Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Army											Date: February 2018	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 0607131A / *Weapons and Munitions Product Improvement Programs*							
COST ($ in Millions)	**Prior Years**	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
Total Program Element	-	19.969	15.738	16.022	2.548	18.570	12.740	9.023	4.952	2.198	Continuing	Continuing
ER2: *Close Combat Technology*	-	6.036	3.774	3.147	-	3.147	2.056	0.000	0.000	0.000	Continuing	Continuing
ER5: *Indirect Fire and Fuze Technology*	-	2.525	2.268	2.820	-	2.820	5.387	5.387	4.200	2.025	0.000	24.612
ER6: *Direct Fire Technology*	-	11.408	9.696	10.055	2.548	12.603	5.297	3.636	0.752	0.173	Continuing	Continuing

Note

In FY 2019, Program Element (PE) 0603639A, Project EL8, Lightweight Cartridge Case for Small Caliber, will transition to PE 0607131, Project ER6, Direct Fire Technology. This project is not a new start.

A. Mission Description and Budget Item Justification

Project ER2: The Close Combat Technology program includes development efforts to upgrade Close Combat technologies, energetics, and munitions, such as counter explosives, grenades, demolitions, shoulder launched munitions, pyrotechnic simulators, countermeasure flares, non-lethal ammunition/systems, networked munitions and mines, that have been fielded or have received approval for full rate production. This program will identify, characterize, study, analyze, test and develop technologies to resolve close combat munition reliability, safety, environmental, storage, standardization, obsolescence and manufacturing/producibility issues.

FY 2019 funds resource improvements to the following programs: MK3A2 Offensive Hand Grenade, AN-M82A1 Obscuration Grenade, M82 Simulant Smoke Practice Grenade Improved Propellant Retainer, and M84 Stun Grenade Design.

Project ER5: The Indirect Fire and Fuze Technology project includes product improvement development efforts to upgrade indirect fire weapon systems and munitions that have already been fielded and/or are in production. Indirect Fire Weapons and Munitions Product Improvement Projects include improved target engagement, increased reliability, availability, maintainability, and safety, standardization and interoperability with weapons and munitions of Allied Nations, defense exportability features, reduction of failure mechanisms, and supply chain risk through introduction of new and alternative technology and materiel solutions, improvement of manufacturing methods and their associated production and life cycle support processes, new capabilities in response to the evolving and emerging threats and countermeasures, and reduction/elimination of potential environmental and health risks associated with these products.

This supports the identification, study, analysis, and development of fuzing technologies and Safe & Arm (S&A) devices in production and in the field. This project will implement technologies into fuzing systems to preclude obsolescence, maximize standardization, enhance performance, and improve the safety and exportability of existing munitions. The project addresses two major areas: (1) analysis and (2) block upgrades. Analysis efforts will identify second sources for fuzing systems that may reduce costs by providing competition, and maintain production when sources or parts are no longer available. It will also allow for the performance enhancement of current ammunition items by conducting studies of major fuze components to detect and identify latent defects. The second major area is block upgrades, which will

identify and perform studies on improvements to fuzes, increase commonality of fuze components and requirements. Block upgrades will enable the introduction of the latest technologies into fuzing, keep the fuzing design current to avoid obsolescence issues, and add capabilities.

FY 2019 will support modeling and simulation on medium caliber S&A modifications, will evaluate medium caliber prototype modifications against performance requirements, will conduct studies on mortar fuze design architecture with the latest Fuze safety guidelines to preclude component obsolescence, will conduct studies on hand grenade fuze to reduce the number of critical defects that will improve producibility and increase safety, will conduct engineering tests to prove-out electronic transceiver replacement prototypes for indirect fire and direct fire proximity fuzes, will conduct studies on artillery fuze electronic safe and arm designs for low cost safe and arm performance enhancements, and will evaluate optimized impact switch prototypes.

Project ER6: The Direct Fire Technology funding will be used to support direct fire ammunition from small caliber ammunition, 40mm grenade, medium caliber cannon ammunition and large caliber ammunition enhancements to lethality, effectiveness, survivability, accuracy and general product improvements. FY 2019 funds are used for a more lethal and safer design for 40mm grenades that will be built and tested. Warhead improvement and primer improvement for the 30mm Apache ammunition are also under development. A number of studies on potential improvements for training ammunition and environmentally friendly primers will be conducted. Potential improvements to 105mm and 120mm ammunition will be examined.

B. Program Change Summary ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	19.617	15.738	13.599	-	13.599
Current President's Budget	19.969	15.738	16.022	2.548	18.570
Total Adjustments	0.352	0.000	2.423	2.548	4.971
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	0.352	-	2.423	-	2.423
• Other Adjustments 1	-	-	0.000	2.548	2.548

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0607131A / *Weapons and Munitions Product Improvement Programs*	Project (Number/Name) ER2 / *Close Combat Technology*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
ER2: *Close Combat Technology*	-	6.036	3.774	3.147	-	3.147	2.056	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program includes development efforts to upgrade Close Combat technologies, energetics, and munitions, such as counter explosives, grenades, demolitions, shoulder launched munitions, pyrotechnic simulators, countermeasure flares, non-lethal ammunition/systems, networked munitions and mines, that have been fielded or have received approval for full rate production. This program will identify, characterize, study, analyze, test and develop technologies to resolve close combat munition reliability, safety, environmental, storage, standardization, obsolescence and manufacturing/producibility issues.

FY 2019 funds will resource improvements to the following programs: MK3A2 Offensive Hand Grenade, AN-M8A1 Obscuration Grenade, M82 Simulant Smoke Practice Grenade Improved Propellant Retainer, and M84 Stun Grenade Design.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Claymore Force-on-Force Training Aids, Devices, Simulators, and Simulations (TADSS) Trainer ***Description:*** Develop an improved Claymore Force-on-Force Training Aids, Devices, Simulators, and Simulations (TADSS) Trainer. The Claymore does not have a TADSS trainer with sight, sound & Multiple Integrated Laser Engagement System (MILES) capability. Development of an improved Claymore trainer will allow Claymore to be trained at Combat Training Centers (CTCs) and will provide more realistic and effective training for the user when they are training Claymore as an end item and when training Claymore as initiated by Spider.	0.914	-	-	-	-
Title: MK3A2 Replacement, Offensive Hand Grenade Effort ***Description:*** The Current MK3A2 Offensive Hand Grenade can expose the warfighter to toxic levels of asbestos and is restricted for use in Continental United States and Outside Continental United State (CONUS/OCONUS). The warfighter cannot safely employ this grenade. Alternate munitions do not satisfy user requirements for incapacitating the enemy. This effort incorporates modern materials and insensitive explosives to provide a safer, producible offensive grenade. ***FY 2018 Plans:***	2.481	0.867	0.182	-	0.182

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607131A / *Weapons and Munitions Product Improvement Programs*	**Project (Number/Name)** ER2 / *Close Combat Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Both Production Qualification and Arena testing will be conducted as well as documentation for Type Classification (TC) (planned for 3QFY19). ***FY 2019 Base Plans:*** Complete TC/FMR documentation. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Decreased ARDEC support is required in FY19.					
Title: Countermeasure Flare Decoy Formulations ***Description:*** Improve the producibility of countermeasure (CM) decoy formulations in order to increase the production safety and functional reliability to protect aircraft against multiple threat systems. ***FY 2018 Plans:*** Improve the producibility of countermeasure (CM) decoy formulations and solutions in order to increase the production safety and functional reliability and performance improvement of solutions to protect aircraft against multiple threat systems. Develop prototype solutions and conduct testing. Effort will result in a production representative prototype countermeasure solutions. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Effort ends in FY18; no FY19 funds required.	0.548	1.635	-	-	-
Title: AN-M8A1 Obscuration Grenade ***Description:*** This effort supports the Type Classification/Production Prove Out of an improved obscurant grenade that provides the warfighter with screening performance of the legacy AN-M8 smoke grenade without exposing Soldiers to the toxic effects of that legacy grenade's Hexachloroethane smoke. Use of the AN-M8 Obscuration Grenade has been discontinued inside and outside the Continental United States (CONUS/ OCONUS) due to restrictions on the use of Hexachloroethane on the battlefield. The M83 training smoke grenade is currently used in lieu of the AN-M8 in both training and tactical operations. However, since the M83 does not give screening performance comparable to the legacy AN-M8 grenade, the current warfighter strategy is to use two M83 Obscuration Grenades in lieu of a single AN-M8. ***FY 2018 Plans:*** Requirement Validation and completion of the HX grenade fill Toxicity Study. Assessment of suitability of the legacy M201A1 Fuze for use with the proposed HX fill, and detailed review of the AN-M8 Technical Data	0.192	1.272	1.266	-	1.266

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607131A / *Weapons and Munitions Product Improvement Programs*	**Project (Number/Name)** ER2 / *Close Combat Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Package (TDP) for adequacy to support future production. Also, development of a plan to facilitize Pine Bluff Arsenal (PBA) for future production of the M8A1. ***FY 2019 Base Plans:*** Perform Energetic Material Qualification Testing (EMQ) testing. Review/Finalize Technical Data Package. Coordinate with Pine Bluff Arsenal (PBA) to ensure PBA programs required production facility upgrades, in synchronization with PM CCS program objectives, to establish an AN-M8A1 production capability that currently does not exist. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Reduced ARDEC support required.					
Title: M84 Stun Grenade Design ***Description:*** The M84 Stun Grenade was previously procured using a performance specification acquisition approach. Based on upcoming buys due to increased quantities, the current detailed TDP needs to be evaluated to ensure a consistent design. ***FY 2019 Base Plans:*** Work to complete TDP validation and testing is required, as well as complete TC/FMR activities. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** New improvement effort funded in FY19; not previously funded.	-	-	1.080	-	1.080
Title: M82 Simulant Smoke Practice Grenade ***Description:*** The M82 encountered performance issues during the last production as a result of the less than optimal design for the base. Developing a new base design that minimizes any leak paths and facilitates the metal clip contact surface with the launcher will greatly improve the producibility and reliability of the grenade. This effort consists of the development and prove out of the base design. ***FY 2019 Base Plans:*** Develop base design, procure mold and parts for testing. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** New improvement effort funded in FY19; not previously funded.	-	-	0.619	-	0.619
Title: FASCAM	1.901	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607131A / *Weapons and Munitions Product Improvement Programs*	**Project (Number/Name)** ER2 / *Close Combat Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Description: This effort supports the development of a new Deep Terrain Shaping Obstacle (DTSO). The current DTSO in the U.S. inventory has a life expectancy of 36 years (losing capability in 2025). The methods used to make this determination are unknown. Testing effort is to determine the actual life expectancy and effectiveness of the current DTSO system in order to decide when a replacement capability needs to be fielded. In parallel, evaluation the technical data package and determining the cost of producing additional units of the current DTSO.					
Accomplishments/Planned Programs Subtotals	6.036	3.774	3.147	-	3.147

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The strategy for the MK3A2 Offensive Hand Grenade is to develop, test and qualify a new design that eliminates the toxic hazards and provides the required performance for the user in FY19. Follow-on procurement efforts will be competitive pending market research.
The strategy for the AN-M8A1 is to develop a safer smoke for use by the soldiers that meet the existing requirements. Once the smoke fill is developed and qualified, the plan is to examine the potential use of adding this capability to Pine Bluff Arsenal.
The strategy for the M84 Stun Grenade is to complete the development of the technical date package and test/qualify the design prior to being used in future competitive pending the results of a market survey.
The M82 program is updating the design of specific parts to make it more producible and will be proving out the design for use in future production efforts.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0607131A / *Weapons and Munitions Product Improvement Programs*	Project (Number/Name) ER2 / *Close Combat Technology*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MK3A2 Replacement, Offensive Hand Grenade	MIPR	PM CCS : Picatinny Arsenal, NJ	-	-		0.090		-		-		-	Continuing	Continuing	-
AN-M8A1 Enhanced Obscuration Grenade	MIPR	PM CCS : Picatinny Arsenal, NJ	-	-		0.150		-		-		-	Continuing	Continuing	-
M82 Simulant Smoke Practice Grenade Improved Propellant Retainer	MIPR	PM CCS : Picatinny Arsenal, NJ	-	-		-		0.044	Jan 2019	-		0.044	Continuing	Continuing	-
M84 Stun Grenade	MIPR	PM-CCS : Picatinny Arsenal, NJ	-	-		-		0.048	Jan 2019	-		0.048	Continuing	Continuing	-
		Subtotal	-	-		0.240		0.092		-		0.092	Continuing	Continuing	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Claymore Force-on-Force TADSS Trainer - Design, Develop and Deliver a Production Prototype	MIPR	ARDEC : Picatinny Arsenal, NJ	0.353	0.914	May 2017	-		-		-		-	Continuing	Continuing	-
MK3A2 Replacement, Offensive Hand Grenade	C/FFP	Battelle Memorial Institute : Columbus, OH	0.359	0.189	Apr 2017	-		-		-		-	Continuing	Continuing	-
M82 Simulant Smoke Practice Grenade Improved Propellant Retainer	MIPR	ARDEC : Picatinny Arsenal. NJ	-	-		-		0.381	Jan 2019	-		0.381	Continuing	Continuing	-
		Subtotal	0.712	1.103		-		0.381		-		0.381	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0607131A / *Weapons and Munitions Product Improvement Programs*	Project (Number/Name) ER2 / *Close Combat Technology*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MK3A2 Replacement, Offensive Hand Grenade	MIPR	ARDEC : Picatinny Arsenal	-	1.227	May 2017	0.660		0.182	Dec 2018	-		0.182	Continuing	Continuing	-
Countermeasure Flare Decoy Formulations	MIPR	ARDEC : Picatinny Aresenal, NJ	-	0.269	Aug 2017	0.415		-		-		-	Continuing	Continuing	-
Countermeasure Flare Decoy Formulations	MIPR	CERDEC Flight Testing Support : Lakehurst, NJ	-	-		0.170		-		-		-	Continuing	Continuing	-
AN-M8A1 Enhanced Obscuration Grenade	MIPR	ARDEC : Picatinny Arsenal, NJ	-	0.125	Aug 2017	0.413		0.429	Jan 2019	-		0.429	Continuing	Continuing	-
AN-M8A1 Enhanced Obscuration Grenade	MIPR	ECBC : Edgewood, MD	-	-		0.387		0.370	Jan 2019	-		0.370	Continuing	Continuing	-
AN-M8A1 Enhanced Obscuration Grenade	MIPR	Pine Bluff : Pine Bluff Arsenal	-	0.067	Jan 2017	0.322		0.244	Jan 2019	-		0.244	Continuing	Continuing	-
MK3A2 Replacement, Offensive Hand Grenade	MIPR	Defense Information Technical Center : Fort Belvoir, VA	-	0.007	Mar 2017	-		-		-		-	Continuing	Continuing	-
M82 Simulant Smoke Practice Grenade Improved Propellant Retainer	MIPR	ECBC : Edgewood, MD	-	-		-		0.095	Jan 2019	-		0.095	Continuing	Continuing	-
M82 Simulant Smoke Practice Grenade Improved Propellant Retainer	MIPR	Pine Bluff Arsenal : PBA, AR	-	-		-		0.099	Mar 2019	-		0.099	Continuing	Continuing	-
M84 Stun Grenade	MIPR	ARDEC : Picatinny Arsenal, NJ	-	-		-		0.832	Jan 2019	-		0.832	Continuing	Continuing	-
MK3A2 Replacement, Offensive Hand Grenade	MIPR	DTIC : Ft. Belvoir,VA	-	0.001	Oct 2017	-		-		-		-	Continuing	Continuing	-
FASCAM Study - Mine Design and Producibility Review	C/CPFF	Savit : Rockaway, NJ	-	0.401	Aug 2017	-		-		-		-	Continuing	Continuing	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army			Date: February 2018
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Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FASCAM Study - Gator Landmine System Reliability Review	MIPR	ARDEC : Picatinny Arsenal, NJ	-	0.440		-		-		-		-	Continuing	Continuing	-
FASCAM Study - GATOR Drop Test	MIPR	ARDEC : Picatinny Arsenal, NJ	-	0.160		-		-		-		-	Continuing	Continuing	-
MK3A2 Replacement, Offensive Hand Grenade	MIPR	Nova Tech : NJ	-	0.104	Aug 2017	-		-		-		-	Continuing	Continuing	-
FASCAM Study - YPG Gator Component Testing	MIPR	Yuma Proving Ground (YPG) : Yuma, AZ	-	0.383		-		-		-		-	Continuing	Continuing	-
FASCAM Study - ARDEC Gator Component Testing	MIPR	ARDEC : Picatinny Arsenal, NJ	-	0.290		-		-		-		-	Continuing	Continuing	-
FASCAM Study - ARDEC Gator Component Testing	MIPR	ARDEC : Picatinny Arsenal, NJ	-	0.227		-		-		-		-	Continuing	Continuing	-
		Subtotal	-	3.701		2.367		2.251		-		2.251	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MK3A2 Replacement, Offensive Hand Grenade	MIPR	Army Test and Evaluation Command : Aberdeen Proving Grounds, MD	-	0.626	Aug 2017	-		-		-		-	Continuing	Continuing	-
MK3A2 Replacement, Offensive Hand Grenade	MIPR	Fort Hood, Tx : TBD	-	-		0.117		-		-		-	Continuing	Continuing	-
Countermeasure Flare Decoy Formulations	MIPR	Naval Air Warefare Center Aircraft Division : Patuxent River, MD	-	0.150	Sep 2017	0.300		-		-		-	Continuing	Continuing	-
Countermeasure Flare Decoy Formulations	MIPR	Naval Air Warfare Center Weapons	-	0.129	Sep 2017	0.750		-		-		-	Continuing	Continuing	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0607131A / *Weapons and Munitions Product Improvement Programs*	Project (Number/Name) ER2 / *Close Combat Technology*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Division - Flight Testing : China Lake, CA													
MK3A2 Replacement, Offensive Hand Grenade	MIPR	ATEC : Aberdeen Proving Grounds, NJ	-	0.147	Jan 2018	-		-		-		-	Continuing	Continuing	-
MK3A2 Replacement, Offensive Hand Grenade	MIPR	Dugway Proving Grounds : UT	-	0.024	Aug 2017	-		-		-		-	Continuing	Continuing	-
MK3A2 Replacement, Offensive Hand Grenade	MIPR	Various : Various	-	0.116	Jan 2018	-		-		-		-	Continuing	Continuing	-
MK3A2 Replacement, Offensive Hand Grenade	MIPR	Public Health Command : MD	-	0.040	Jan 2018	-		-		-		-	Continuing	Continuing	-
AN-M8A1 Enhanced Obscuration Grenade	MIPR	ARDEC : Picatinny Arsenal. NJ	-	-		-		0.112	Nov 2018	-		0.112	Continuing	Continuing	-
AN-M8A1 Enhanced Obscuration Grenade	MIPR	Pine Bluff Arsenal (PBA) : Pine Bluff Arsenal, AR	-	-		-		0.111	Nov 2018	-		0.111	Continuing	Continuing	-
M84 Stun Grenade	MIPR	TBD : TBD	-	-		-		0.200	Mar 2019	-		0.200	Continuing	Continuing	-
		Subtotal	-	1.232		1.167		0.423		-		0.423	Continuing	Continuing	N/A

	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.712	6.036		3.774		3.147		-		3.147	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607131A / *Weapons and Munitions Product Improvement Programs*	**Project (Number/Name)** ER2 / *Close Combat Technology*

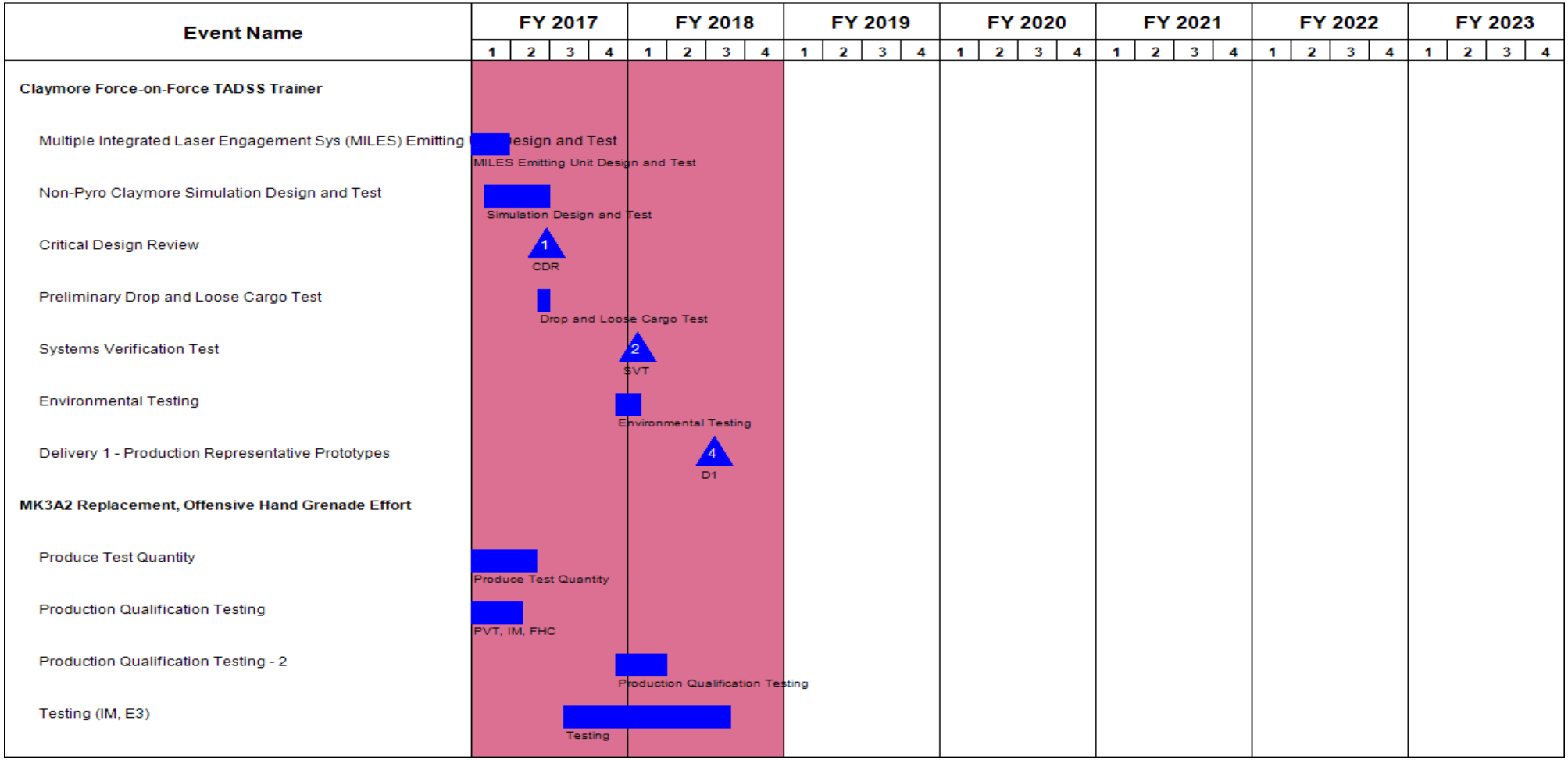

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607131A / *Weapons and Munitions Product Improvement Programs*	**Project (Number/Name)** ER2 / *Close Combat Technology*

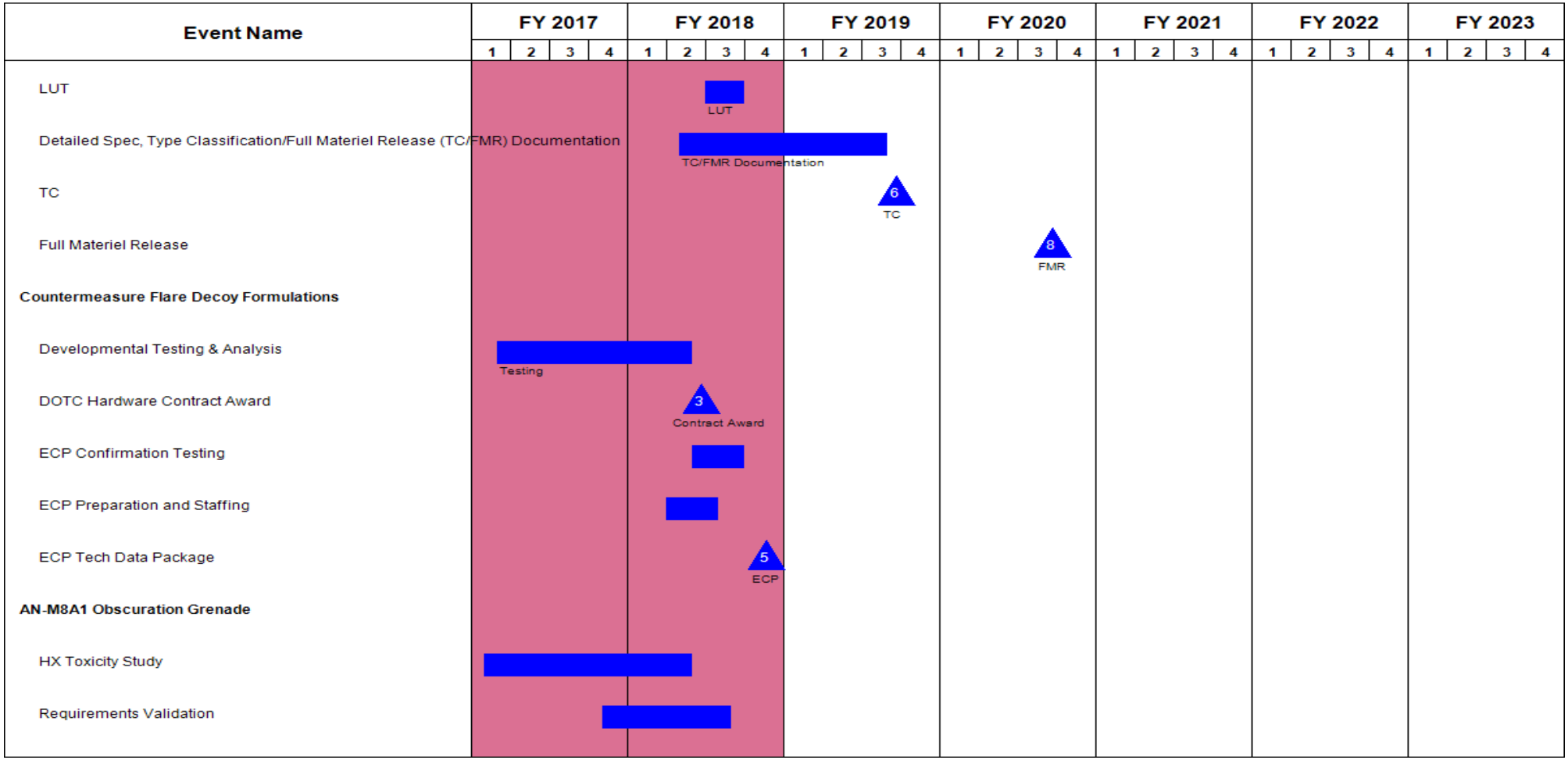

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607131A / *Weapons and Munitions Product Improvement Programs*	**Project (Number/Name)** ER2 / *Close Combat Technology*

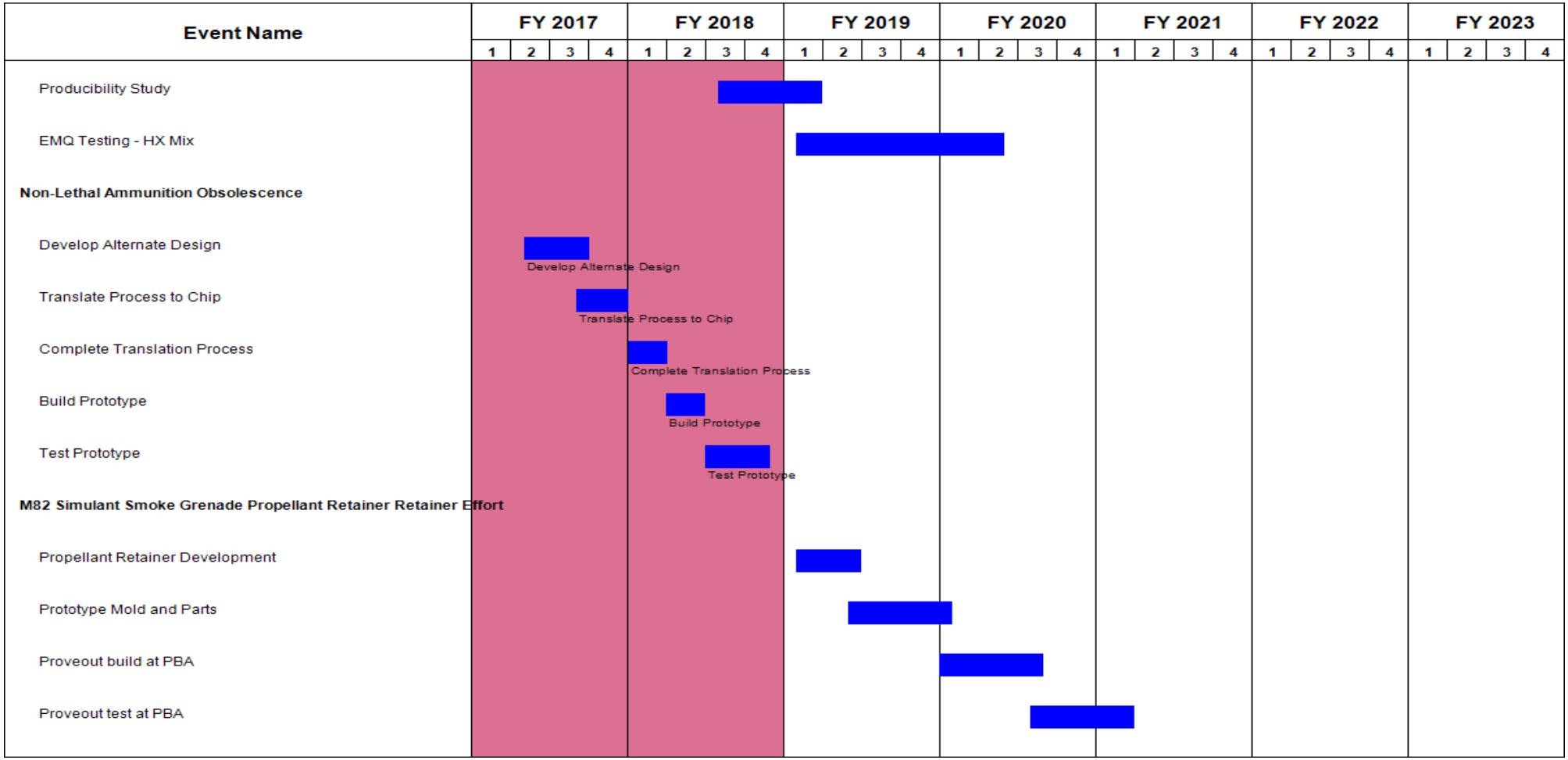

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607131A / *Weapons and Munitions Product Improvement Programs*	**Project (Number/Name)** ER2 / *Close Combat Technology*

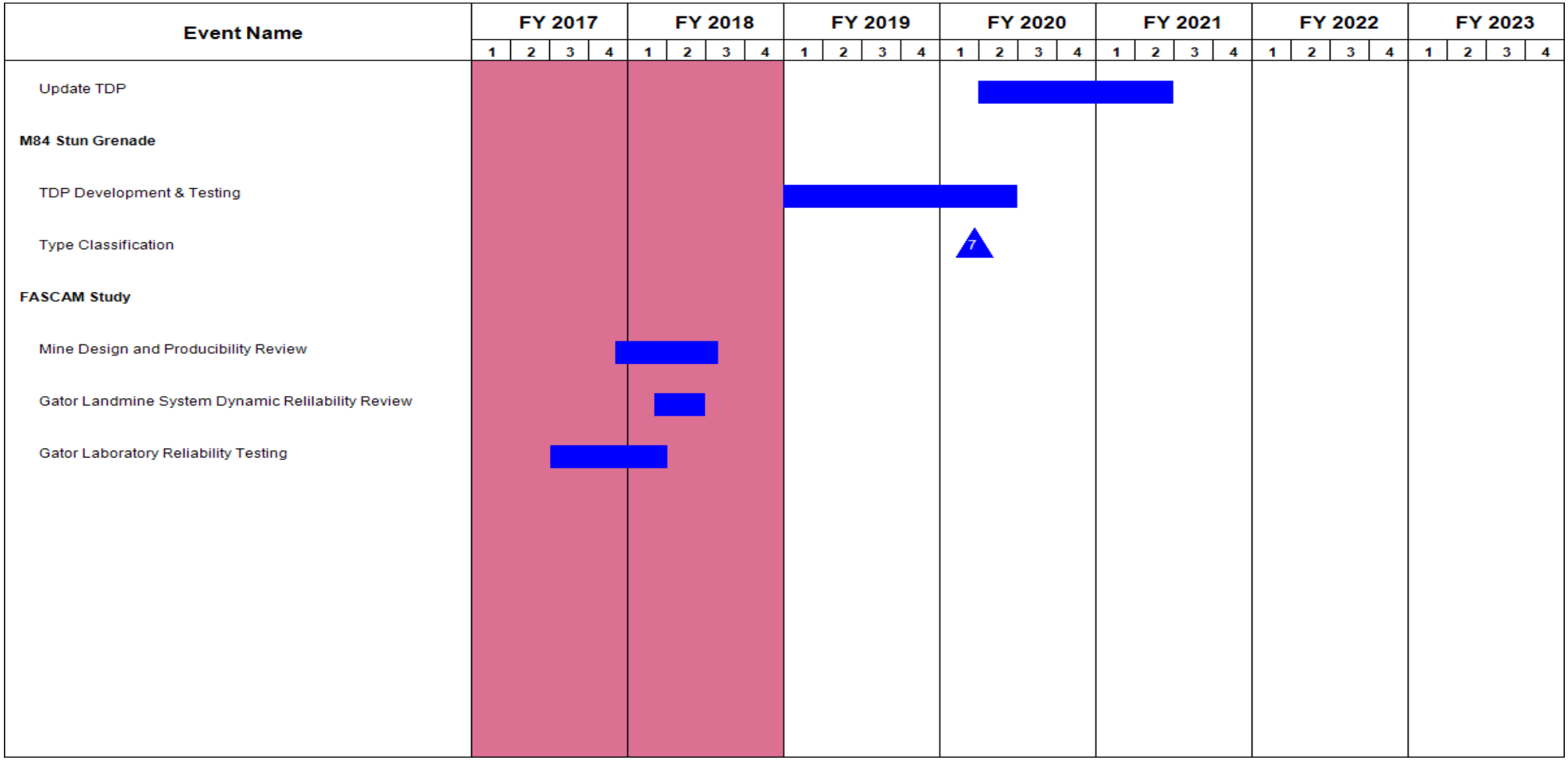

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607131A / *Weapons and Munitions Product Improvement Programs*	**Project (Number/Name)** ER2 / *Close Combat Technology*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Claymore Force-on-Force TADSS Trainer	1	2017	4	2020
Fireset Board Design and Test	1	2016	3	2016
Multiple Integrated Laser Engagement Sys (MILES) Emitting Unit Design and Test	1	2016	1	2017
Non-Pyro Claymore Simulation Design and Test	1	2016	2	2017
Early User Assessment	1	2016	1	2016
Critical Design Review	2	2017	2	2017
Fort Leonard Wood and Benning Demonstration	4	2016	4	2016
Preliminary Drop and Loose Cargo Test	2	2017	2	2017
Systems Verification Test	1	2018	1	2018
Environmental Testing	4	2017	1	2018
Delivery 1 - Production Representative Prototypes	3	2018	3	2018
MK3A2 Replacement, Offensive Hand Grenade Effort	1	2017	4	2020
Produce Test Quantity	2	2016	2	2017
Production Qualification Testing	3	2016	1	2017
Production Qualification Testing - 2	4	2017	1	2018
Testing (IM, E3)	3	2017	3	2018
LUT	3	2018	3	2018
Detailed Spec, Type Classification/Full Materiel Release (TC/FMR) Documentation	2	2018	3	2019
TC	3	2019	3	2019
Full Materiel Release	3	2020	3	2020
Countermeasure Flare Decoy Formulations	1	2017	4	2020
Developmental Testing & Analysis	1	2017	2	2018

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Army		Date: February 2018
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	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
DOTC Hardware Contract Award	2	2018	2	2018
ECP Confirmation Testing	2	2018	3	2018
ECP Preparation and Staffing	2	2018	3	2018
ECP Tech Data Package	4	2018	4	2018
AN-M8A1 Obscuration Grenade	1	2017	4	2020
HX Toxicity Study	1	2017	2	2018
Requirements Validation	4	2017	3	2018
Producibility Study	3	2018	1	2019
EMQ Testing - HX Mix	1	2019	2	2020
Non-Lethal Ammunition Obsolescence	1	2017	4	2020
Develop Alternate Design	2	2017	3	2017
Translate Process to Chip	3	2017	4	2017
Complete Translation Process	1	2018	1	2018
Build Prototype	2	2018	2	2018
Test Prototype	3	2018	4	2018
M82 Simulant Smoke Grenade Propellant Retainer Retainer Effort	1	2017	4	2020
Propellant Retainer Development	1	2019	2	2019
Prototype Mold and Parts	2	2019	1	2020
Proveout build at PBA	1	2020	3	2020
Proveout test at PBA	3	2020	1	2021
Update TDP	2	2020	2	2021
M84 Stun Grenade	1	2017	4	2020
TDP Development & Testing	1	2019	2	2020
Type Classification	1	2020	1	2020
FASCAM Study	3	2017	3	2018

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Army		Date: February 2018
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	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Mine Design and Producibility Review	4	2017	3	2018
Gator Landmine System Dynamic Relilability Review	1	2018	2	2018
Gator Laboratory Reliability Testing	3	2017	1	2018

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army			Date: February 2018
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COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
ER5: *Indirect Fire and Fuze Technology*	-	2.525	2.268	2.820	-	2.820	5.387	5.387	4.200	2.025	0.000	24.612
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Indirect Fire and Fuze Technology project includes product improvement development efforts to upgrade indirect fire weapon systems and munitions that have already been fielded and/or are in production. Indirect Fire Weapons and Munitions Product Improvement Projects include improved target engagement, increased reliability, availability, maintainability, and safety, standardization and interoperability with weapons and munitions of Allied Nations, defense exportability features, reduction of failure mechanisms, and supply chain risk through introduction of new and alternative technology and materiel solutions, improvement of manufacturing methods and their associated production and life cycle support processes, new capabilities in response to the evolving and emerging threats and countermeasures, and reduction/elimination of potential environmental and health risks associated with these products.

This supports the identification, study, analysis, and development of fuzing technologies and Safe & Arm (S&A) devices in production and in the field. This project will implement technologies into fuzing systems to preclude obsolescence, maximize standardization, enhance performance, and improve the safety and exportability of existing munitions. The project addresses two major areas: (1) analysis and (2) block upgrades. Analysis efforts will identify second sources for fuzing systems that may reduce costs by providing competition, and maintain production when sources or parts are no longer available. It will also allow for the performance enhancement of current ammunition items by conducting studies of major fuze components to detect and identify latent defects. The second major area is block upgrades, which will identify and perform studies on improvements to fuzes, increase commonality of fuze components and requirements. Block upgrades will enable the introduction of the latest technologies into fuzing, keep the fuzing design current to avoid obsolescence issues, and add capabilities.

FY 2019 will support modeling and simulation on medium caliber S&A modifications, will evaluate medium caliber prototype modifications against performance requirements, will conduct studies on mortar fuze design architecture with the latest Fuze safety guidelines to preclude component obsolescence, will conduct studies on hand grenade fuze to reduce the number of critical defects that will improve producibility and increase safety, will conduct engineering tests to prove-out electronic transceiver replacement prototypes for indirect fire and direct fire proximity fuzes, will conduct studies on artillery fuze electronic safe and arm designs for low cost safe and arm performance enhancements, and will evaluate optimized impact switch prototypes.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Fuze Technology Improvements (FTI)	0.625	1.818	2.820	-	2.820
Description: Activities include maturation, validation, and risk reduction of fuze technology and fuze component alternatives to increase sources of supply, improve performance, increase safety, and lower cost. Activities also include integration of fuze initiation improvements to increase reliability and lower fuze costs, evaluation of fuze					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
electronic upgrades to improve safety and increase performance reliability, assessment of inductive fuze setting improvements to lower costs, and evaluation of medium caliber fuze safe and arm improvements for increased safety. ***FY 2018 Plans:*** Block Upgrades: Conduct engineering tests to prove-out the mortar fuze electronics upgrades. Conduct studies on medium caliber fuze safe and arm features to improve safety and increase throughput. Conduct tests to prove-out mortar fuze impact switch upgrades. Analysis/Risk Mitigation: Conduct evaluations on transceiver component replacement prototype devices for indirect fire and direct fire fuzes. Conduct studies on Microelectromechanical systems (MEMS) based impact switches for medium and large caliber applications for reduced cost and improved producibility. ***FY 2019 Base Plans:*** Block Upgrades: Will conduct modeling and simulation on medium caliber S&A design modifications, will evaluate medium caliber prototype modifications against performance requirements, will conduct studies on hand grenade fuze to reduce the number of critical defects that will improve producibility and increase safety, will conduct studies on artillery fuze electronic safe and arm designs for low cost S&A performance enhancements. Analysis / Risk Mitigation: Will conduct engineering tests to prove-out electronic transceiver replacement prototypes for indirect fire and direct fire proximity fuzes, will evaluate optimized impact switch prototypes, will conduct studies on mortar fuze design architecture with the latest fuze safety guidelines to preclude component obsolescence. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** There is an increase in funding from FY 2018 to FY 2019 due to three additional Fuze Technology Integration (FTI) projects that have been added to the program portfolio in FY 2019.					
Title: 81mm M821A3E1 HE IM Mortar Program ***Description:*** Activities include the maturation of the lethality through modeling and simulation as well as testing to ensure the 81mm will meet all user requirements. Activities also include ballistic testing to ensure safe and effective firing of the 81mm Mortar. This will also include modeling to ensure the contour of the round will ensures stable interior and exterior ballistics. Activities will also focus on maturation of the manufacturability	1.900	0.450	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
of the round to ensure unit cost is as low as possible, this will be executed through loading studies and other Design of Experiments (DOE). ***FY 2018 Plans:*** Program completes safety/environmental test and analysis. Activities will include full arena testing and analysis of test data. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** In FY 2018, the M821A3E1 Program is transitioning to PAA dollars. Zero RDT&E dollars are required in FY 2019 for this effort.					
Accomplishments/Planned Programs Subtotals	2.525	2.268	2.820	-	2.820

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Fuze Technology Improvement (FTI) will improve current production munitions by exploiting existing fuzing technologies and inserting them into current fielded and/or production fuzes, providing safer, more producible, and more lethal fuzing solutions. FTI develops second source suppliers and resolves component obsolescence issues to mitigate risk and prevent production interruptions in order to continue to provide safer, more reliable munitions for the Warfighter with significant risk reduction to production fuzes also benefiting the U.S. Taxpayer. The effort is a continuation of studies, analysis, evaluations, and development of fuzing technologies and safe and arm devices in production and in the field. This program will implement these technologies into fuzing systems to preclude component obsolescence, maximize standardization, enhance performance, and improve the safety and exportability of existing munitions. The Fuze Technology Integration Program utilizes both the DoD Ordnance Technology Consortium (DOTC) Other Transaction Agreement (OTA) initiatives to produce prototypes of the fuze technologies and devices, and FAR-based contracts to implement proven efforts into production fuzes.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army		Date: February 2018
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
40mm Fuze Improvements	SS/FFP	AMTEC Corporation : Janesville, WI	-	-		0.100	Mar 2018	0.200	Sep 2019	-		0.200	0.000	0.300	0.100
Fuze Technology Development	MIPR	DoD Ordnance Technology Consortium (DOTC) : Various	0.200	0.152	Feb 2017	1.060	Dec 2017	1.481	Oct 2018	-		1.481	0.000	2.893	-
81mm M821A3E1 HE IM Mortar Prototyping	MIPR	DoD Ordnance Technology Consortium (DOTC) : Various	-	1.040	Jan 2017	-		-		-		-	0.000	1.040	-
		Subtotal	0.200	1.192		1.160		1.681		-		1.681	0.000	4.233	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Fuze Technology Integration Engineering Support	MIPR	Armament Research, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	1.136	0.473	Dec 2016	0.658	Nov 2017	0.819	Nov 2018	-		0.819	0.000	3.086	-
M821A3E1 Engineering Support	MIPR	Armament Research, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	-	0.491	Dec 2016	-		-		-		-	0.000	0.491	-
		Subtotal	1.136	0.964		0.658		0.819		-		0.819	0.000	3.577	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army			Date: February 2018
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Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FTI Ballistic Testing	MIPR	Army Test and Evaluation Command (ATEC) : Yuma Proving Ground, AZ	0.100	-		-		0.320	Mar 2019	-		0.320	0.000	0.420	-
M821A3E1 Full Arena Testing and Analysis	MIPR	Army Research Lab : Aberdeen Proving Ground, MD	-	-		0.450	Mar 2018	-		-		-	0.000	0.450	-
M821A3E1 HE IM Mortar Testing	MIPR	Army Test and Evaluation Command (ATEC) : Yuma Proving Ground, AZ	-	0.369	Jun 2017	-		-		-		-	0.000	0.369	-
		Subtotal	0.100	0.369		0.450		0.320		-		0.320	0.000	1.239	N/A

	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	1.436	2.525		2.268		2.820		-		2.820	0.000	9.049	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Army		Date: February 2018
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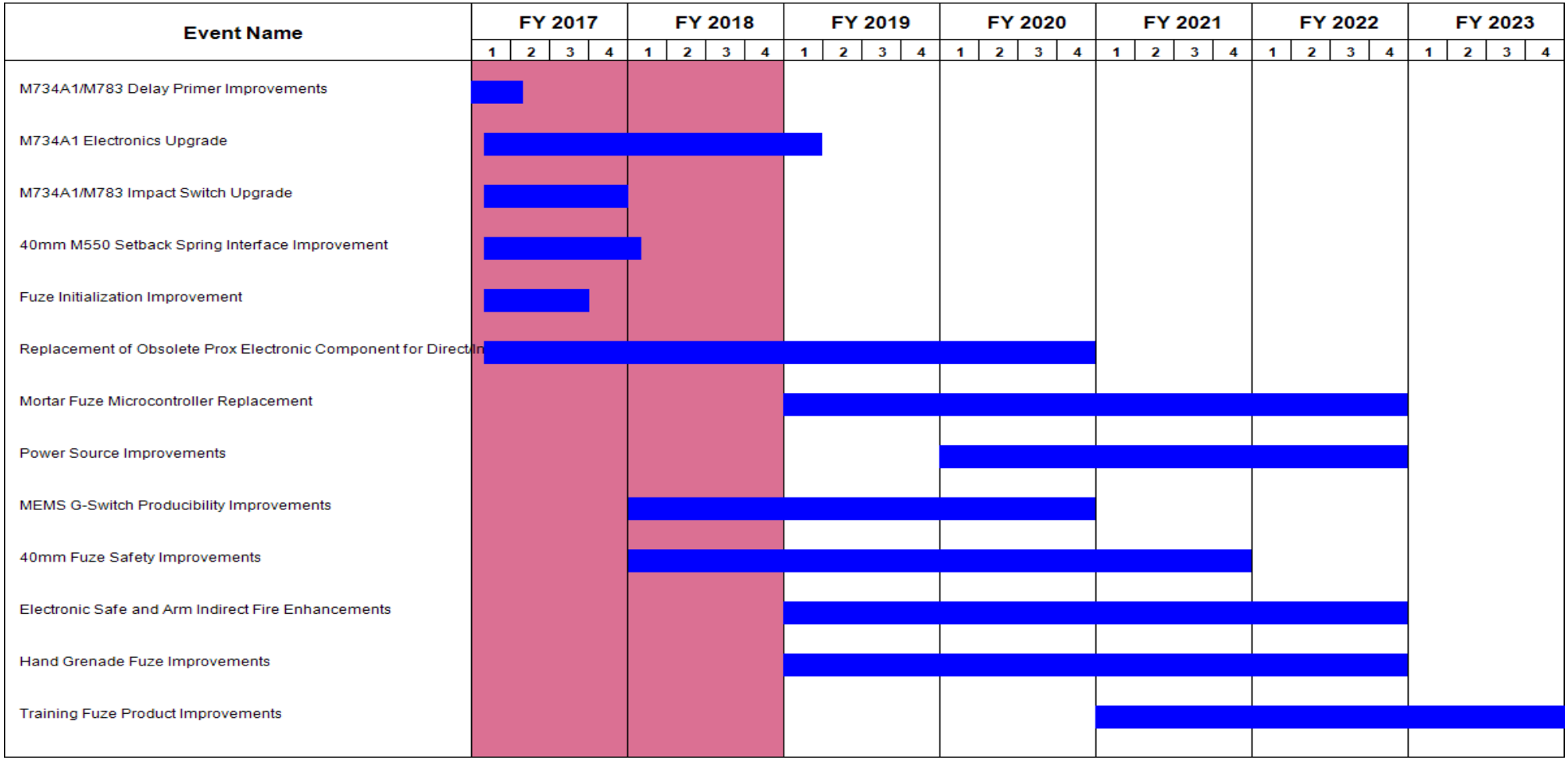

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Army		Date: February 2018
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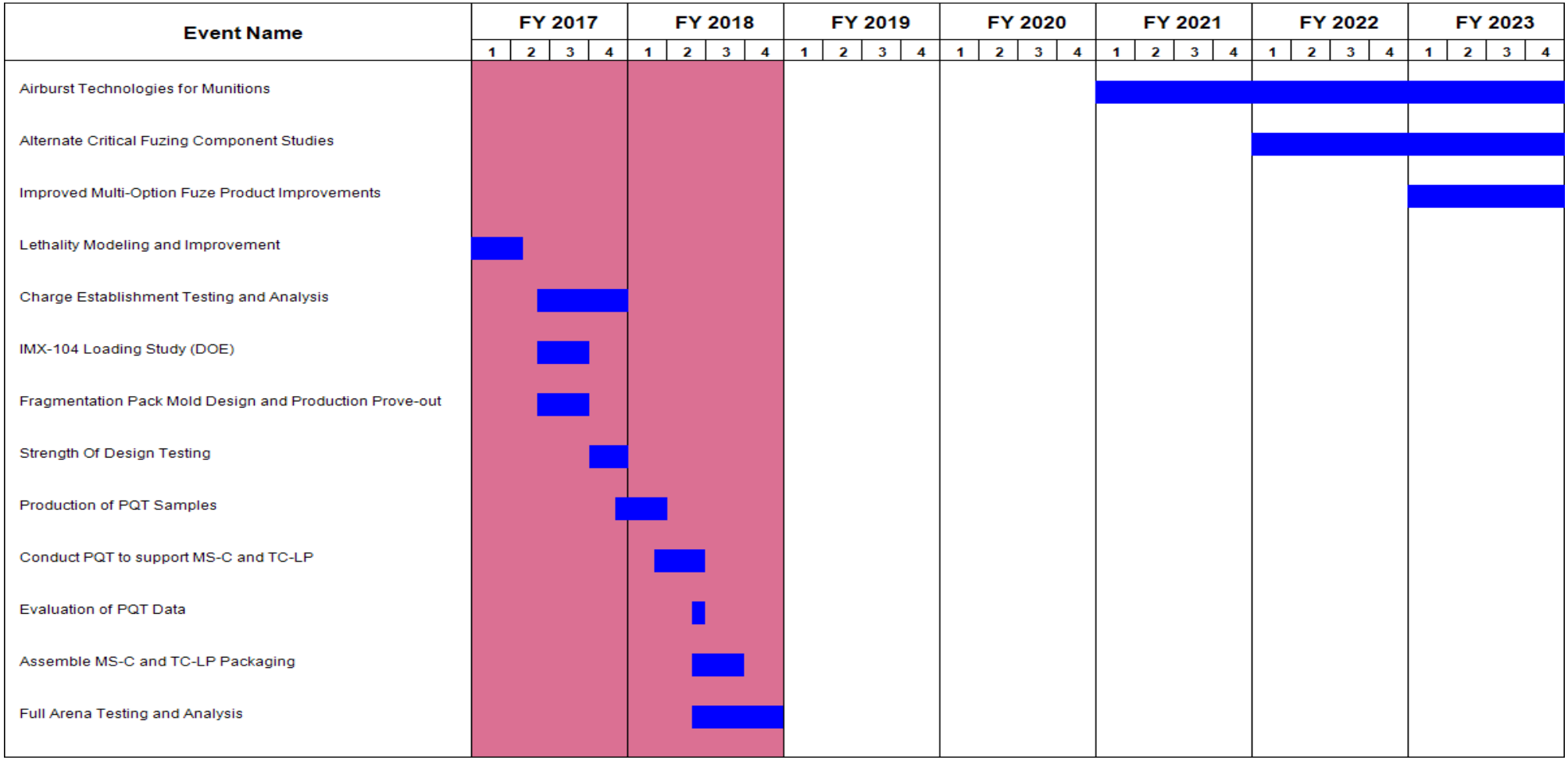

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Army		Date: February 2018
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Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
M734A1/M783 Delay Primer Improvements	1	2016	1	2017
M734A1 Electronics Upgrade	1	2016	1	2019
M734A1/M783 Impact Switch Upgrade	1	2016	4	2017
40mm M550 Setback Spring Interface Improvement	1	2016	1	2018
Fuze Initialization Improvement	1	2016	3	2017
Replacement of Obsolete Prox Electronic Component for Direct/Indirect Fire Fuzes	1	2017	4	2020
Mortar Fuze Microcontroller Replacement	1	2019	4	2022
Power Source Improvements	1	2020	4	2022
MEMS G-Switch Producibility Improvements	1	2018	4	2020
40mm Fuze Safety Improvements	1	2018	4	2021
Electronic Safe and Arm Indirect Fire Enhancements	1	2019	4	2022
Hand Grenade Fuze Improvements	1	2019	4	2022
Training Fuze Product Improvements	1	2021	4	2024
Airburst Technologies for Munitions	1	2021	4	2024
Alternate Critical Fuzing Component Studies	1	2022	4	2024
Improved Multi-Option Fuze Product Improvements	1	2023	4	2025
Lethality Modeling and Improvement	3	2016	1	2017
Charge Establishment Testing and Analysis	2	2017	4	2017
IMX-104 Loading Study (DOE)	2	2017	3	2017
Fragmentation Pack Mold Design and Production Prove-out	2	2017	3	2017
Strength Of Design Testing	4	2017	4	2017
Production of PQT Samples	4	2017	1	2018

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	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Conduct PQT to support MS-C and TC-LP	1	2018	2	2018
Evaluation of PQT Data	2	2018	2	2018
Assemble MS-C and TC-LP Packaging	2	2018	3	2018
Full Arena Testing and Analysis	2	2018	4	2018

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0607131A / *Weapons and Munitions Product Improvement Programs*	Project (Number/Name) ER6 / *Direct Fire Technology*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
ER6: *Direct Fire Technology*	-	11.408	9.696	10.055	2.548	12.603	5.297	3.636	0.752	0.173	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2019, Program Element (PE) 0603639A, Project EL8, Lightweight Cartridge Case for Small Caliber, will transition to PE 0607131, Project ER6, Direct Fire Technology. This project is not a new start.

A. Mission Description and Budget Item Justification

The Direct Fire Technology funding will be used to support direct fire ammunition from small caliber ammunition, 40mm grenade, medium caliber cannon ammunition and large caliber ammunition enhancements to lethality, effectiveness, survivability, accuracy and general product improvements. FY 2019 funds are used for a more lethal and safer design for 40mm grenades that will be built and tested. Warhead improvement and primer improvement for the 30mm Apache ammunition are also under development. A number of studies on potential improvements for training ammunition and environmentally friendly primers will be conducted. Potential improvements to 105mm and 120mm ammunition will be examined.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Lightweight Ammunition	-	0.855	3.000	-	3.000
Description: Develop, demonstrate, and qualify a Lightweight Small Caliber Ammunition (LSCA) 7.62mm, 5.56mm, and .50 caliber capability that will provide an ammunition weight savings of ten to fifty percent to the M2, M240, M4A1, and M249 gunner, assistant gunner, and ammo bearer. ***FY 2018 Plans:*** Phase II Contractors are developing a preliminary lightweight cartridge design. The Government is completing the Systems Requirement Review and Preliminary Design Review then beginning Pre-Validation Testing. ***FY 2019 Base Plans:*** Phase II contractor will continue to develop preliminary lightweight cartridge design. The government will conduct Pre-Validation Testing (PVT) and a Limited User Evaluation (LUE) prior to down-selecting to a single contractor for Phase III award. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Funding needed to continue research and development of lightweight ammunition in FY 2019.					
Title: Lead Free Primer	1.868	1.500	0.755	-	0.755

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Description: Automate and Integrate environmental friendly lead free primary explosives within the small caliber family of ammunition. Addresses health concerns of lead intake during firing by removing lead styphnate from small caliber primers. Automated pilot line combined with new mix reduces human exposure, improves quality, improves safety and reduces environmental waste in manufacturing process. ***FY 2018 Plans:*** FY 2018 funding completes the build for the 5.56mm primer qualification and initiates the 7.62mm and .50 caliber pilot lines. FY 2018 finalizes the Technical Data Packages for the three calibers and completes the EMQB process. Finally, the program refines and optimizes the automation of the manufacturing process. ***FY 2019 Base Plans:*** FY 2019 funding will provide the ability to conduct primer qualification testing on 5.56mm primers, complete the build for the 7.62mm primer qualification, and begin the build for Caliber .50 primer qualification. The program will continue to work through the transition of the automated primer manufacturing process to Lake City Army Ammunition Plant (LCAAP), as well as refinement and optimization of the automated process. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Funding needed to continue research and development of Green Primer ammunition in FY 2019.					
Title: Support Sniper Ammunition Integration Into Army Standard Sniper Weapons ***Description:*** Modify existing sniper ammunition to support integration into new Army standard sniper weapons. Maintain compatibility with legacy sniper weapons while improving operational availability. ***FY 2018 Plans:*** FY 2018 work continues to test and evaluate sniper ammunition improvements. ***FY 2019 Base Plans:*** FY 2019 work will continue to test and evaluate sniper ammunition improvements. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 funding needed for continued sniper ammunition development.	0.243	1.360	0.500	-	0.500
Title: Support Improvements in Direct Fire Propulsion Systems ***Description:*** Improve Direct Fire Propulsion Systems to increase user survivability. ***FY 2018 Plans:***	0.117	0.500	0.500	-	0.500

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
FY 2018 work continues to explore additional sources of supply in the National Technology and Industrial Base (NTIB) to reduce the dependence on foreign suppliers and pursue improvements to address temperature sensitivities of energetics and primer ballistics. Work also includes technology improvements to reduce muzzle flash and increase precision by reducing dispersion of the M80A1, M118LR, and other sniper compatible ammunition. ***FY 2019 Base Plans:*** FY 2019 work will continue to explore additional sources of supply in the NTIB and pursue improvements to address temperature sensitivities of energetics and primer ballistics. Efforts will also be made to continue to explore technology improvements to reduce muzzle flash and increase precision by reducing dispersion of the M80A1, M118LR, and other sniper compatible ammunition.					
Title: Improved M789 Lethality, Warhead Fragmentation Improvement ***Description:*** Improve 30mm M789 warhead lethality by performing trade studies and implementing advanced warhead and fuze technologies to promote more efficient fragmentation. ***FY 2018 Plans:*** FY 2018 work supports the completion and implementation of trade studies following testing, Technical Data Packages (TDP) updating, and preparing for manufacturability and qualification build. ***FY 2019 Base Plans:*** FY 2019 work will continue to support the completion and implementation of trade studies following testing, TDP updating, and preparing for manufacturability and qualification build. Funding will also support the initial build to be used to for qualification testing. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 funding needed for continued M789 lethality development.	0.020	1.000	2.900	-	2.900
Title: M433 Warhead Improvement ***Description:*** 40mm: Improve lethality (fragmentation) of the M433 grenade. ***FY 2018 Plans:***	3.360	1.570	0.500	-	0.500

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
FY 2018 work finishes Pre Production Qualification Tests (PPQT), perform Materiel Release (MR)/Engineering Change Proposal (ECP) actions, and support contracting actions to transition new Technical Data Package (TDP) into Full Rate Production (FRP). ***FY 2019 Base Plans:*** FY 2019 work will complete ECP and TDP actions. FY 2019 work will also complete qualification testing. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 funding needed to finalize the development of the M433E1 round.					
Title: 20mm C-RAM Ammo Improvement ***Description:*** As per Joint Urgent Operational Needs Statement (JUONS) CC-0562 for enhanced lethality, M940 20mm ammunition requires research and development efforts to increase the lethality effects of the Land-based Phalanx Weapon System (LPWS) against larger rocket threats. This effort will increase the current capability of the M940 by incorporating design features to provide improvement to probability of Kill. ***FY 2018 Plans:*** FY 2018 funding continues to support the design and testing of multiple improved M940 concepts aimed at quickly providing enhanced lethality effects against large rocket threats. Concurrently, an optimized concept is being designed and tested to provide a more permanent solution with enhanced lethality and significant improvement to probability of kill. ***FY 2019 Base Plans:*** FY 2019 funding will continue to support the design and development of an optimized M940 concept to achieve enhanced lethality and an improved probability of kill. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 funding needed for additional M940 research and development.	5.800	0.580	0.250	-	0.250
Title: 30x173mm and 30x113mm Airburst Munitions ***Description:*** Increase anti-personnel lethality and lethality within Military Operations in an Urban Terrain (MOUT) structures compared to current Army medium caliber solutions. ***FY 2018 Plans:*** FY 2018 funding supports the study of the 30x173mm airburst capable cartridge and programming/ communication unit which interfaces with Stryker Infantry Carrier Vehicle (ICV) and/or Army Future Fighting	-	0.653	0.250	-	0.250

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Vehicles. Funding supports the 30x113 airburst capable cartridge and unit programming. Efforts will try to establish commonality for these key systems. ***FY 2019 Base Plans:*** FY 2019 funding will continue to support the study of the 30x173mm airburst capable cartridge and programming/communication unit which interfaces with Stryker Infantry Carrier Vehicle (ICV) and/or Army Future Fighting Vehicles. Funding will support the 30x113mm cartridge development for the Apache aircraft and other Army weapon platforms. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 funding needed for additional research, development, and testing of the munitions.					
Title: Tank Ammunition Improvements ***Description:*** Develop and test potential improvements to 105mm and 120mm gun system ammunition. ***FY 2018 Plans:*** FY 2018 work includes various efforts for 105mm and 120mm tank ammunition, including chemical tracer improvements, combustible cartridge case design and fabrication improvements, and non-developmental cartridge testing for the M68 cannon. ***FY 2019 Base Plans:*** FY 2019 work will continue to support various efforts for 105mm and 120mm tank ammunition, including tracer improvements, combustible cartridge case design and fabrication improvements, and non-developmental cartridge testing for the M68 cannon. Additionally, preliminary design work will be conducted to improve the M1002 training cartridge to an acceptable training cartridge for the new 120mm Advanced Multipurpose (AMP) cartridge. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Additional funding in FY 2019 needed to continue development of combustible cartridge case on other large caliber enhancements.	-	1.450	0.250	-	0.250
Title: 40mm M576 Improvement Study ***Description:*** 40mm M576 product improvement will provide the warfighter with the ability to quickly defeat closed-in personnel targets ***FY 2018 Plans:***	-	0.178	0.200	-	0.200

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607131A / *Weapons and Munitions Product Improvement Programs*	**Project (Number/Name)** ER6 / *Direct Fire Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
FY 2018 funding supports efforts to baseline the current M576 capabilities and explore improved candidate designs. ***FY 2019 Base Plans:*** FY 2019 funding will be used to continue to explore improved candidate designs. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Additional funding in FY 2019 will support M576 baseline and exploration of enhanced designs.					
Title: Medium Caliber Single Crystal Tungsten Evaluation ***Description:*** Testing will be conducted to determine the effectiveness of single crystal tungsten penetrators against armored targets. ***FY 2018 Plans:*** FY 2018 work includes testing to determine the effectiveness of single crystal tungsten penetrators against armored targets. ***FY 2019 Base Plans:*** FY 2019 work will continue to include testing to determine the effectiveness of single crystal tungsten penetrators against armored targets.	-	0.050	0.050	-	0.050
Title: M550 Fuze Improvement ***Description:*** Replace 40mm M550 single stage fuze with a dual spinlock fuze to improve safety and performance reliability. ***FY 2019 Base Plans:*** FY 2019 funding will be used to acquire and study M550 fuzes and materials in order to support the new fuze build and FY 2020 testing events. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 funding needed for research and development activities for the M550 Fuze.	-	-	0.400	-	0.400
Title: Caliber .50 Improvement ***Description:*** Explore options for improvement to current legacy .50 caliber ammunition in response to the .50 caliber Munitions Capabilities Development Document (CDD).	-	-	0.500	-	0.500

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607131A / *Weapons and Munitions Product Improvement Programs*	**Project (Number/Name)** ER6 / *Direct Fire Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
FY 2019 Base Plans: FY2019 funding will support the exploration of improvements to various .50 caliber munitions to include the M903 and M962 rounds. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Increase of funds will support improvements to .50 caliber munitions.					
Title: Operation Inherent Resolve for ISIL - JUONS CC-0562 M940 Ammunition ***Description:*** FY 2019 Overseas Contingency Operations request includes $2.548 Million for a Joint Urgent Operational Needs Statement for M940 ammunition. ***FY 2019 Base Plans:*** OCO only ***FY 2019 OCO Plans:*** OCO funds will provide M940 ammunition improvements. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** JUONS CC-0562	-	-	0.000	2.548	2.548
Accomplishments/Planned Programs Subtotals	11.408	9.696	10.055	2.548	12.603

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• EL8: *LIGHTWEIGHT CARTRIDGE CASE FOR SMALL CALIBER*	1.807	2.500	0.000	-	0.000	-	-	-	-	0.000	4.307

Remarks

The funding lines started work on the 7.62mm lightweight ammunition which transitions to PE 0607131A ER6, Direct Fire Technology.

D. Acquisition Strategy

All contracts will be full and open competition firm fixed price.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0607131A / *Weapons and Munitions Product Improvement Programs*	Project (Number/Name) ER6 / *Direct Fire Technology*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Manager Maneuver Ammunition Systems (PM MAS) - Labor & Travel	Various	Picatinny Arsenal : NJ	0.009	0.100		0.300		0.400		-		0.400	Continuing	Continuing	Continuing
Contract 1 - M433 Warhead Improvement	C/FFP	Polymer Technologies Incorporated : Newark, DE	0.171	-		-		-		-		-	0.000	0.171	-
Contract 2 - M433 Warhead Improvement	C/IDIQ	Amtec Corporation : Huntsville, AL	0.134	-		-		-		-		-	0.000	0.134	-
Contract 3 - M433 Warhead Improvement	C/FFP	Amtec Corporation : Huntsville, AL	-	2.275		1.500		-		-		-	0.000	3.775	-
Contract 1 - M789 Enhanced Lethality	C/FFP	TBD : TBD	-	-		-		0.500		-		0.500	0.000	0.500	-
Contract 1 - Lightweight Ammunition	C/FFP	TBD : TBD	-	-		0.500		1.742		-		1.742	0.000	2.242	-
Contract 1 - Green Primer	C/FFP	Innovative Materials & Processes (IMP), LLC : Rapid City, SD	0.415	0.556		-		0.500		-		0.500	0.000	1.471	-
Contract 2 - Green Primer	C/FFP	Alion Science and Technology Corporation : McLean, VA	0.038	-		-		-		-		-	0.000	0.038	-
Contract 3 - Green Primer	C/FFP	Orbital - ATK : Independence, MO	-	0.750		-		0.500		-		0.500	0.000	1.250	-
Contract 4 - Green Primer	C/FFP	Frankilin Engineering Group : Nashville, TN	-	0.170		-		-		-		-	0.000	0.170	-
Contract 1 - M940 Enhancement	C/FFP	General Dynamics Ordnance and Tactical Systems : Marion, VA	-	0.231		-		-		-		-	0.000	0.231	-
Contract 2 - M940 Enhancement	C/FFP	MATSYS : Sterling, VA	-	0.168		-		-		-		-	0.000	0.168	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army			Date: February 2018
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contract 3 - M940 Enhancement	C/FFP	TBD : TBD	-	-		0.500		-		-		-	0.000	0.500	-
Contract 1 - M80A1	C/FFP	TBD : TBD	-	-		-		0.575		-		0.575	0.000	0.575	-
Contract 1 - JUONS CC-0562 M940 Ammunition	C/FFP	TBD : TBD	-	-		-		0.000		2.548		2.548	0.000	2.548	-
		Subtotal	0.767	4.250		2.800		4.217		2.548		6.765	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Armament Research Development and Engineering Center (ARDEC)	MIPR	ARDEC : Picatinny Arsenal, NJ	1.361	3.702		6.296		5.438		-		5.438	Continuing	Continuing	Continuing
		Subtotal	1.361	3.702		6.296		5.438		-		5.438	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Army Research Lab (ARL)	MIPR	Aberdeen : MD	0.015	0.200		0.300		0.400		-		0.400	Continuing	Continuing	Continuing
Aberdeen Test Center (ATC)	MIPR	Aberdeen Test Center : Aberdeen, MD	0.036	-		0.300		-		-		-	Continuing	Continuing	Continuing
Redstone Arsenal	MIPR	Redstone Arsenal : Redstone Arsenal AL	-	3.256		-		-		-		-	0.000	3.256	-
		Subtotal	0.051	3.456		0.600		0.400		-		0.400	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0607131A / *Weapons and Munitions Product Improvement Programs*	Project (Number/Name) ER6 / *Direct Fire Technology*	

	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	2.179	11.408		9.696		10.055		2.548		12.603	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607131A / *Weapons and Munitions Product Improvement Programs*	**Project (Number/Name)** ER6 / *Direct Fire Technology*

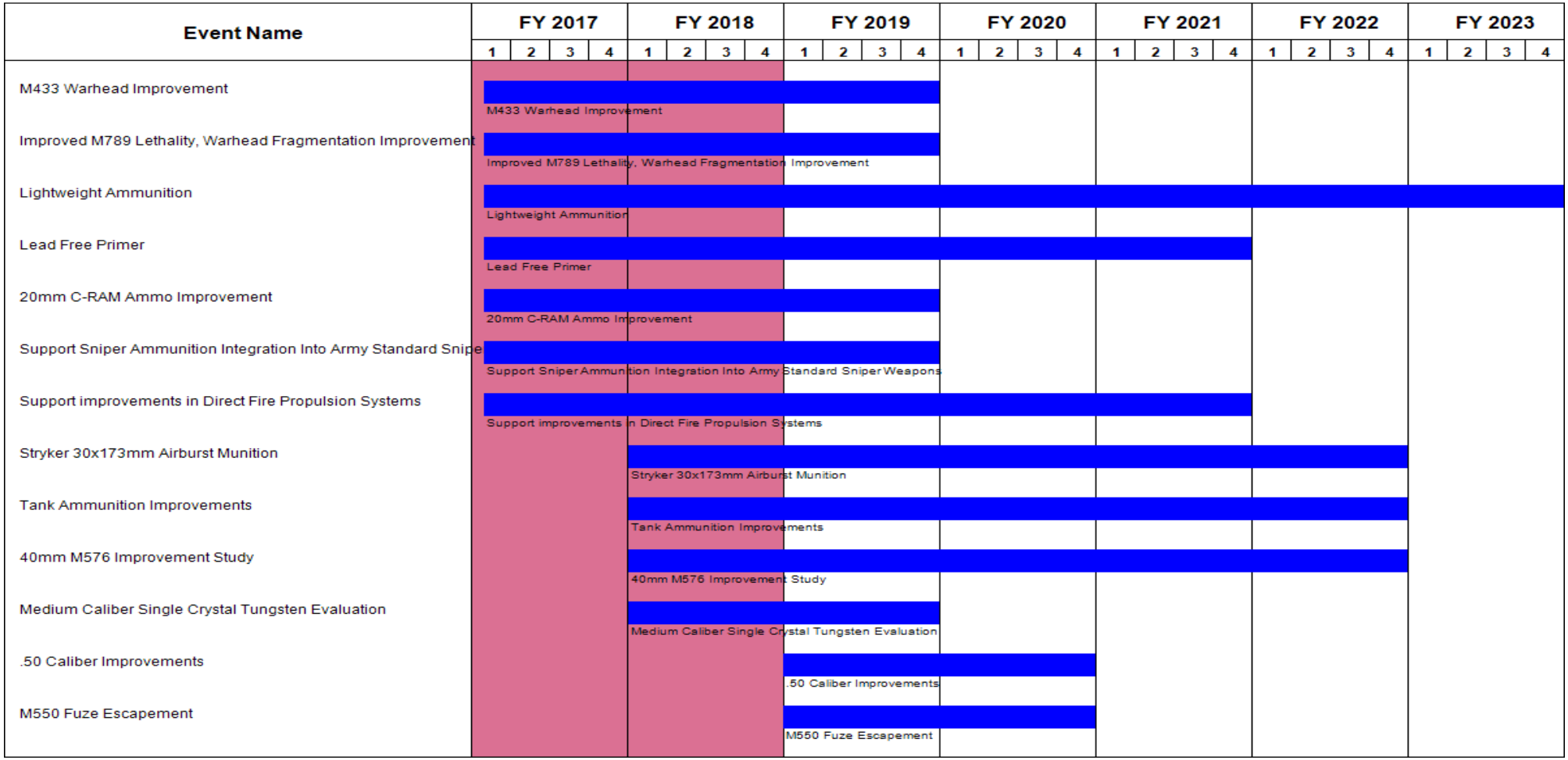

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607131A / *Weapons and Munitions Product Improvement Programs*	**Project (Number/Name)** ER6 / *Direct Fire Technology*

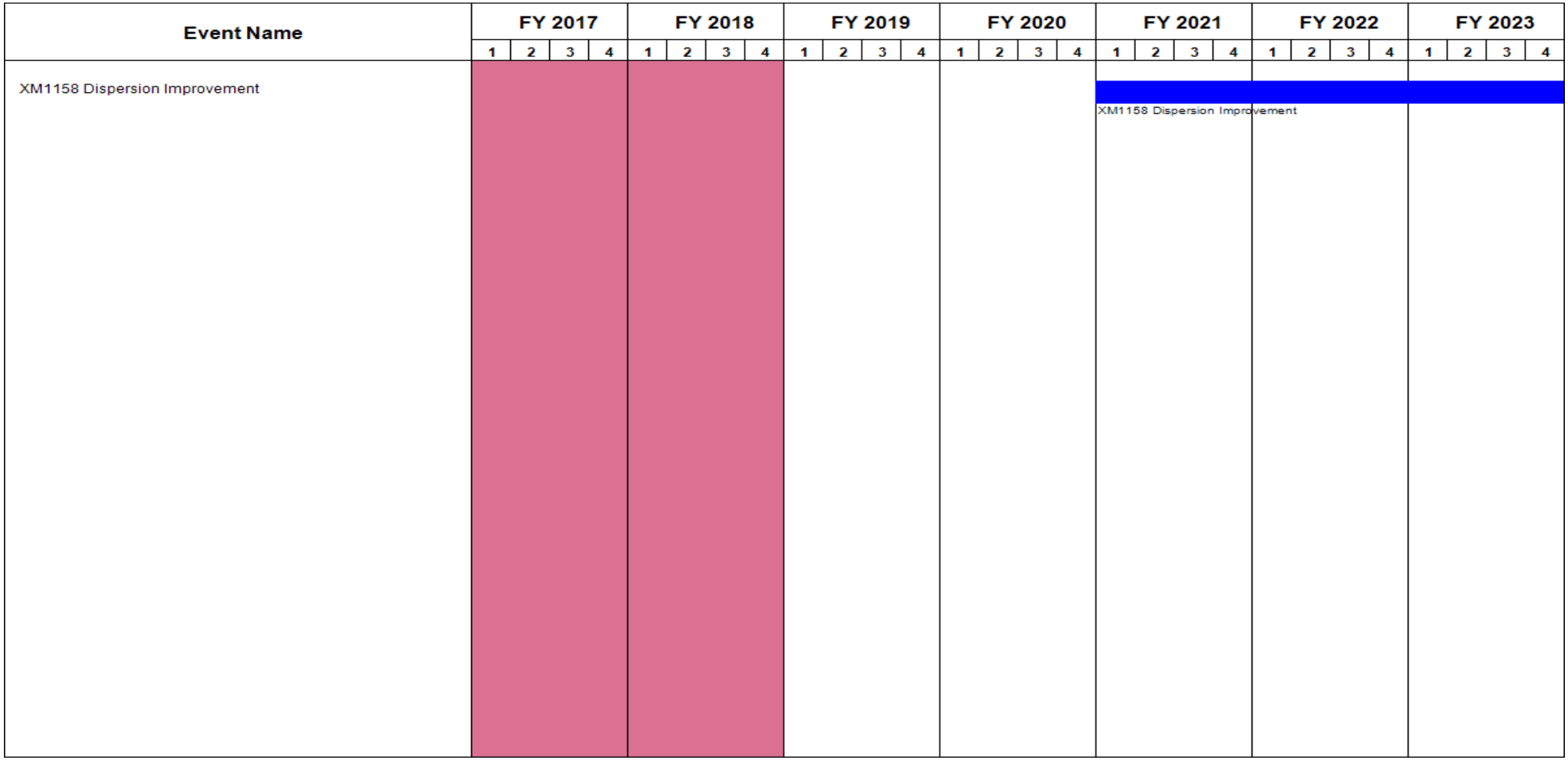

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607131A / *Weapons and Munitions Product Improvement Programs*	**Project (Number/Name)** ER6 / *Direct Fire Technology*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Improved Door Breach	1	2016	4	2016
Target Practice Spotter Technology Insertion	1	2015	4	2016
New Ammo Design Qualification & NATO Mission Support	1	2016	4	2016
M433 Warhead Improvement	1	2015	4	2019
Improved M789 Lethality, Warhead Fragmentation Improvement	1	2015	4	2019
Lightweight Ammunition	1	2015	4	2023
Lead Free Primer	1	2015	4	2021
20mm C-RAM Ammo Improvement	1	2017	4	2019
Support Sniper Ammunition Integration Into Army Standard Sniper Weapons	1	2017	4	2019
Support improvements in Direct Fire Propulsion Systems	1	2017	4	2021
Stryker 30x173mm Airburst Munition	1	2018	4	2022
Tank Ammunition Improvements	1	2018	4	2022
40mm M576 Improvement Study	1	2018	4	2022
Medium Caliber Single Crystal Tungsten Evaluation	1	2018	4	2019
.50 Caliber Improvements	1	2019	4	2020
M550 Fuze Escapement	1	2019	4	2020
XM1158 Dispersion Improvement	1	2021	4	2023