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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 I BA 4: Advanced Component Development & Prototypes (ACD&P)					R-1 Program Element (Number/Name) PE 0603619A I Landmine Warfare and Barrier - Adv 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	-	69.237	45.198	92.915	-	92.915	6.963	0.000	0.000	0.000	Continuing	Continuing
606: Cntrmn/Barrier Adv Dev	-	3.187	2.964	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.151
BU5: Standoff Volcano Obstacle (SAVO) Adv Tech	-	0.000	0.000	12.983	-	12.983	6.963	0.000	0.000	0.000	0.000	19.946
EK7: Area Denial Capability Development	-	66.050	42.234	79.932	-	79.932	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program Element (PE) provides for the Concept Exploration and Refinement of Terrain Shaping Obstacles and develops alternatives to the Family of Scatterable Mines systems.

Project 606 enables component development of a new detection capability for explosive hazards, improvised explosive devices (IED), and components in support of route clearance operations. These capabilities will enhance the effectiveness of the Route Clearance Platoon within the Engineer Company, the Brigade Combat Team as well as with other related Army missions.

Project BU5 Standoff Activated Volcano Obstacle (SAVO) provides an interim Anti-Vehicle (AV) capability to address the Army's directed close tactical obstacle capability gap. FY 2020 funding resources the initiation of the SAVO program. 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.

Project EK7 Area Denial Capability Development will evaluate integrated technologies and prototype systems in a realistic operating environment to expedite technology transition for Terrain Shaping Obstacles. The obstacles will deny the enemy terrain and freedom of action while allowing friendly forces to maneuver freely within the same battle space. Area Denial Capability Development provides controlled scalable effects against mounted enemy forces that disrupt, turn, fix, delay or block their ability to maneuver. Area Denial Capability Development enables the Combatant Commander to shape the battle space without exposing friendly forces to enemy engagement and to actively detect and engage the enemy at all operational ranges. Area Denial Capability Development will utilize an open system and modular architecture to facilitate future development, maintenance, repair, and product improvements.

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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 4: Advanced Component Development & Prototypes (ACD&P)		R-1 Program Element (Number/Name) PE 0603619A / Landmine Warfare and Barrier - Adv Dev			
B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	72.909	45.254	98.627	-	98.627
Current President's Budget	69.237	45.198	92.915	-	92.915
Total Adjustments	-3.672	-0.056	-5.712	-	-5.712
• Congressional General Reductions	-0.059	-0.056			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.797	-			
• SBIR/STTR Transfer	-2.816	-			
• Adjustments to Budget Years	-	-	-5.712	-	-5.712
Change Summary Explanation					
FY 2018 Congressional General Reduction in the amount of \$0.059 million due to Section 8024 (f), Federally Funded Research and Development Center (FFRDC) reductions.					
FY 2018 SBIR/STTR Transfer in the amount of -\$2.816 million breakout: Project 606 is \$0.162 million and Project EK7 is \$2.654 million.					
FY 2018 Congressional Rescission of \$20M.					
FY 2019 Congressional General Reduction in the amount of \$0.056 million due to Section 8024 (f), Federally Funded Research and Development Center (FFRDC) reductions.					
FY 2019 SBIR/STTR Transfer in the amount of -\$1.643 million breakout: Project 606 is \$0.095 million and Project EK7 is \$1.548 million.					
FY 2020 funding decrease of \$5.712 million supports the Army's modernization priorities in support of the National Defense Strategy.					

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Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603619A / Landmine Warfare and Barrier - Adv Dev				Project (Number/Name) 606 / Cntrmn/Barrier Adv 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
606: Cntrmn/Barrier Adv Dev	-	3.187	2.964	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	6.151
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
Note Project funding was decreased to support the Army's Modernization priorities in support of the National Defense Strategy.												
A. Mission Description and Budget Item Justification Project 606 Countermine/Barrier Advanced Development enables development and evaluation of technologies that will perform detection, neutralization, and clearing of landmines and Improvised Explosive Devices (IEDs) at operational speeds. The Forward Reconnaissance and Explosive Hazard Detection (FREHD) system is a suite of four capabilities for use by route clearance patrols to provide standoff detection of explosive hazards: vehicle-mounted anomaly detection; pinpoint explosive hazard detection; explosive hazard vapor and particle detection; and remote visualization. FREHD increases the rate of advance of the route clearance formation while removing Soldiers and equipment from the proximity of blast and fragmentation. There are no FY 2020 Base Research, Development, Test & Evaluation (RDT&E) funds requested for this project.												
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Husky Mounted Detection System (HMDS) Engineering and Program Management Description: Supports System Engineering and Program Management								1.435	-	-	-	-
Title: HMDS Explosive Hazard Detection Technology Development Description: Explosive Hazard Detection Technology Analysis								1.478	-	-	-	-
Title: HMDS Explosive Hazard Detection Test and Evaluation Description: Explosive Hazard Detection Test and Evaluation								0.274	-	-	-	-
Title: Forward Reconnaissance and Explosive Hazard Detection (FREHD) FY 2019 Plans:								-	2.869	-	-	-

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Appropriation/Budget Activity 2040 / 4				R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>				Project (Number/Name) 606 / <i>Cntrmn/Barrier Adv Dev</i>				
B. Accomplishments/Planned Programs (\$ in Millions)												
								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Conduct the Milestone Decision Authority (MDA) delegation, the Materiel Development Decision (MDD), the Analysis of Alternatives (AoA) and the Milestone documentation for the initiation of Technology Maturation and Risk Reduction (TMRR)												
FY 2019 to FY 2020 Increase/Decrease Statement: In FY2020 FREHD has no funding												
Title: FY 2019 SBIR / STTR Transfer								-	0.095	-	-	-
FY 2019 Plans: SBIR / STTR Tax												
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer												
Accomplishments/Planned Programs Subtotals								3.187	2.964	-	-	-
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	
• 415: <i>Mine Neutral/Detection</i>	12.537	33.204	17.910	-	17.910	0.727	0.645	5.000	4.630	Continuing	Continuing	
• R64001: <i>HUSKY MOUNTED DETECTION SYSTEM (HMDS)</i>	16.695	35.834	83.082	34.253	117.335	152.437	67.879	-	-	0.000	390.180	
• R64002: <i>HMDS - GROUND PENETRATING RADAR</i>	16.695	35.834	53.700	34.253	87.953	57.453	12.129	-	-	0.000	210.064	
• R64003: <i>HMDS - DEEP BURIED DETECTION</i>	-	-	29.382	-	29.382	94.984	55.750	-	-	0.000	180.116	
Remarks PE 0604808 Project 415 Mine Neutralization and Detection is the engineering development follow-on to this funding line, and is a shared project line. The above profile represents the total line and all combined efforts.												
D. Acquisition Strategy The Husky Mounted Detection System (HMDS) program is pursuing an acquisition approach that delivers capability 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 FY 2018, as part Engineering Development activities, the program will execute an Engineering Change Proposal (ECP) to add a wire detection capability to address evolving threat, and Infrared illumination to enable nighttime operation. A second ECP to improve operational availability of the HMDS during inclement weather												

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<p>and address obsolescence and Cyber Security deficiencies will follow. As part of the Advanced Development activities, the HMDS Program will conduct additional development and evaluation of technologies to address a broader spectrum of emerging threats, interoperability with electronic countermeasures, and detection and neutralization of landmines and Improvised Explosive Devices (IEDs) at operational speeds.</p> <p>E. Performance Metrics 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 / 4						R-1 Program Element (Number/Name) PE 0603619A / Landmine Warfare and Barrier - Adv Dev				Project (Number/Name) 606 / Cntrmn/Barrier Adv 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
Program Management - HMDS	MIPR	PM Terrestrial Sensors : Fort Belvoir, VA	-	0.300		-		-		-		-	0.000	0.300	-
Program Management - FREHD	Allot	PM CCS : Picatinny Arsenal, NJ	-	-		0.133	Mar 2019	-		-		-	0.000	0.133	-
Subtotal			-	0.300		0.133		-		-		-	0.000	0.433	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 To Be Determined	TBD	TBD : TBD	-	0.780		-		-		-		-	0.000	0.780	-
FY19 SBIR / STTR	TBD	TBD : TBD	-	-		0.095		-		-		-	0.000	0.095	-
Subtotal			-	0.780		0.095		-		-		-	0.000	0.875	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
HMDS Explosive Hazard Detection - Technology Analysis	MIPR	TRADOC : Ft. Eustis, VA	-	0.488		-		-		-		-	0.000	0.488	-
HMDS Explosive Hazard Detection - Engineering Support	MIPR	CERDEC NVESD : Ft. Belvoir, VA	-	1.115		-		-		-		-	0.000	1.115	-
HMDS Explosive Hazard Detection - System Analysis and Test Design	FFRDC	IDA : Alexandria, VA	-	0.230		-		-		-		-	0.000	0.230	-
FREHD	MIPR	Various : Various	-	-		2.736	Mar 2019	-		-		-	0.000	2.736	-
Subtotal			-	1.833		2.736		-		-		-	0.000	4.569	N/A

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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 Explosive Hazard Detection	MIPR	ATEC : Alexandria, VA	-	0.274		-		-		-		-		Continuing	Continuing	-
Subtotal			-	0.274		-		-		-		-		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	-	3.187	2.964	-	-	-	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 / 4										R-1 Program Element (Number/Name) PE 0603619A / Landmine Warfare and Barrier - Adv Dev								Project (Number/Name) 606 / Cntrmn/Barrier Adv 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
HMDS/FREHD																																					

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / Landmine Warfare and Barrier - Adv Dev	Project (Number/Name) 606 / Cntrmn/Barrier Adv Dev

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
HMDS/FREHD	1	2018	4	2019

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603619A / Landmine Warfare and Barrier - Adv Dev				Project (Number/Name) BU5 / Standoff Volcano Obstacle (SAVO) Adv Tech			
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
BU5: Standoff Volcano Obstacle (SAVO) Adv Tech	-	0.000	0.000	12.983	-	12.983	6.963	0.000	0.000	0.000	0.000	19.946
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY 2020.

A. Mission Description and Budget Item Justification

This is a new start project starting in FY 2020. Project BU5 Standoff Activated Volcano Obstacle (SAVO) provides an interim Anti-Vehicle (AV) capability to address the Army's directed close tactical obstacle capability gap. FY 2020 funding resources the initiation of the SAVO program. 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.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: SAVO Rapid Prototyping	-	-	9.450	-	9.450
Description: Initiation of the SAVO system Rapid Prototyping phase.					
FY 2020 Base Plans: Performs SAVO system Rapid Prototyping phase to include; Initiation of new start effort, development of system design, conduct requirements review, development of test and evaluation hardware configurations and fabrication of prototype systems for early test and evaluation.					
FY 2019 to FY 2020 Increase/Decrease Statement: The increase from FY 2019 to FY 2020 is \$9.450 million as this is a new start effort.					
Title: Engineering Support	-	-	0.350	-	0.350
Description: Provide Engineering Support.					
FY 2020 Base Plans:					

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Appropriation/Budget Activity 2040 / 4		R-1 Program Element (Number/Name) PE 0603619A / Landmine Warfare and Barrier - Adv Dev		Project (Number/Name) BU5 / Standoff Volcano Obstacle (SAVO) Adv Tech		
B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Performs OGA and contract engineering support to the Integrated Product Team supporting the Rapid Prototyping effort.						
FY 2019 to FY 2020 Increase/Decrease Statement: The increase from FY 2019 to FY 2020 is \$0.350 million as this is a new start effort and there was no funding in FY 2019.						
Title: SAVO Management Services Description: Program Management and Support FY 2020 Base Plans: Performs program management of the SAVO program. FY 2019 to FY 2020 Increase/Decrease Statement: The increase from FY 2019 to FY 2020 is \$1.433 million as this is a new start effort and there was no funding in FY 2019.		-	-	1.433	-	1.433
Title: SAVO Test & Evaluation Description: Provides support to Contractor/Government test activities. FY 2020 Base Plans: Performs test and evaluation activities such as development of test and evaluation strategy and conduction of initial testing on the prototype systems. FY 2019 to FY 2020 Increase/Decrease Statement: The increase from FY 2019 to FY 2020 is \$1.750 million as this is a new start effort and there was no funding in FY 2019.		-	-	1.750	-	1.750
Accomplishments/Planned Programs Subtotals		-	-	12.983	-	12.983
C. Other Program Funding Summary (\$ in Millions)						
N/A						
Remarks						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) BU5 / <i>Standoff Volcano Obstacle (SAVO) Adv Tech</i>
<u>D. Acquisition Strategy</u> SAVO will utilize a Middle Tier of Acquisition for Rapid Prototyping and Fielding acquisition approach in accordance with Section 804 of the 2016 National Defense Authorization Act (NDAA). Development will utilize an Other Transaction Authority contract.		
<u>E. Performance Metrics</u> N/A		

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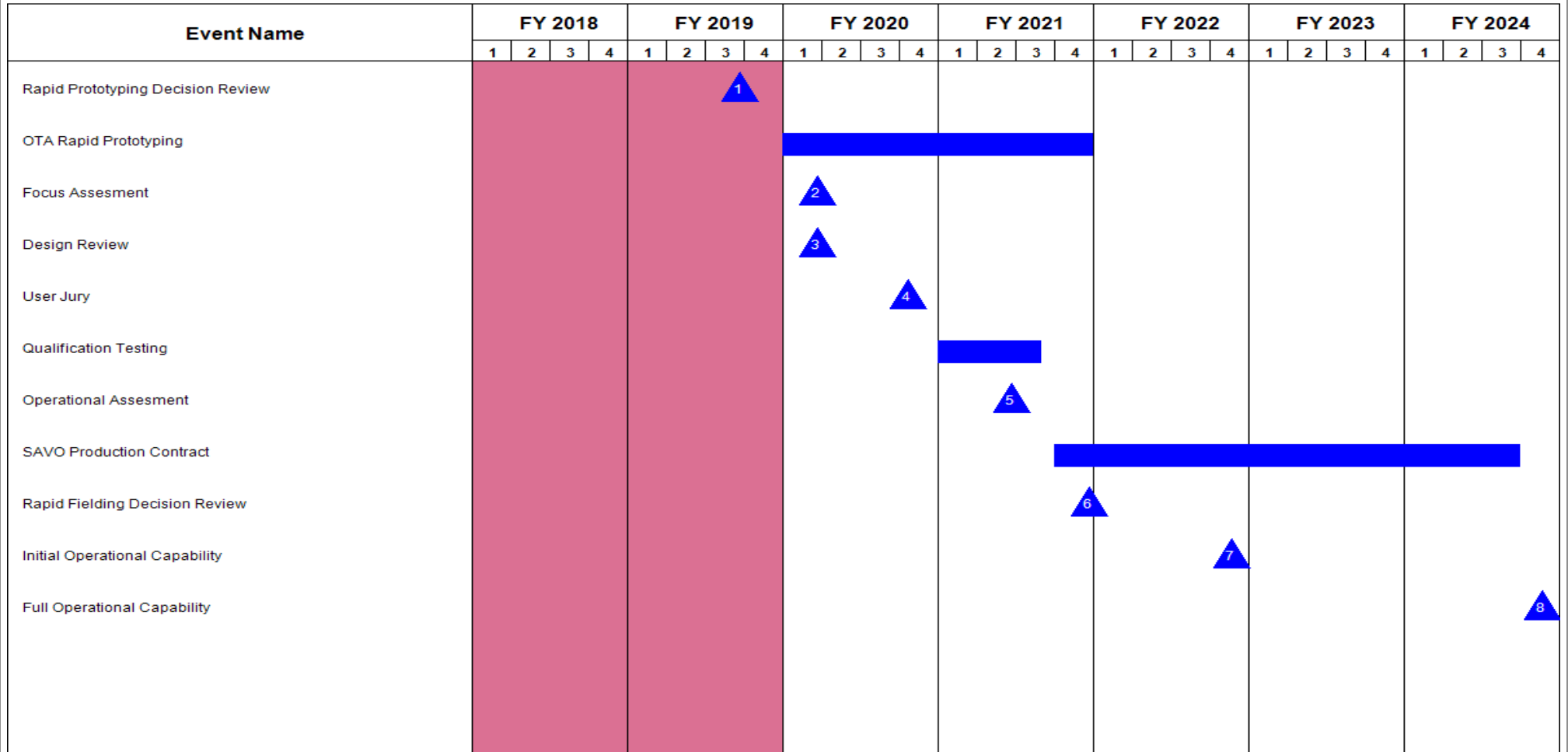
Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 4						R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>						Project (Number/Name) BU5 / <i>Standoff Volcano Obstacle (SAVO) Adv Tech</i>			
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
SAVO Program Management TDY and Support	MIPR	PM Close Combat Systems : Picatinny Arsenal, NJ	-	-		-		1.433	Jan 2020	-		1.433	0.000	1.433	-
Subtotal			-	-		-		1.433		-		1.433	0.000	1.433	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
DOTC Manufacture Support	C/CPIF	To Be Determined : To Be Determined	-	-		-		6.450	Nov 2019	-		6.450	0.000	6.450	-
Subtotal			-	-		-		6.450		-		6.450	0.000	6.450	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
ARL HRED MANPRINT Support	MIPR	Army Research Laboratory (ARL) - HRED : Picatinny Arsenal, NJ	-	-		-		0.050	Jan 2020	-		0.050	0.000	0.050	-
Contract Test and Engineering Support	C/CPIF	To Be Determined : To Be Determined	-	-		-		0.300	Jan 2020	-		0.300	0.000	0.300	-
SAVO - ARDEC Engineering Support	TBD	ARDEC : Picatinny Arsenal, NJ	-	-		-		3.000	Jan 2020	-		3.000	0.000	3.000	-
Subtotal			-	-		-		3.350		-		3.350	0.000	3.350	N/A

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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
Other Government Agencies and Support Contractors	MIPR	Army Test & Evaluation Command (ATEC) : TBD	-	-		-		1.750	May 2020	-		1.750	0.000	1.750	-
Subtotal			-	-		-		1.750		-		1.750	0.000	1.750	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			-	-		0.000		12.983		-		12.983	0.000	12.983	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) BU5 / <i>Standoff Volcano Obstacle (SAVO) Adv Tech</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Rapid Prototyping Decision Review	3	2019	3	2019
OTA Rapid Prototyping	1	2020	4	2021
Focus Assessment	1	2020	1	2020
Design Review	1	2020	1	2020
User Jury	4	2020	4	2020
Qualification Testing	1	2021	3	2021
Operational Assessment	2	2021	2	2021
SAVO Production Contract	4	2021	3	2024
Rapid Fielding Decision Review	4	2021	4	2021
Initial Operational Capability	4	2022	4	2022
Full Operational Capability	4	2024	4	2024

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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
EK7: Area Denial Capability Development	-	66.050	42.234	79.932	-	79.932	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
This project provides for the development of Terrain Shaping Obstacles.												
Area Denial Capability Development will evaluate integrated technologies and prototype systems in a realistic operating environment to expedite technology transition for Terrain Shaping Obstacles. The obstacles will deny the enemy terrain and freedom of action while allowing friendly forces to maneuver freely within the same battlespace. Area Denial Capability Development provides controlled scalable effects against mounted enemy forces that disrupt, turn, fix, delay or block their ability to maneuver. Area Denial Capability Development enables the Combatant Commander to shape the battle space without exposing friendly forces to enemy engagement and to actively detect and engage the enemy at all operational ranges. Area Denial Capability Development will utilize an open system and modular architecture to facilitate future development, maintenance, repair, and product improvements.												
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Area Denial Capability Development								34.230	25.583	59.976	-	59.976
Description: Develop and build system and sub-system level concepts that will be evaluated for affordability, feasibility, and technical maturity. Complete competitive development of systems and perform initiatives to mature technical feasibility and reduce risk.												
FY 2019 Plans: Will conduct analysis of munitions delivery system alternatives. Prepare for Milestone A decision to develop Terrain Shaping Obstacle munitions. Will award contract agreements to mature munitions technology and reduce program technical and cost risk.												
FY 2020 Base Plans: Conduct system level design, mature munitions technologies, mature obstacle delivery methods, integrate munitions into delivery system, mature system technology and reduce program technical and cost risk.												
FY 2019 to FY 2020 Increase/Decrease Statement: Funds were increased in FY 2020 to conduct Technology Maturation activities.												
Title: Engineering Support								10.283	12.165	12.766	-	12.766

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019		
Appropriation/Budget Activity 2040 / 4		R-1 Program Element (Number/Name) PE 0603619A / Landmine Warfare and Barrier - Adv Dev		Project (Number/Name) EK7 / Area Denial Capability Development		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: Provide Engineering Support. FY 2019 Plans: Will provide engineering support to analyze munitions delivery system alternatives, achieve Milestone A decision to develop Terrain Shaping Obstacle munitions, and award contract agreements to mature munitions technology and reduce program technical and cost risk. FY 2020 Base Plans: Provide engineering support for system development, integration, contractor developmental testing, system performance modeling and simulation, and risk reduction efforts. FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increase was attributable to revised engineering support plan.						
Title: Program Management and Oversight Description: Program Management and Support FY 2019 Plans: Will provide Program Management support to analyze munitions delivery system alternatives, achieve Milestone A decision to develop Terrain Shaping Obstacle munitions, and award contract agreements to mature munitions technology and reduce program technical and cost risk. Will conduct industry engagements and award Technology Maturation and Risk Reduction phase contracts/agreements to develop Terrain Shaping Obstacle munitions. FY 2020 Base Plans: Provide program management and oversight for system development, integration, contractor developmental testing, system performance modeling and simulation, and risk reduction efforts. Conduct long-range program planning, risk analysis, and program oversight. FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increase is attributable to assessment of PM support costs.		1.537	2.738	4.890	-	4.890
Title: Test & Evaluation Description: Provides support to Contractor/Government test activities. FY 2019 Plans:		-	0.200	2.300	-	2.300

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019	
Appropriation/Budget Activity 2040 / 4				R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>				Project (Number/Name) EK7 / <i>Area Denial Capability Development</i>			

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Develop test and evaluation strategy for initial prototype systems.					
<i>FY 2020 Base Plans:</i> Support contractor lead developmental testing as needed and conduct a test to assess technology readiness for engineering and manufacturing development.					
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 increase was attributable to revised Test and Evaluation plans.					
<i>Title:</i> FY 2018 Congressional Rescission	20.000	-	-	-	-
<i>Title:</i> FY 2019 SBIR / STTR Transfer <i>Description:</i> FY 2019 SBIR / STTR Transfer	-	1.548	-	-	-
<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	66.050	42.234	79.932	-	79.932

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
• 0604808A: <i>Landmine Warfare/Barrier - Eng Dev</i>	26.188	43.064	39.208	-	39.208	166.902	159.442	170.596	100.426	Continuing	Continuing
Remarks											
PE 0604808A Project 434 Anti-personnel Landmine Alternatives (NSD) is the engineering and manufacturing development follow-on to this funding line, and is a shared project line. The above profile represents the total program element, not only the follow-on activities of the program.											
D. Acquisition Strategy											
The Dominating Mobility Through Terrain Shaping and Engagement (DMTTS&E) Initial Capabilities Document (ICD) was approved by the Joint Requirements Oversight Council (JROC) on 3 October 2014. The DMTTS&E ICD documents Terrain Shaping Obstacle (TSO) capabilities at all operational ranges including those within line-of-sight and those that are beyond line-of-sight. The Army awarded four concept prototype contracts/agreements to develop representative prototypes (hardware and/or models) which were used to assess the TSO concepts, technical risks, and costs of potential munitions systems and associated capabilities. The Army has awarded											

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) EK7 / <i>Area Denial Capability Development</i>
<p>two initiatives to develop representative prototypes of top attack munitions to assess concept feasibility, maturity and technical risk. The Army intends to develop the TSO munitions system and associated capabilities. The TSO system will eventually be packaged into various delivery methods for employment at all operational ranges; however, the Army plans to initially develop and field the TSO capability at close operational ranges. The Army intends to competitively award up to two Technology Maturation and Risk Reduction (TMRR) contracts/agreements in FY 2019 to develop competing prototypes of the TSO munitions and associated capabilities, which includes close-range delivery mechanisms. As the munitions system matures, the items will be available for integration into additional delivery methods for employment across the entire range of operations.</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 / 4						R-1 Program Element (Number/Name) PE 0603619A / Landmine Warfare and Barrier - Adv Dev				Project (Number/Name) EK7 / Area Denial Capability Development					
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
Program	MIPR	PM-CCS : Picatinny Arsenal, NJ	12.004	1.537	Jul 2018	2.433	Feb 2019	1.740	Nov 2019	-		1.740	Continuing	Continuing	-
Scorpion Contract Closeout	MIPR	General Dynamics : TBD	-	-		0.305		-		-		-	0.000	0.305	-
SBIR/STTR/FFRDC	MIPR	PM CCS : Picatinny Arsenal, NJ	-	-		-		3.150	Nov 2019	-		3.150	Continuing	Continuing	-
FY 2018 Congressional Rescission	TBD	TBD : TBD	-	20.000		-		-		-		-	0.000	20.000	-
Subtotal			12.004	21.537		2.738		4.890		-		4.890	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
Prototype Development D	SS/CPFF	Northrop Grumman Systems Corporation : Redondo Beach, CA	6.973	0.430	Apr 2018	-		-		-		-	0.000	7.403	-
Top Attack Prototype Development A	SS/CPFF	Orbital ATK : Plymouth, MN	7.962	0.422	Apr 2018	-		-		-		-	0.000	8.384	-
Top Attack Prototype Development B	SS/CPFF	Textron Defense Systems : Wilmington, MA	11.569	0.949	Aug 2018	-		-		-		-	0.000	12.518	-
Technology Maturation Risk Reduction (TMRR) Development A	C/TBD	TBD : TBD	-	-		11.183	Jun 2019	29.988	Feb 2020	-		29.988	Continuing	Continuing	-
Technology Maturation Risk Reduction (TMRR) Development B	C/TBD	TBD : TBD	-	-		11.183	Jun 2019	29.988	Feb 2020	-		29.988	Continuing	Continuing	-
Common Component Communications Study	SS/CPFF	NAL Research Corporation : Manassas, Virginia	-	3.454	Aug 2018	0.708	Feb 2019	-		-		-	0.000	4.162	-

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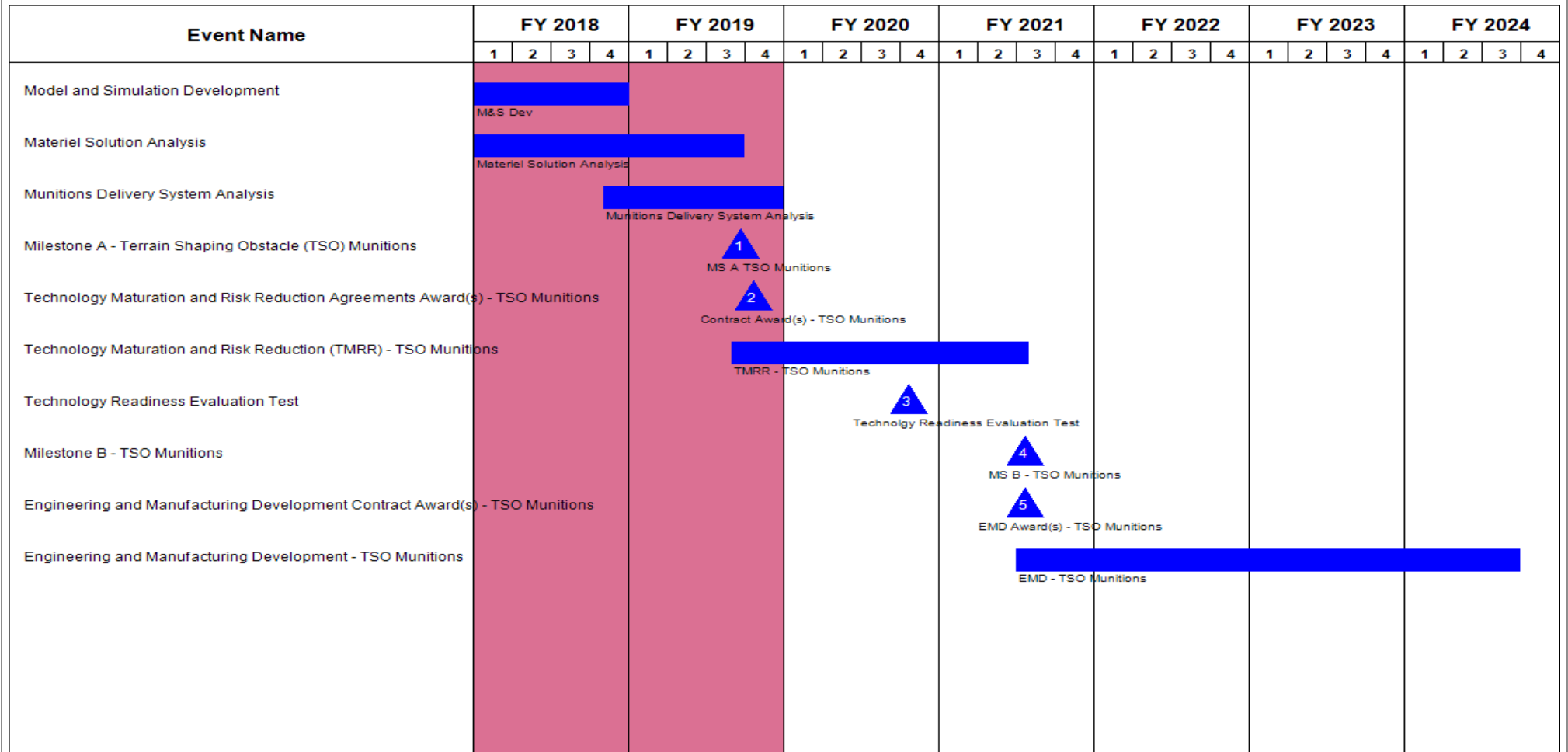
Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 4						R-1 Program Element (Number/Name) PE 0603619A / Landmine Warfare and Barrier - Adv Dev				Project (Number/Name) EK7 / Area Denial Capability Development					
Product Development (\$ 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
Secure Communications Network	SS/CPFF	NGMS : Redondo Beach, CA	-	14.488	Aug 2018	-		-		-		-	0.000	14.488	-
Secure Communications Network	SS/CPFF	Textron Defense Systems : Wilmington, MA	-	14.488	Aug 2018	-		-		-		-	0.000	14.488	-
Prototype Manufacturing Support Contractor	C/CPIF	To Be Determined : To Be Determined	-	-		2.510	Jun 2019	-		-		-	0.000	2.510	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		1.548		-		-		-	0.000	1.548	-
Subtotal			26.504	34.231		27.132		59.976		-		59.976	Continuing	Continuing	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
ARDEC Engineering Support	MIPR	ARDEC : Picatinny Arsenal, NJ	9.820	5.578	Mar 2018	7.673	Dec 2018	6.830	Dec 2019	-		6.830	Continuing	Continuing	-
CERDEC Engineering Support	MIPR	CERDEC : Fort Belvoir, VA	1.059	0.889	Mar 2018	0.368	Jan 2019	0.745	Jan 2020	-		0.745	Continuing	Continuing	-
Mitre Engineering Support (C4)	FFRDC	Mitre : McLean, VA	2.697	-		1.080	Aug 2019	1.112	Aug 2020	-		1.112	Continuing	Continuing	-
Fibertek, INC. Operational Contractor Support	C/CPFF	FIBERTEK, INC. : Herndon, VA	0.601	0.130	Feb 2018	-		-		-		-	0.000	0.731	-
General Program Support	C/FFP	Millennium Corporation : Picatinny Arsenal, NJ	0.023	0.425	Mar 2018	-		-		-		-	0.000	0.448	-
General Program Support	C/FFP	To Be Determined : Picatinny Arsenal, NJ	-	-		0.329	May 2019	0.345	May 2020	-		0.345	0.000	0.674	-
ARL Engineering Support	MIPR	ARMY RESEARCH LABORATORY (ARL) : Adelphi, MD	1.486	0.776	Aug 2018	0.682	Jan 2019	0.832	Jan 2020	-		0.832	Continuing	Continuing	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 4						R-1 Program Element (Number/Name) PE 0603619A / Landmine Warfare and Barrier - Adv Dev				Project (Number/Name) EK7 / Area Denial Capability Development					
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
Milestone Document Development Support	SS/CPAF	Booze Allen Hamilton : Picatinny Arsenal, NJ	-	2.484	Mar 2018	1.173	Feb 2019	-		-		-	0.514	4.171	-
Milestone Document Development Support	C/CPAF	TBD : Picatinny Arsenal, NJ	-	-		-		2.102	Mar 2020	-		2.102	0.000	2.102	-
NVESD Engineering Support	MIPR	NVESD : Fort Belvoir, VA	0.893	-		0.580	Jan 2019	0.600	Jan 2020	-		0.600	Continuing	Continuing	-
Product Support Integration	SS/FFP	TBD : Picatinny Arsenal, NJ	-	-		0.200	Jan 2019	0.200	Jan 2020	-		0.200	Continuing	Continuing	-
Air Worthiness Certification	MIPR	AMRDEC : Redstone Arsenal, AL	-	-		0.010	Dec 2018	-		-		-	0.000	0.010	-
Integrated Logistics Support	MIPR	TACOM ILSC : Warren, MI	-	-		0.069	Dec 2018	-		-		-	0.000	0.069	-
Subtotal			16.579	10.282		12.164		12.766		-		12.766	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
Technology Readiness Evaluation Test	MIPR	TBD : TBD	-	-		-		2.300	Apr 2020	-		2.300	0.000	2.300	-
Other Government Agency T&E Support	TBD	TBD : TBD	-	-		0.200		-		-		-	0.000	0.200	-
Subtotal			-	-		0.200		2.300		-		2.300	0.000	2.500	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			55.087	66.050		42.234		79.932		-		79.932	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 / 4		R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>		Project (Number/Name) EK7 / <i>Area Denial Capability Development</i>	



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603619A / <i>Landmine Warfare and Barrier - Adv Dev</i>	Project (Number/Name) EK7 / <i>Area Denial Capability Development</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Area Denial Capability Development	2	2025	1	2026
Model and Simulation Development	1	2016	4	2018
Concept Prototype Build	2	2016	4	2016
Concept Prototype Test and Evaluation	1	2017	1	2017
Analysis of Alternatives	1	2016	4	2016
Materiel Solution Analysis	1	2017	3	2019
Munitions Delivery System Analysis	4	2018	4	2019
Milestone A - Terrain Shaping Obstacle (TSO) Munitions	3	2019	3	2019
Technology Maturation and Risk Reduction Agreements Award(s) - TSO Munitions	4	2019	4	2019
Technology Maturation and Risk Reduction (TMRR) - TSO Munitions	3	2019	3	2021
Technology Readiness Evaluation Test	4	2020	4	2020
Milestone B - TSO Munitions	3	2021	3	2021
Engineering and Manufacturing Development Contract Award(s) - TSO Munitions	3	2021	3	2021
Engineering and Manufacturing Development - TSO Munitions	3	2021	3	2024