	42.021
• E50510: DEMO KIT, BLASTING: Munition Array Charge, XM335	1.586	2.350	0.000	-	0.000	-	-	-	-	0.000	3.936
• R64003: HMDS - DEEP BURIED DETECTION	-	-	29.382	-	29.382	94.984	55.750	-	-	0.000	180.116
Remarks											
D. Acquisition Strategy											
<p>The Husky Mounted Detection System (HMDS) program is pursuing an acquisition approach that delivers capability increments - Increment A, Configuration 1 (A1) to the Warfighter by leveraging the Quick Reaction Capability (QRC) Ground Penetrating Radar (GPR) currently deployed in support of Operation Enduring Freedom (OEF) and Operation Inherent Resolve (OIR). In FY2020, the program will complete execution of an Engineering Change Proposals (ECP) to add a wire detection capability to address evolving threat, and Infrared illumination to enable nighttime operation, improve operational availability of the HMDS during inclement weather and address obsolescence and Cyber Security deficiencies.</p> <p>The Route Clearance & Interrogation System (RCIS) program executes an Engineering Manufacturing and Development (EMD) phase for Type I systems with an OEM contract award for Delta High Mobility Engineering Excavator (HMEE) support and a contract award in 4QFY2018 to one EMD contractor for the Semi-Autonomous Control (SAC) Kit . The SAC Kit was awarded based on a source selection from full and open competition. The SAC EMD contract awardee will execute Preliminary Design Review (PDR), design, integration, and build phase of seven Semi-Autonomous Capability (SAC) kits, integrated onto six vehicles, with one kit available for engineering and System Integration Lab (SIL) evaluations. These assets enable the Government to execute a full Pre-Production Qualification Test (PPQT) and to evaluate against Capability Production Document (CPD) and performance specification requirements. Production and Technical Data Package (TDP) procurement options on the EMD contract take advantage of competition to assist in cost reduction. The RCIS Type I program Lifecycle Cost Estimate (LCCE), and associated budget request, was updated based on costs associated with modifying the base HMEE platform to accept the SAC kit, changes in the acquisition strategy and alignment of development and test activities in support of a production decision. To support EMD, ALUGS is funding Reset/Recap of four Buffalo Mine Protected Clearance Vehicle (MPCV) test assets at Letterkenny Army Depot. These will be provided to the SAC contractor for Operator Control Unit (OCU) integration.</p> <p>The Vehicle Optics Sensor System (VOSS) program has no planned activities in FY 2019 or beyond.</p>											

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
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<p>Spiral development of software upgrades to MVD will be procured in FY 2018 and FY 2019. Additional funding will be required to support the remote visualization capability in the FREHD CDD.</p> <p>The Standoff Robotic Explosive Hazard Detection System (SREHD) (formerly known as AMDS) is currently in the Low Rate Initial Production (LRIP) phase to provide standoff detection, marking, and neutralization of explosive hazards (e.g., landmines, improvised explosive devices (IED), booby-traps (explosive), and unexploded ordnance (UXO)) in complex and urban terrain, including confined areas and subterranean environments (e.g., buildings, bunkers, tunnels, etc.). Transition to Low Rate Initial Production (LRIP) occurred 30 April 2018 under PAA E50510 / DEMO KIT, BLASTING: Munition Array Charge, XM335, for the neutralization capability, as well under OPA R68260 / AREA MINE DETECTION SYSTEM (AMDS) for the detection and marking capabilities. Due to the realignment of funds FY 2020-2024 to higher Army priorities, the proponent withdrew support to the Standoff Robotic Explosive Hazard Detection System (SREHD) after Low Rate Initial Production (LRIP) award. Subsequently, the Milestone Decision Authority (MDA) directed that FY 2019 funding will not be executed for this program. Due to timing, funding is still reflected in FY 2019. Research, Development, Test and Evaluation (RDTE) tasks will conclude in FY 2019 under FY 2018 PE 0654808A, Project 415, Landmine Warfare/Barrier - Eng Dev, once corrective action plans and trainer re-development are completed. The program will conclude in June 2020 under FY 2018 OPA R68260 / AREA MINE DETECTION SYSTEM (AMDS) and PAA E50510 / DEMO KIT, BLASTING: Munition Array Charge, XM335 for system qualification and production and receipt of LRIP quantities for an orderly program closeout.</p> <p><u>E. Performance Metrics</u> N/A</p>		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev				Project (Number/Name) 415 / Mine Neutral/Detection					
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
HMDS System Engineering & Program Management	MIPR	PM Terrestrial Sensors : Fort Belvoir. VA	1.280	0.470		1.818	Jan 2019	1.247	Mar 2020	-		1.247	Continuing	Continuing	Continuing
Program Management - RCIS Type I	MIPR	PM FP : Warren, MI	4.189	0.024		0.769	Oct 2018	0.650	Oct 2019	-		0.650	Continuing	Continuing	-
Program Management - MTRS Inc II	MIPR	PM FP : Warren, MI	3.726	-		-		-		-		-	0.000	3.726	-
VOSS Geo-location and new Infrared Camera	MIPR	PM Ground Sensors : Ft. Belvoir, VA	0.491	0.143		-		-		-		-	0.000	0.634	-
SREHD (Formerly AMDS) Program Management	Allot	JPEO A&A, PM CCS : Picatinny Arsenal, NJ	3.726	0.142	Oct 2017	-		-		-		-	0.000	3.868	-
SREHD (Formerly AMDS) Program Closeout	Allot	JPEO A&A, PM CCS : Picatinny Arsenal, NJ	-	-		0.811	Dec 2018	-		-		-	0.000	0.811	-
Subtotal			13.412	0.779		3.398		1.897		-		1.897	Continuing	Continuing	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
HMDS A1 Dev of Engineering Change Proposal w/ Wire Detect and InfraRed	SS/FFP	Chemring Sensors & Electronic Systems (CSES) : Dulles, VA	2.597	5.840		15.223	Jan 2019	1.889	Nov 2019	-		1.889	Continuing	Continuing	Continuing
HMDS Auto-height improvements	C/CPFF	TBD : TBD	-	-		-		2.702	Nov 2019	-		2.702	Continuing	Continuing	Continuing
HMDS Systems Training Product Development	MIPR	CECOM : Various	-	-		0.892	Nov 2018	0.764	Nov 2019	-		0.764	Continuing	Continuing	Continuing
RCIS Type I	SS/FFP	J C Bamford : Pooler, GA	9.233	-		1.810	Nov 2018	1.610	Oct 2019	-		1.610	0.000	12.653	Continuing

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Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev				Project (Number/Name) 415 / Mine Neutral/Detection					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
RCIS Type I test assets	MIPR	Letterkenny Army Depot : Letterkenny, PA	2.252	-		-		-		-		-	0.000	2.252	-
RCIS Type I SAC	C/CPIF	QinetiQ : Waltham, MA	-	-		3.700	Nov 2018	3.450	Oct 2019	-		3.450	Continuing	Continuing	-
MTRS Inc II	C/FFP	PM FP, PdM UGV : Warren, MI	2.566	-		-		-		-		-	0.000	2.566	-
VOSS Geo-location and Infrared Camera	C/CPFF	Various : Ft. Belvoir, VA	3.347	0.295		-		-		-		-	0.000	3.642	-
Multi-Function Video Display	MIPR	NVESD : Fort Belvoir, VA	3.722	0.250		0.500	Oct 2018	-		-		-	3.047	7.519	3.047
RCV & Enablers Improvements - EHP Upgrades	C/CPFF	KRC : Houghton, MI	1.233	-		-		-		-		-	0.000	1.233	-
Buffalo MPCV Interrogation Arm Improvements	C/CPFF	KRC : Houghton, MI	-	-		0.425	Nov 2018	-		-		-	0.000	0.425	-
SREHD (Formerly AMDS) EMD and Trainer Re-development	C/CPIF	Carnegie Robotics LLC : Pittsburgh, PA	29.830	1.059	Jan 2018	-		-		-		-	0.000	30.889	-
SREHD (Formerly AMDS) RAMS Type B Integration with Trainer	MIPR	ARL : Adelphi, MD	-	0.300	Mar 2018	-		-		-		-	0.000	0.300	-
FY 2019 SBIR/STTR Transfer	TBD	Various : Various	-	-		1.359	Oct 2018	-		-		-	0.000	1.359	-
Subtotal			54.780	7.744		23.909		10.415		-		10.415	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev				Project (Number/Name) 415 / Mine Neutral/Detection					
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
HMDS - Program and Logistics Support	MIPR	Various : Various	-	-		-		1.794	Nov 2019	-		1.794	Continuing	Continuing	Continuing
RCIS Type I	MIPR	TARDEC, TACOM : Warren, MI	7.518	0.070		0.764	Oct 2018	0.400	Oct 2019	-		0.400	Continuing	Continuing	-
Robotics Interoperability	MIPR	PM FP, PdM ALUGS : Warren, MI	3.960	-		-		-		-		-	0.000	3.960	-
MTRS Inc II	Various	PM FP, PdM UGV : Warren, MI	10.146	-		-		-		-		-	0.000	10.146	-
VOSS Geo-location and Infrared Camera	MIPR	Various : Various	2.720	0.379		-		-		-		-	0.000	3.099	-
Multi-function Video Display	C/CPFF	NVESD/CERDEC : Fort Belvoir, VA	3.297	0.500		-		-		-		-	0.000	3.797	-
Add on Armor (AoA) Husky RPG Kit	MIPR	TARDEC : Warren, MI	0.283	0.033	Jul 2018	-		-		-		-	0.000	0.316	-
AoA Husky AoA Kit	MIPR	TARDEC : Warren, MI	0.091	-		-		-		-		-	0.000	0.091	-
Development of Buffalo EFP AoA Kit	MIPR	TARDEC : Warren, MI	0.400	-		-		-		-		-	0.000	0.400	-
SREHD (Formerly AMDS)	MIPR	Various : Various	11.395	2.281	Jan 2018	-		-		-		-	0.000	13.676	-
Subtotal			39.810	3.263		0.764		2.194		-		2.194	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
HMDS ATEC Testing	MIPR	ATEC : Alexandria, VA	4.486	0.559		3.781	Mar 2019	2.003	Nov 2019	-		2.003	Continuing	Continuing	Continuing
HMDS Test Support	MIPR	CECOM : Various	-	-		0.892	Nov 2018	0.501	Nov 2019	-		0.501	Continuing	Continuing	Continuing
RCIS Type I	MIPR	ATEC : Aberdeen, MD	1.739	0.033	Jul 2018	0.460	Nov 2018	0.900	Oct 2019	-		0.900	0.000	3.132	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev						Project (Number/Name) 415 / Mine Neutral/Detection			
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
MTRS Inc II	MIPR	TARDEC, Various : Warren, MI	1.131	-		-		-		-		-	0.000	1.131	-
VOSS Geo-location and new Infrared Camera	MIPR	ATEC : Alexandria, VA	4.813	0.059		-		-		-		-	Continuing	Continuing	Continuing
Multi-Function Video Display	WR	KRC : Houghton, MI	1.100	-		-		-		-		-	0.000	1.100	-
RCV & Enabler Improvements ?MMPV Type II Interrogation Arm.	MIPR	TARDEC : Warren, MI	0.367	-		-		-		-		-	0.000	0.367	-
Add on Armor (AoA) Husky RPG	MIPR	ATEC : Aberdeen, MD	0.100	-		-		-		-		-	0.000	0.100	-
Add on Armor Buffalo EFP and RPG	MIPR	ATEC : Aberdeen, MD	0.300	-		-		-		-		-	0.000	0.300	-
Add-on Armor	MIPR	ARL : Adelphi, MD	0.100	-		-		-		-		-	0.000	0.100	-
SREHD (Formerly AMDS)	MIPR	OTC : Ft. Hood, TX	4.341	-		-		-		-		-	0.000	4.341	-
SREHD (Formerly AMDS)	MIPR	ARL : Adelphi, MD	-	0.100	Jun 2018	-		-		-		-	0.000	0.100	-
Subtotal			18.477	0.751		5.133		3.404		-		3.404	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			126.479	12.537		33.204		17.910		-		17.910	Continuing	Continuing	N/A
Remarks															
Due to the realignment of funds FY 2020-2024 to higher Army priorities, the proponent withdrew support to the Standoff Robotic Explosive Hazard Detection System (SREHD) after Low Rate Initial Production (LRIP) award. Subsequently, the Milestone Decision Authority (MDA) directed that FY 2019 funding will not be executed for this program. Due to timing, funding is still reflected in FY 2019. Research, Development, Test and Evaluation (RDTE) tasks will conclude in FY 2019 under FY 2018 PE 0654808A, Project 415, Landmine Warfare/Barrier - Eng Dev, once corrective action plans and trainer re-development are completed. The program will conclude in June 2020 under FY 2018 OPA R68260 / AREA MINE DETECTION SYSTEM (AMDS) and PAA E50510 / DEMO KIT, BLASTING: Munition Array Charge, XM335 for system qualification and production and receipt of LRIP quantities for an orderly program closeout.															

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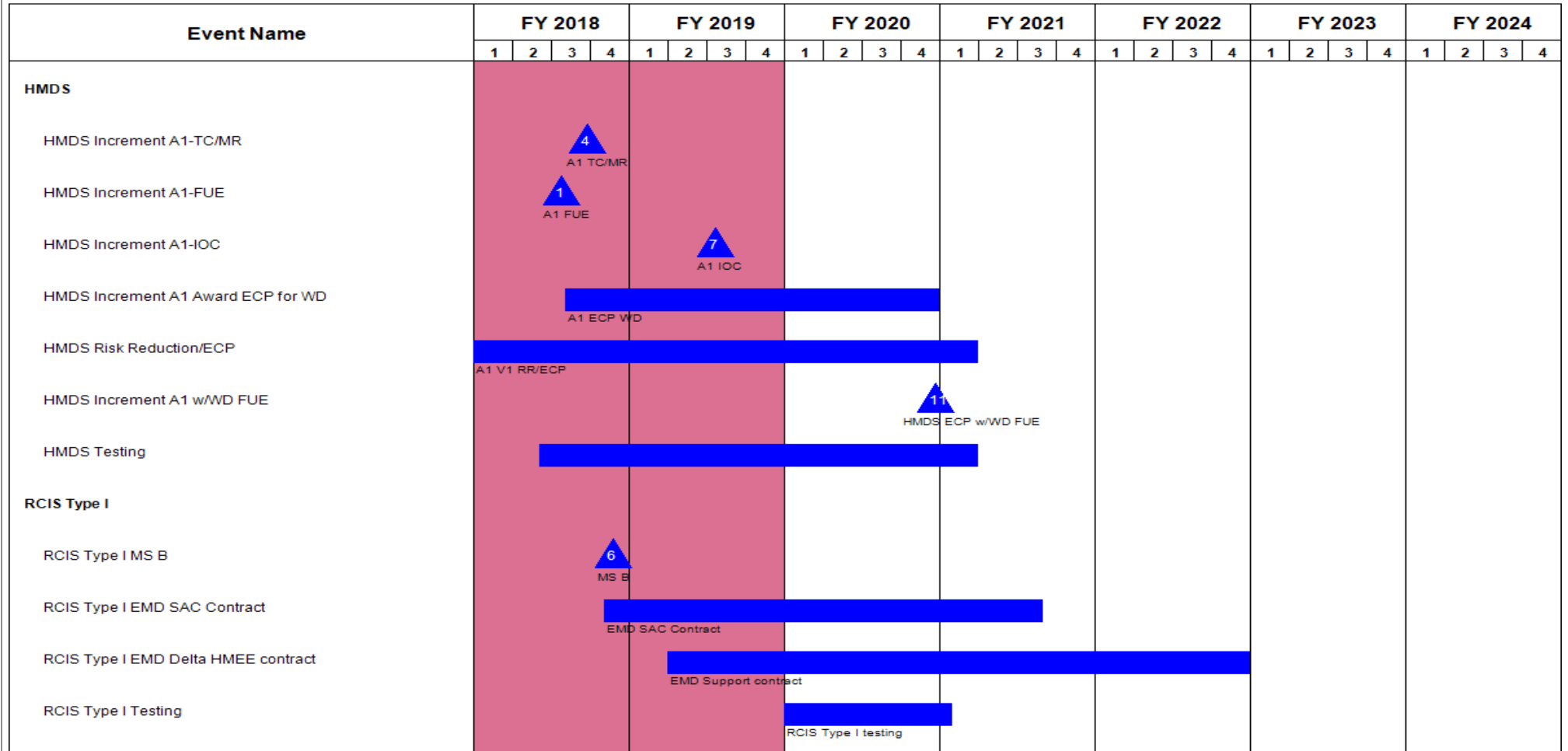
Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army

Date: March 2019

Appropriation/Budget Activity
2040 / 5

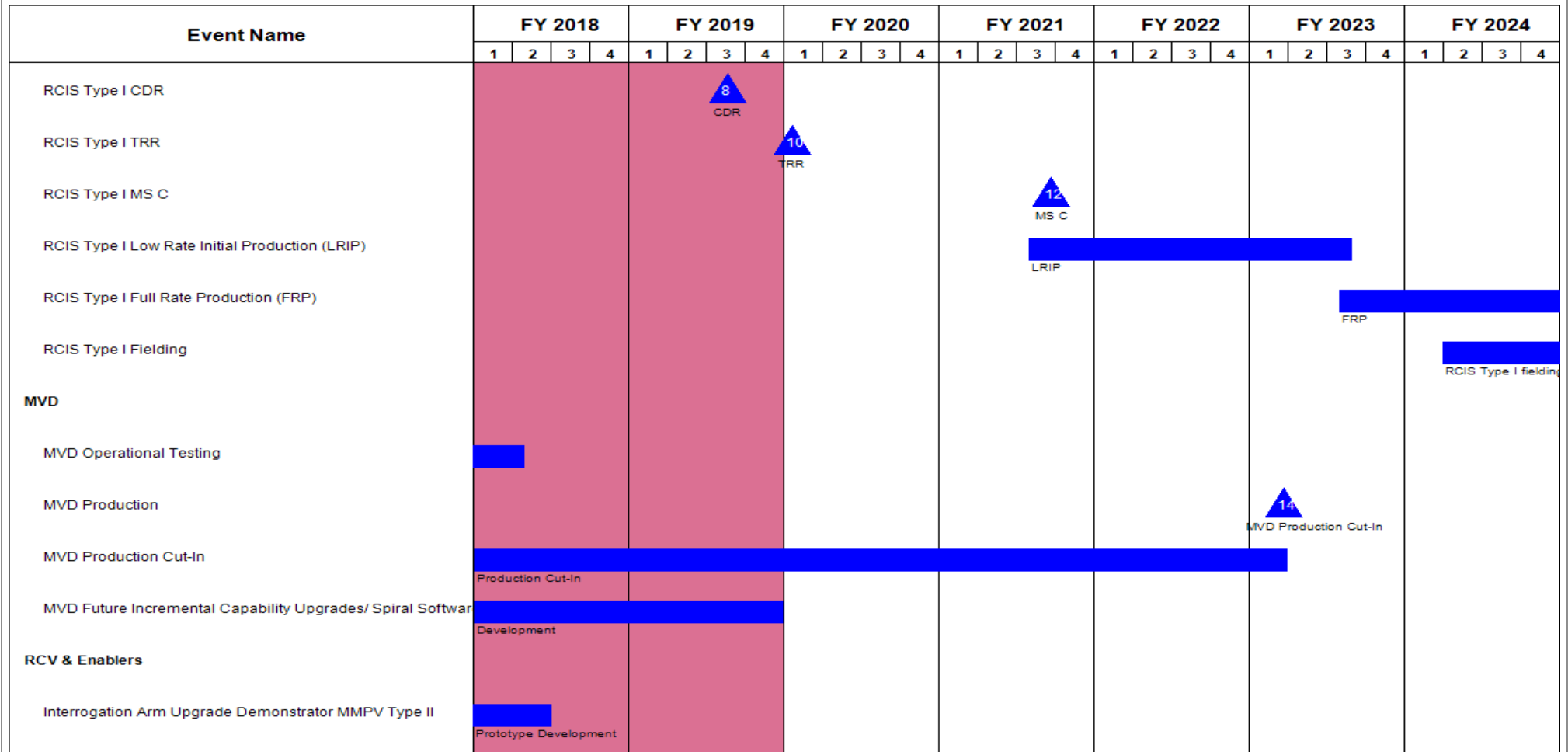
R-1 Program Element (Number/Name)
PE 0604808A / Landmine Warfare/Barrier -
Eng Dev

Project (Number/Name)
415 / Mine Neutral/Detection



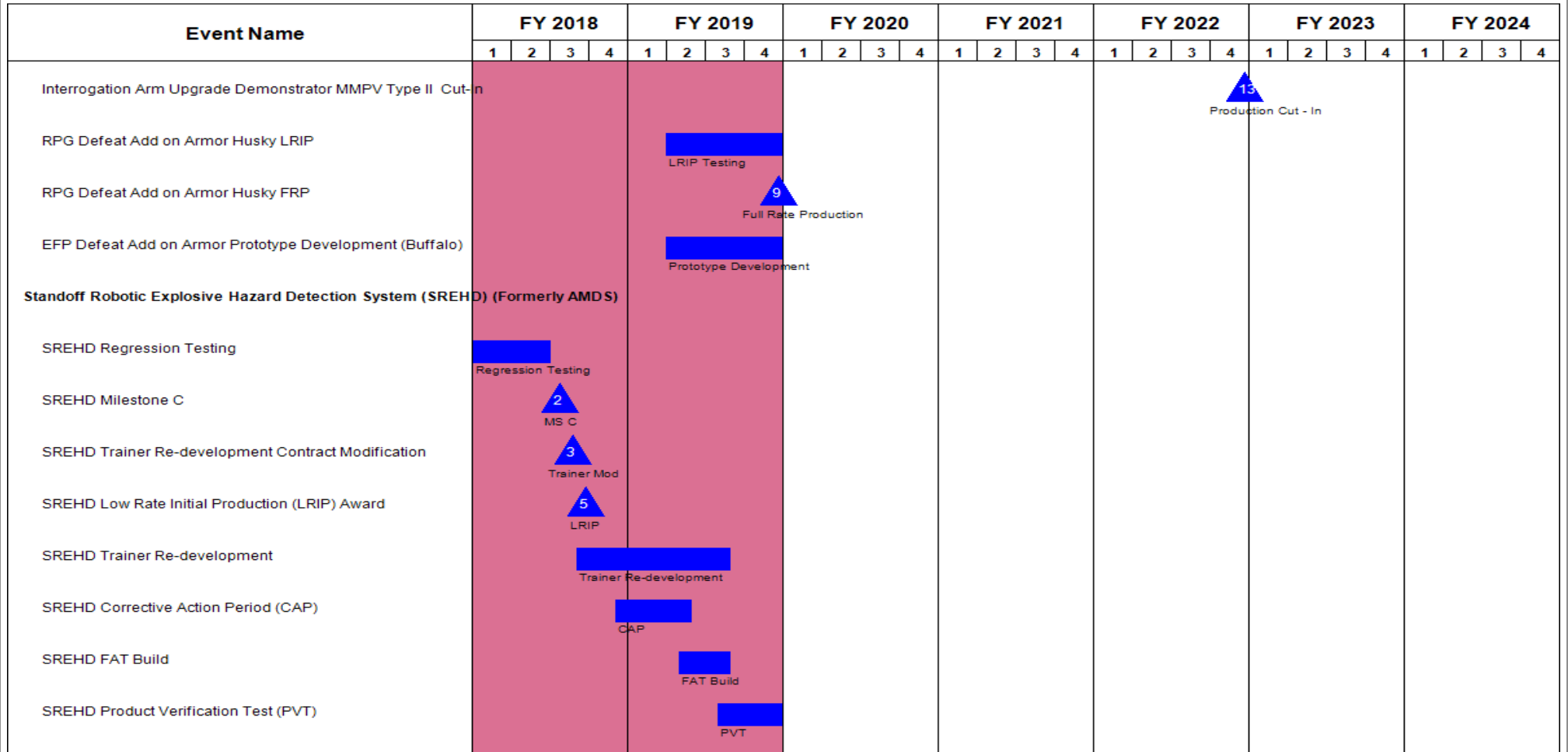
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604808A / <i>Landmine Warfare/Barrier - Eng Dev</i>		Project (Number/Name) 415 / <i>Mine Neutral/Detection</i>	



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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604808A / <i>Landmine Warfare/Barrier - Eng Dev</i>		Project (Number/Name) 415 / <i>Mine Neutral/Detection</i>	



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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army																Date: March 2019												
Appropriation/Budget Activity 2040 / 5									R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev								Project (Number/Name) 415 / Mine Neutral/Detection											
Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
SREHD First Article Test (FAT)																												
SREHD LRIP Build																												
SREHD LRIP Deliveries																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604808A / <i>Landmine Warfare/Barrier - Eng Dev</i>	Project (Number/Name) 415 / <i>Mine Neutral/Detection</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
HMDS	1	2016	1	2023
HMDS Increment A1-TC/MR	3	2018	3	2018
HMDS Increment A1-FUE	3	2018	3	2018
HMDS Increment A1-IOC	3	2019	3	2019
HMDS Increment A1 Award ECP for WD	3	2018	4	2020
HMDS Risk Reduction/ECP	2	2017	1	2021
HMDS Increment A1 w/WD FUE	4	2020	4	2020
HMDS Testing	2	2018	1	2021
RCIS Type I	1	2015	4	2022
RCIS Type I MS B	4	2018	4	2018
RCIS Type I EMD SAC Contract	4	2018	3	2021
RCIS Type I EMD Delta HMEE contract	2	2019	4	2022
RCIS Type I Testing	1	2020	1	2021
RCIS Type I CDR	3	2019	3	2019
RCIS Type I TRR	1	2020	1	2020
RCIS Type I MS C	3	2021	3	2021
RCIS Type I Low Rate Initial Production (LRIP)	3	2021	3	2023
RCIS Type I Full Rate Production (FRP)	3	2023	4	2027
RCIS Type I Fielding	2	2024	3	2028
MVD	1	2016	4	2022
MVD Operational Testing	4	2017	1	2018
MVD Production	1	2023	1	2023

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019	
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev		Project (Number/Name) 415 / Mine Neutral/Detection	
	Start		End	
Events	Quarter	Year	Quarter	Year
MVD Production Cut-In	1	2018	1	2023
MVD Future Incremental Capability Upgrades/ Spiral Software Development	1	2017	4	2019
RCV & Enablers	1	2016	4	2022
Interrogation Arm Upgrade Demonstrator MMPV Type II	2	2017	2	2018
Interrogation Arm Upgrade Demonstrator MMPV Type II Cut-In	4	2022	4	2022
EHP Debris Blower Camera Upgrade	2	2016	3	2016
Add on Armor (AoA)	2	2015	2	2015
TEST - RPG Defeat Add on Armor Husky LRIP	2	2017	2	2017
RPG Defeat Add on Armor Husky LRIP	2	2019	4	2019
TEST -RPG Defeat Add on Armor Husky LRIP	3	2017	3	2017
RPG Defeat Add on Armor Husky FRP	4	2019	4	2019
TEST - RPG Defeat Add on Armor Husky FRP	4	2017	4	2017
EHP Roller Development	1	2016	2	2017
EFP Defeat Add on Armor Prototype Development (Buffalo)	2	2019	4	2019
TEST - EFP Defeat Add on Armor Prototype Development (Buffalo)	1	2017	2	2017
TEST - EFP Defeat & RPG Add on Armor Testing (Buffalo)	4	2017	4	2017
Standoff Robotic Explosive Hazard Detection System (SREHD) (Formerly AMDS)	1	2018	4	2022
SREHD Regression Testing	1	2018	2	2018
SREHD Milestone C	3	2018	3	2018
SREHD Trainer Re-development Contract Modification	3	2018	3	2018
SREHD Low Rate Initial Production (LRIP) Award	3	2018	3	2018
SREHD Trainer Re-development	3	2018	3	2019
SREHD Corrective Action Period (CAP)	4	2018	2	2019
SREHD FAT Build	2	2019	3	2019
SREHD Product Verification Test (PVT)	3	2019	4	2019

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev	Project (Number/Name) 415 / Mine Neutral/Detection	

Events	Start		End	
	Quarter	Year	Quarter	Year
SREHD First Article Test (FAT)	4	2019	4	2019
SREHD LRIP Build	4	2019	3	2020
SREHD LRIP Deliveries	4	2019	3	2020

Note

Due to the realignment of funds FY 2020-2024 to higher Army priorities, the proponent withdrew support to the Standoff Robotic Explosive Hazard Detection System (SREHD) after Low Rate Initial Production (LRIP) award. Subsequently, the Milestone Decision Authority (MDA) directed that FY 2019 funding will not be executed for this program. Due to timing, funding is still reflected in FY 2019. Research, Development, Test and Evaluation (RDTE) tasks will conclude in FY 2019 under FY 2018 PE 0654808A, Project 415, Landmine Warfare/Barrier - Eng Dev, once corrective action plans and trainer re-development are completed. The program will conclude in June 2020 under FY 2018 OPA R68260 / AREA MINE DETECTION SYSTEM (AMDS) and PAA E50510 / DEMO KIT, BLASTING: Munition Array Charge, XM335 for system qualification and production and receipt of LRIP quantities for an orderly program closeout.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev				Project (Number/Name) 434 / Anti-Personnel Landmine Alternatives (NSD)			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
434: Anti-Personnel Landmine Alternatives (NSD)	-	5.264	0.000	0.000	-	0.000	155.048	157.400	163.500	93.396	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
Spider Increment 1A will build upon the existing M7 Spider system. The M7 Spider system is a hand-emplaced, remotely controlled (Man-In-The-Loop) system that provides highly responsive terrain-shaping and protection capabilities. M7 Spider replaces persistent anti-personnel landmines, is compliant with US National Landmine policy, and has been fielded to US forces in support of Operation Enduring Freedom and currently being fielded to Engineers within Brigade Combat Teams in the Active and Army National Guard components. Additional capabilities will be developed to enhance the Spider Remote Control Station and demonstrate the ability to employ legacy Government-Off-The-Shelf (GOTS) lethal and non-lethal anti-personnel (AP) munitions and counter mobility obstacles. Spider Increment 1A will utilize an open system architecture to facilitate future munition integration.												
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Spider Engineering Support								0.713	-	-	-	-
Description: Perform engineering support.												
Title: Spider Test and Evaluation								2.898	-	-	-	-
Description: Provide support to Contractor/Government test activities.												
Title: Spider Management Services								1.653	-	-	-	-
Description: Program Management and support of Spider Increment 1A.												
Accomplishments/Planned Programs Subtotals								5.264	-	-	-	-
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost	
• B55501: SPIDER APLA Remote Control Unit	0.996	-	0.000	-	0.000	-	-	-	-	0.000	0.996	
• B54020: Spider Family of Networked Munitions Incr	4.500	13.345	10.930	-	10.930	13.982	8.648	7.515	4.024	0.000	62.944	

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army									Date: March 2019		
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev				Project (Number/Name) 434 / Anti-Personnel Landmine Alternatives (NSD)			
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• EK7: Area Denial Capability Development	66.050	42.234	79.932	-	79.932	-	-	-	-	0.000	188.216
Remarks											
Project EK7 is for the concept exploration and refinement of Terrain Shaping Obstacles.											
D. Acquisition Strategy											
The Spider Engineering Manufacturing Development (EMD) contract was a competitively awarded Cost Plus Incentive Fee EMD contract with a one year Firm-Fixed Price (FFP) Low Rate Initial Production (LRIP) option. A Government Level 3 Technical Data Package (TDP) will be delivered as part of the EMD contract. The modified TDP at the end of LRIP will be the basis of a Full Rate Production (FFP) contract.											
SAVO will consider using a Middle Tier of Acquisition for Rapid Prototyping and Fielding acquisition approach in accordance with Section 804 of the 2016 NDAA along with other acquisition strategy options. Development with utilize an Other Transaction Authority contract.											
E. Performance Metrics											
N/A											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev				Project (Number/Name) 434 / Anti-Personnel Landmine Alternatives (NSD)					
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Spider - Program Management	Various	PM-CCS, : Picatinny Arsenal, NJ	4.029	0.325		-		-		-		-	0.000	4.354	-
SBIR/STTR, FFRDC and Section 3001/3004 ATB Adjustments	Various	PM CCS, : Picatinny Arsenal, NJ	3.686	-		-		-		-		-	0.000	3.686	-
Subtotal			7.715	0.325		-		-		-		-	0.000	8.040	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Spider Non-Lethal Launcher (FY12)	SS/CPIF	Alliant Techsystems Operations, LLC : Plymouth, MN	0.667	-		-		-		-		-	0.000	0.667	-
Spider Inc 1A (FY13-16)	C/CPIF	Northrop Grumman Systems Corporation : Carson, CA	29.819	-		-		-		-		-	0.000	29.819	-
Rifleman Radio Systems	Reqn	General Dynamics, C4 Systems : Scottsdale, AZ	0.057	-		-		-		-		-	0.000	0.057	-
Subtotal			30.543	-		-		-		-		-	0.000	30.543	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Spider - ARDEC Eng support	MIPR	ARDEC, : Picatinny Arsenal, NJ	15.101	0.683		-		-		-		-	0.000	15.784	-
Contractor Engineering Support	C/FFP	TBD : TBD	-	0.030		-		-		-		-	0.000	0.030	-
Subtotal			15.101	0.713		-		-		-		-	0.000	15.814	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604808A / Landmine Warfare/Barrier - Eng Dev				Project (Number/Name) 434 / Anti-Personnel Landmine Alternatives (NSD)					
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Support Contractor/ Government Test Activities	MIPR	OTC, AMSAA, AEC, ATEC, NIE, TSMO, ARDEC : Various	3.502	4.226		-		-		-		-	0.000	7.728	-
Subtotal			3.502	4.226		-		-		-		-	0.000	7.728	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			56.861	5.264		0.000		-		-		-	0.000	62.125	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity		R-1 Program Element (Number/Name)		Project (Number/Name)	
2040 / 5		PE 0604808A / Landmine Warfare/Barrier - Eng Dev		434 / Anti-Personnel Landmine Alternatives (NSD)	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Interactive Electronic Training Manual (IETM) Validation (2)																												
Force Development Test (FDT)																												
Initial Operational Test (IOT)																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604808A / <i>Landmine Warfare/Barrier - Eng Dev</i>	Project (Number/Name) 434 / <i>Anti-Personnel Landmine Alternatives (NSD)</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
SPIDER Networked Munitions Increment 1A	1	2004	1	2005
Request For Proposal (RFP)	1	2013	1	2013
Source Selection	2	2013	4	2013
Spider Increment 1A Development	4	2013	4	2017
Contractor DT	3	2014	4	2015
Government DT	3	2015	3	2017
Limited User Test (LUT)	2	2016	3	2016
MS C Documentation	2	2016	3	2017
Interactive Electronic Training Manual (IETM) Validation (2)	3	2018	3	2018
Force Development Test (FDT)	3	2018	3	2018
Initial Operational Test (IOT)	4	2018	1	2019