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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)	R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	40.358	77.696	92.753	-	92.753	39.193	32.769	26.811	14.003	Continuing	Continuing
694: Medium Caliber Ammunition	-	1.435	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.435
BQ4: 155mm Artillery Propulsion XM654	-	0.000	7.200	15.705	-	15.705	0.000	0.000	0.000	0.000	0.000	22.905
EB8: OWL for Small Caliber Ammunition	-	1.984	2.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.984
EB9: Aviation Airborne Expendable Countermeasures	-	5.004	3.186	4.496	-	4.496	6.054	0.000	0.000	0.000	0.000	18.740
EC2: Adv Armor-Piercing (ADVAP) for Small Cal Ammo	-	5.334	6.821	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	12.155
EC3: Ammunition Logistics Prototyping	-	1.271	1.525	1.713	-	1.713	2.168	1.798	1.834	1.870	0.000	12.179
EL7: Reduced Range Ammunition	-	2.090	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.090
EU3: .50 Caliber All-Purpose Tactical Cartridge (APTC)	-	0.000	4.250	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.250
FA5: Assured Precision Weapons and Munitions	-	13.797	31.267	29.878	-	29.878	30.971	30.971	24.977	12.133	Continuing	Continuing
FG1: Cannon-Delivered Area Effects Munitions (C-DAEM)	-	5.713	21.447	40.961	-	40.961	0.000	0.000	0.000	0.000	Continuing	Continuing
XT5: 30mm Anti-Personnel and Counter UAS	-	3.730	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.730

Note

In Fiscal Year (FY) 2021 there are no budget requests for:

- Project EB8 One-Way Luminescence (OWL) for Small Caliber funding transitioned to Budget Activity (BA) 5 Program Element (PE) 0604802A Weapons and Munitions
- Eng Dev Weapons and Munitions - Eng Dev Project EP4 OWL Small Caliber Ammo.

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<p>- Project EC2 Adv Armor-Piercing (ADVAP) Small Cal Ammo funding transitioned to BA 5 PE 0604802A Weapons and Munitions - Eng Dev Project EP5 Adv Armor Piercing (ADVAP) Small Caliber Ammo and Project FL4 Small Caliber Ammo Next Gen Squad Weapons.</p> <p>- Project EU3 A.50 Caliber All-Purpose Tactical Cartridge (APTC) funding transitioned to BA 5 PE Budget Activity 05, PE 0604802A, Project EU5 .50 Caliber All-Purpose Tactical Cartridge (APTC).</p> <p>A. Mission Description and Budget Item Justification</p> <p>The Tank and Medium Caliber Ammunition Program Element encompasses a comprehensive program to develop, rapidly transition to production, and field advanced weapons and munitions for small, medium and large caliber munitions, tank ammunition, mortar ammunition, cannon artillery ammunition, and close combat system items. These Projects will ensure continued battlefield overmatch and lethality of United States maneuver forces against the full range of modern battlefield threats. To achieve this, Tank and Medium Caliber Ammunition projects will identify and develop promising technologies through competitive development and streamlined acquisition procedures.</p> <p>Project 694 Medium Caliber Ammunition: This Project supports development of 30x113 millimeter (mm) self-destructing airburst munitions and qualify 30x113mm linked ammunition for ground vehicles. Increase precision and lethality capability to defeat personnel and materiel targets as well as support the Joint Urgent Operational Need Statement (JUONS) CC-0558 Counter-Unmanned Aerial Systems (C-UAS) to counter the rapidly evolving threat of Unmanned Aerial Systems. This effort will qualify the links for use with existing M788 and M789 ammunition and develop self-destructing and airburst capable munitions fired from the Lightweight 30x113mm Link Fed Chain Gun. There is no Fiscal Year (FY) 2021 request.</p> <p>Project BQ4 155mm Artillery Propulsion: Supercharge is a stand-alone top-zone 155 millimeter (mm) propelling charge required to achieve maximum range requirements from the XM1299A1 Extended Range Cannon Artillery (ERCA) Self-Propelled Howitzer (SPH). It will achieve lethality overmatch out to 70 kilometers (km) with developmental extended range projectiles, and will increase range with legacy projectiles by thirty percent. Supercharge is composed of combustible cartridge case (foamed celluloid or felted fiber technology), integral metal Stub Case, electrically initiated primer, and advanced artillery propellant. FY 2021 funding will support design risk reduction and prototype maturation efforts for two parallel Supercharge variants (2-piece bag and cased) to support the concurrent development of ERCA Increment 1C and ERCA Increment 2 (with added automated loading system), which directly supports the Army's Long Range Precision Fires (LRPF) Cross Functional Team (CFT) priority in support of the National Defense Strategy.</p> <p>Project EB8 OWL for Small Caliber: The OWL project is a critical technology development in response to the 7.62 millimeter (mm) and 5.56mm Families of Ammunition Capabilities Development Documents (CDD) and .50 caliber munitions CDD. Current small caliber ammunition tracer rounds are a pyrotechnic tracer mix which allows enemy forces to see the trace round and track its trajectory back to the shooter. The OWL project's objective is to develop and field a full tracer round to replace the current pyrotechnic cartridges with trace cartridges that are only visible to the shooter and soldiers in close proximity, increasing soldier survivability, and increasing lethality by incorporating Enhanced Performance Round (EPR) technology into the new tracer ammunition. 7.62mm and 5.56mm are the immediate focus followed by a similar development strategy for .50 caliber cartridges. There is no FY 2021 funding request.</p>		

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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	
<p>Project EB9 Aviation Airborne Expendable Countermeasure (AAECM) supports the advanced development activities and technology demonstrations of the AAECM to include the XM215 Flare and XM20 Radio Frequency (RF) expendables. These expendable countermeasures systems are essential parts of survivability equipment for Army aircraft. Army Research Development Technology & Evaluation (RDT&E) efforts are coordinated with Program Executive Office (PEO) Aviation to address the AAECM capability, a critical enabler for the Future Vertical Lift (FVL) - Aircraft Survivability Equipment (ASE) CFT within the Army's top modernization priorities.</p> <p>These advanced decoys will address deficiencies in Army aircraft protection and the safety of its aircrews against advanced Man-Portable Air Defense Systems (MANPADS) and shoulder launched Surface-to-Air Missiles (SAM) systems. This program will evaluate integrated technologies and countermeasure prototype systems in realistic operating test environments. Prototypes will demonstrate component and subsystem maturity prior to integration into major Army aircraft platforms. FY 2021 includes initial developmental/operational testing on XM215 and RF Countermeasures (CM).</p> <p>Project EC2 ADVAP: The Advanced Armor-Piercing (ADVAP) project is a critical technology development in response to the 7.62 millimeter (mm) and 5.56mm Family of Ammunition Capabilities Development Documents (CDD) and the Soldier Lethality Cross Functional Team (SL CFT) Initial Capability Document (ICD) which outlines the requirements for new ammunition to support the rapid prototyping/development of the Next Generation Squad Weapons (NGSW) under the Middle Tier of Acquisition (MTA) authority for rapid prototyping/rapid fielding. New ADVAP ammunition is designed to provide overmatch capability to defeat advanced light armored threats within typical machine gun engagement ranges.</p> <p>The Next Generation Squad Weapons (NGSW) ammunition is split into two initial variants, the General Purpose (GP) and the Special Purpose (SP). The nomenclature for the GP ammunition is XM1186 and the nomenclature for the SP ammunition is XM1184. The overall objective of the ADVAP project is to develop and Full Materiel Release (FMR) ammunition to defeat hard targets. There is no FY 2021 funding request.</p> <p>Project EC3 Ammunition Logistics Prototyping: This Project supports the future force by improving the distribution, management, reliability and survivability of ammunition through the advanced development, integration, and demonstration of logistics system enablers. These enablers will improve the efficiency and effectiveness of ammunition operations, to include retrograde, while reducing the logistics footprint on the battlefield. Technology areas addressed include handling, distribution, and management (strategic and tactical), prognostics, diagnostics, and asset visibility, explosives safety, and adaptive and environmentally friendly packaging and palletization. The efficient deployment and sustainment of reliable ammunition is vital to success on the battlefield. This Project enhances the operational effectiveness of the ammunition logistics system to ensure the distribution of reliable ammunition to the warfighter. FY 2021 funding will be used to reduce device cost and establish an alternate source for monitoring devices, as well as, verifying that issues found during testing have been resolved. FY 2021 funding will also be used to demonstrate a suite of monitoring technologies, which will be used for assessing munitions reliability.</p> <p>Project EL7 Reduced Range Ammunition: The small caliber Reduced Range Ammunition (RRA) project is a critical technology development in response to the 7.62 millimeter (mm) and .50 caliber Capabilities Development Documents (CDD). The overall objective of RRA is to provide training ammunition suitable for use on military installations with Surface Danger Zone (SDZ) restrictions. The relatively long maximum range of the 7.62mm and .50 caliber service ammunition poses challenges on training ranges in range restricted areas. RRA will mitigate a training gap on installations by providing a materiel solution that meets training needs while shortening and condensing the SDZ. This will allow soldiers to train with 7.62mm and .50 caliber weapons on restricted ranges. The RRA cartridge design will be compatible with all Army 7.62mm and .50 caliber weapons but specifically optimized to work in the M240 and M2 Machine Guns. There is no funding requested in FY 2021.</p>		

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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	
<p>Project EU3 .50 Caliber APTC: The APTC project is a critical technology development in response to the .50 caliber Munitions Capabilities Development Documents (CDD). The overall objective of APTC is to deliver a single round that replaces and improves current legacy .50 caliber ammunition. The APTC will be compatible with all Army .50 caliber weapons but specifically optimized to work in the M2 Machine Guns. There is no FY 2021 funding request.</p> <p>Project FA5 APWM: The APWM is focused on advanced risk mitigation, technology integration, prototyping, and product support to identify, evaluate, mature, test, and demonstrate various assured precision prototype technologies in weapon and munitions components and subsystems within a complex system of systems environment. The APWM Project reinforces the National Defense Strategy's major lines of effort through technology development and prototyping, which increases lethality and ensures future combat overmatch success of the Joint Force against peer/near-peer adversaries. This project also aims to improve program performance and affordability for multiple weapons and munitions Programs of Record (PoRs) via Joint Lethality Positioning, Navigation and Timing (PNT) and Army M-Code Global Positioning System (GPS) coordinated efforts. The APWM Project directly supports top Army Modernization Priorities via the Assured-PNT (A-PNT) and LRPF CFT imperatives in support of the National Defense Strategy. FY 2021 funding will support engagement by Weapons and Munitions PNT experts in the development, evaluation, and technology delivery activities of the Air Force's M-Code GPS, Army's PNT related programs, and A-PNT CFT programs in support of LRPF and Counter Area Access/Area Denial missions. Funding will also enable component and subsystem architecture input essential for precision weapons and munitions operating in a NavWar system-of-systems environment, Army M-Code GPS technology integration and evaluation, planning for next generation M-Code GPS integration into the Long Range-Precision Guidance Kit (LR-PGK) as the DoD-selected representative Joint precision munition, and maturation of alternative PNT related technologies and solutions to enable informed A-PNT related PoR milestone and Army cross-functional modernization decisions.</p> <p>Project FG1 C-DAEM: The Cannon-Delivered Area Effects Munitions (C-DAEM) Project will provide United States (U.S). ground forces with the capability to engage area personnel through armored targets, while denying threat forces full operational freedom within the targeted area. An Analysis of Alternatives (AoA) was completed in January 2018 to inform Army acquisition and investment decisions regarding replacement of the current stockpile of 155 millimeter (mm) Dual Purpose Improved Conventional Munitions (DPICM) with Department of Defense (DoD) policy compliant munitions and address anti-armor and extended range capability requirements. The Army validated two materiel solutions for C-DAEM to be pursued in parallel. C-DAEM Armor (Increment 1) will destroy moved and moving infantry fighting vehicles, self-propelled howitzers, and tanks. C-DAEM DPICM Replacement (Increment 2) will destroy personnel to light-skinned vehicles. FY 2021 funding will support the completion of the C-DAEM Armor competitive demonstration phase, which will identify the most promising candidate(s) to support the Army's modernization priorities in support of the National Defense Strategy.</p> <p>Project XT5 30mm Anti-Personnel and Counter UAS: Lightweight 30x113mm (LW30) Airburst is a new capability identified as a Warfighter requirement in the Capability Production Document (CPD), AH-64E Helicopter, Increment 1, Version 6. The LW30 airburst cartridge improves the ability of the Warfighter to effectively engage antipersonnel/materiel targets due to increased lethality. Airburst capability provides the user with a much higher probability of achieving a first burst kill against enemy personnel targets in the open. The LW30 will retain its dual purpose warhead, allowing it to continue to defeat light armored threats through point detonation. The cartridge provides increased lethal effects against personnel and soft-skin vehicular targets increasing Soldier Survivability on the ground during troops in contact engagements and decreases the required number of rounds to reach the desired lethal effects. There is no funding requested in FY 2021.</p>		

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B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	41.921	82.146	50.948	-	50.948
Current President's Budget	40.358	77.696	92.753	-	92.753
Total Adjustments	-1.563	-4.450	41.805	-	41.805
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-4.450			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-1.563	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	41.805	-	41.805

Change Summary Explanation

Increase due to continuation and completion of the Cannon-Delivered Area Effects Munitions (C-DAEM) - Armor (Increment 1) competitive demonstration activities resourced in Project FG1. Increase also attributed to risk reduction and prototype maturation efforts for two parallel Supercharge variants to support concurrent development of Extended Range Cannon Artillery (ERCA) Increment 1C and ERCA Increment 2 (with automated loading system) resourced in Project BQ4.

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army										Date: February 2020		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition				Project (Number/Name) 694 / Medium Caliber Ammunition			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
694: Medium Caliber Ammunition	-	1.435	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.435
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 694 Medium Caliber Ammunition supports development of 30x113 millimeter (mm) self-destructing airburst munitions and qualify 30x113mm linked ammunition for ground vehicles. Increase precision and lethality capability to defeat personnel and materiel targets as well as support the Joint Urgent Operational Need Statement (JUONS) CC-0558 Counter-Unmanned Aerial Systems (C-UAS) to counter the rapidly evolving threat of Unmanned Aerial Systems. This effort will qualify the links and XM950 TP ammunition and develop self-destructing and airburst capable munitions fired from the Lightweight 30x113mm Link Fed Chain Gun. There is no Fiscal Year (FY) 2021 funding request.

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

	FY 2019	FY 2020	FY 2021
Title: Linked 30x113mm Ammunition Qualification and Airburst Development	1.435	-	-
Description: Qualify linked 30x113mm Percussion Primed XM950 Ammunition and develop self-destructing and airburst capable munitions.			
Accomplishments/Planned Programs Subtotals	1.435	-	-

C. Other Program Funding Summary (\$ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• E09900: CTG, 30mm HEDP, M789, Single, f/Gun M230	5.105	5.221	5.323	-	5.323	5.354	5.357	5.357	5.001	0.000	36.718
• E10100: CTG, 30mm TP, M788, Single, f/Gun M230	36.133	22.868	23.341	-	23.341	27.783	37.278	37.417	36.837	0.000	221.657

Remarks

D. Acquisition Strategy

30x113mm - An other transaction agreement (OTA) contract was awarded to purchase links for the 30x113mm ammunition. Linked ammunition deliveries will be synchronized with test schedules for ammunition/weapon qualification and Remote Weapon Station (RWS)/vehicle system integration. Ammunition qualification tests and weapon qualification tests will be conducted in FY 2020. Purchase of linked 30x113mm cartridges will transition to competitive procurement by FY 2020. Efforts to develop a self-destructing airburst capable munition and a guided 30x113mm munition will also be conducted.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603639A / Tank and Medium Caliber Ammunition				694 / Medium Caliber Ammunition							
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
30x113mm Self Destruct and Airburst Ammo Development Contract	C/CPFF	Northrop Grumman Innovation Systems (NGIS) : Plymouth, MN	7.771	0.435	Dec 2019	-		-		-		-	0.000	8.206	-
Subtotal			7.771	0.435		-		-		-		-	0.000	8.206	N/A
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
30x113mm Ammo Combat Capabilities Development Command Armaments Center (CCDC AC)	MIPR	Combat Capabilities Development Command Armaments Center (CCDC AC) : Picatinny, NJ	-	0.500	Nov 2018	-		-		-		-	0.000	0.500	-
Subtotal			-	0.500		-		-		-		-	0.000	0.500	N/A
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
30x113mm Self Destruct Safety Test	MIPR	Aberdeen Testing Center (ATC) : Aberdeen, MD	-	0.300	Dec 2019	-		-		-		-	0.000	0.300	-
30x113mm Electromagnetic Environment Effects Test	MIPR	Redstone Arsenal : Redstone, AL	-	0.200	Dec 2019	-		-		-		-	0.000	0.200	-
Subtotal			-	0.500		-		-		-		-	0.000	0.500	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) 694 / <i>Medium Caliber Ammunition</i>

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	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
30x113mm Linked Ammo Development	30x113mm Ammo Development																											
30x113mm Linked Proximity Ammo Demonstration					▲ 1 30x113mm Prox Ammo Demo																							
30x113mm Linked Self Destruct Safety Certification Test					■ 30x113mm Self Destruct Safety Cert																							
30x113mm Linked Self Destruct System UMR					▲ 2 30x113mm Self Destruct System UMR																							

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) 694 / <i>Medium Caliber Ammunition</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
30x113mm Events	2	2016	2	2017
30x113mm Ammo Development Contract Award	4	2018	4	2018
30x113mm Linked Ammo Development	4	2018	1	2020
30x113mm Linked Proximity Ammo Demonstration	2	2020	2	2020
30x113mm Linked Self Destruct Safety Certification Test	2	2020	2	2020
30x113mm Linked Self Destruct System UMR	3	2020	3	2020

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army										Date: February 2020		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition				Project (Number/Name) BQ4 / 155mm Artillery Propulsion XM654			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
BQ4: 155mm Artillery Propulsion XM654	-	0.000	7.200	15.705	-	15.705	0.000	0.000	0.000	0.000	0.000	22.905
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Supercharge is a stand-alone top-zone 155 millimeter (mm) propelling charge required to achieve maximum range requirements from the XM1299A1 Extended Range Cannon Artillery (ERCA) Self-Propelled Howitzer (SPH). It will achieve lethality overmatch out to 70 kilometers (km) with developmental extended range projectiles, and will increase range with legacy projectiles by thirty percent. Supercharge is composed of combustible cartridge case (foamed celluloid or felted fiber technology), integral metal Stub Case, electrically initiated primer, and advanced artillery propellant. Fiscal Year (FY) 2021 funding will support design risk reduction and prototype maturation efforts for two parallel Supercharge variants (2-piece bag and cased) to support the concurrent development of ERCA Increment 1C and ERCA Increment 2 (with added automated loading system), which directly supports the Army's Long Range Precision Fires Cross Functional Team priority in support of the National Defense Strategy.

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

	FY 2019	FY 2020	FY 2021
Title: 155mm Artillery Propulsion Supercharge	-	6.873	15.705
Description: Unitary top-zone propelling charge for XM907E2 Extended Range Cannon with Slide-block breech for use with ERCA Increments 1C and 2 to gain range overmatch for 155mm artillery.			
FY 2020 Plans: Performed charge establishment and charge uniformity in preparation for ballistic testing including preliminary blast overpressure and charge verification across operational temperatures. Performed packaging rough handling testing.			
FY 2021 Plans: FY 2021 funds will continue the support of concurrent design risk reduction and prototype maturation efforts for two Supercharge variants (2-piece bag and cased) to support the acceleration of ERCA Increment 1C and ERCA Increment 2 with automated loading system.			
FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increase to support maturation of two Supercharge variants to support Army modernization requirements to achieve lethality at 70km with precision accuracy by FY 2023.			
Title: FY 2020 SBIR/STTR Transfer	-	0.327	-
Description: Funding transferred in accordance with Title 15 USC ?638			

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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) BQ4 / <i>155mm Artillery Propulsion XM654</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<i>FY 2020 Plans:</i> Funding transferred in accordance with Title 15 USC ?638			
<i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	7.200	15.705

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• 232: <i>Advanced Lethality & Survivability Demo</i>	70.696	-	0.000	-	0.000	-	-	-	-	0.000	70.696
• BQ3: <i>155mm Artillery Propulsion XM654</i>	-	-	0.000	-	0.000	34.887	25.883	14.815	-	0.000	75.585

Remarks
In FY 2022, this Project will transition to Budget Activity 05, Program Element (PE) 0604802A Weapons and Munitions - Eng Dev Project BQ3 155mm Artillery Propulsion XM654. A Procurement of Ammunition, Army (PAA) funding line, Standard Study Number E99350, was established for transition to procurement FY 2022.

D. Acquisition Strategy
The Supercharge Project will consist of critical technology prototyping, testing, and demonstration of two variants: (1) the Urgent Materiel Release (UMR) of Supercharge 2-piece Bag to support the acceleration of the Extended Range Cannon Artillery (ERCA) Increment 1C to achieve lethality at 70km with precision accuracy by FY 2023, and (2) the Full Materiel Release (FMR) of Supercharge Cased to support ERCA Increment 2 with added automated loading system. The Project will utilize the Defense Ordnance Technology Consortium (DOTC) Other Transaction Agreement (OTA) for the integration of components such as propellant, combustible case, igniter and stub case. Upon design maturation, the Supercharge 2-piece Bag will transition and conduct Engineering Manufacturing and Development (EMD) tasks to qualify the design for UMR to support the ERCA Increment 1C First Unit Issues (FUI). The Supercharge Cased will require additional developmental testing and qualification for Low Rate Initial Production (LRIP) to support ERCA Increment 2. Federal Acquisition Regulation (FAR) based production contract(s) will be awarded after the Supercharge Cased Milestone C for LRIP and Full Rate Production (FRP).

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army											Date: February 2020				
Appropriation/Budget Activity 2040 / 4						R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition					Project (Number/Name) BQ4 / 155mm Artillery Propulsion XM654				

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Program Management	Various	Office of the Project Manager (PM) Combat Ammunition Systems (CAS) : Picatinny Arsenal, NJ	-	-	0.185	Jan 2020	0.500	Oct 2020	-	-	-	0.500	0.000	0.685	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-	0.327		-		-	-		-	0.000	0.327	-
Subtotal			-	-	0.512		0.500		-	-		0.500	0.000	1.012	N/A

Remarks
Program Management reflects Supercharge travel and milestone documentation support. Fiscal Year (FY) 2021 increase required to support the significant increase in test activities.

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Supercharge Prototype Hardware	MIPR	DoD Ordnance Technology Consortium (DOTC) : TBD	-	-	2.625	Mar 2020	7.705	Nov 2020	-	-	-	7.705	0.000	10.330	-
Developmental Projectile/ Fuze Hardware	MIPR	DoD Ordnance Technology Consortium (DOTC) : TBD	-	-	0.965	Mar 2020	1.100	Nov 2020	-	-	-	1.100	0.000	2.065	-
Subtotal			-	-	3.590		8.805		-	-		8.805	0.000	12.395	N/A

Remarks
FY 2021 increase to support prototype maturation of two Supercharge variants to support Army modernization requirements to achieve lethality at 70 kilometers (km) with precision accuracy by FY 2023.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition	Project (Number/Name) BQ4 / 155mm Artillery Propulsion XM654
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Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Engineering Support	MIPR	Combat Capabilities Development Command Armaments Center (CCDC AC) : Picatinny Arsenal, NJ	-	-		1.684	Jan 2020	2.125	Oct 2020	-		2.125	0.000	3.809	-
Subtotal			-	-		1.684		2.125		-		2.125	0.000	3.809	N/A

Remarks
Engineering support required for ongoing design risk reduction and prototype maturation efforts of two Supercharge variants.

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Supercharge Prototype Testing	MIPR	Army Test & Evaluation Command (ATEC) : Yuma, AZ	-	-		1.414	Apr 2020	4.275	Jan 2021	-		4.275	0.000	5.689	-
Subtotal			-	-		1.414		4.275		-		4.275	0.000	5.689	N/A

Remarks
Additional FY 2021 testing activities required for ongoing design risk reduction and prototype maturation efforts of two Supercharge variants.

Project Cost Totals	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
	-	-	7.200	15.705	-	15.705	0.000	22.905	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition	Project (Number/Name) BQ4 / 155mm Artillery Propulsion XM654

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				
	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	
Supercharge 2-piece Bag (UMR Variant)																													
Bag Preliminary Design Review (PDR)																													▲ 1 PDR
Bag Prototype Development & Testing																													Prototyping & Testing
Bag Critical Design Review (CDR)																													▲ 2 CDR
Bag Qualification Testing																													Qualification Testing
Bag Urgent Materiel Release (UMR)	▲ 4 UMR																												
ERCA Increment 1C First Unit Issues (FUI)	▲ 5 ERCA Inc 1C FUI																												
Supercharge Cased (FMR Variant)																													
Cased PDR																													▲ 3 PDR
Cased Prototype Development																													Prototyping
Cased Developmental Testing																													Developmental Testing
Cased Qualification Testing																													Qualification Testing

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) BQ4 / <i>155mm Artillery Propulsion XM654</i>

Note
Schedule reflects design risk reduction and prototype maturation efforts for two parallel Supercharge variants (2-piece bag and cased) required to support the concurrent development of the Extended Range Cannon Artillery (ERCA) Increment 1C (accelerated to achieve precision accuracy at 70km range by FY 2023) and ERCA Increment 2 (with added automated loading system).

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) BQ4 / <i>155mm Artillery Propulsion XM654</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Supercharge 2-piece Bag (UMR Variant)	1	2020	3	2022
Bag Preliminary Design Review (PDR)	2	2020	2	2020
Bag Prototype Development & Testing	2	2020	4	2021
Bag Critical Design Review (CDR)	4	2020	4	2020
Bag Qualification Testing	1	2022	3	2022
Bag Urgent Materiel Release (UMR)	3	2022	3	2022
ERCA Increment 1C First Unit Issues (FUI)	4	2023	4	2023
Supercharge Cased (FMR Variant)	1	2020	4	2025
Cased PDR	1	2021	1	2021
Cased Prototype Development	1	2021	4	2021
Cased Developmental Testing	1	2022	3	2022
Cased Qualification Testing	4	2022	4	2025

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army										Date: February 2020		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition			Project (Number/Name) EB8 / OWL for Small Caliber Ammunition				
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EB8: OWL for Small Caliber Ammunition	-	1.984	2.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.984
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project EB8 One-Way Luminescence (OWL) for Small Caliber funding transitioned to Budget Activity (BA) 5 Program Element (PE) 0604802A Weapons and Munitions - Eng Dev Weapons and Munitions - Eng Dev Project EP4 OWL Small Caliber Ammo.

A. Mission Description and Budget Item Justification

The OWL project is a critical technology development in response to the 7.62 millimeter (mm) and 5.56mm Families of Ammunition Capabilities Development Documents (CDD) and .50 caliber munitions CDD. Current small caliber ammunition tracer rounds are a pyrotechnic tracer mix which allows enemy forces to see the trace round and track its trajectory back to the shooter. The OWL project's objective is to develop and field a full tracer round to replace the current pyrotechnic cartridges with trace cartridges that are only visible to the shooter and soldiers in close proximity, increasing soldier survivability, and increasing lethality by incorporating Enhanced Performance Round (EPR) technology into the new tracer ammunition. 7.62mm and 5.56mm are the immediate focus followed by a similar development strategy for .50 caliber cartridges. There is no Fiscal Year (FY) 2021 funding request.

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

	FY 2019	FY 2020	FY 2021
Title: Technology Maturation and Risk Reduction (TMRR)	1.984	1.909	-
Description: OWL will develop and demonstrate a full tracer technology that eliminates the shortcomings of current legacy tracers.			
FY 2020 Plans: FY 2020 efforts continued activities to mature 5.56mm Technology Readiness Level (TRL). Plans included testing 5.56mm prototype solutions in preparation for TRL 6. Evaluate .50 Caliber and Next Generation Weapon Systems (NGSW) small caliber ammunition OWL technology/prototype ammunition and mature TRLs.			
FY 2020 to FY 2021 Increase/Decrease Statement: Project EB8 OWL for Small Caliber funding transitioned to BA 5 PE 0604802A Weapons and Munitions - Eng Dev Weapons and Munitions - Eng Dev Project EP4 OWL Small Caliber Ammo.			
Title: FY 2020 SBIR/STTR Transfer	-	0.091	-
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2020 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB8 / <i>OWL for Small Caliber Ammunition</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Funding transferred in accordance with Title 15 USC ?638			
<i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	1.984	2.000	-

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• EP4: <i>One-Way Luminescence for Small Caliber Ammo</i>	5.855	8.547	13.977	-	13.977	6.981	7.393	2.998	-	0.000	45.751

Remarks
Project EB8 OWL for Small Caliber funding transitioned to BA 5 PE 0604802A Weapons and Munitions - Eng Dev Weapons and Munitions - Eng Dev Project EP4 OWL Small Caliber Ammo.

D. Acquisition Strategy
The OWL technology will be integrated into the M80A1 trace ammunition production. The OWL concept will be developed through Government and Industry prototyping efforts. Technology Readiness Assessments (TRAs) were conducted in FY 2017 and FY 2018 to evaluate the Industry and Government concepts in order to proceed with the 7.62mm Engineering and Manufacturing Development (EMD) in FY 2019. The 5.56mm and .50 caliber cartridges will follow the 7.62mm schedule with EMD scheduled to commence in FY 2021 for the 5.56mm variant. The new 5.56mm tracer cartridges will replace the legacy 5.56mm M856A1 tracer.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army												Date: February 2020				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)								
2040 / 4				PE 0603639A / Tank and Medium Caliber Ammunition				EB8 / OWL for Small Caliber Ammunition								
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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	
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.091		-		-		-	0.000	0.091	-	
Subtotal			-	-		0.091		-		-		-	0.000	0.091	N/A	
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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	
Tooling Development	Option/CPFF	JAK Tool Engineering Solutions : Cranbury, NJ	-	0.780	Feb 2019	0.238	Feb 2020	-		-		-	0.000	1.018	Continuing	
Prototype Development Contract 1	Option/CPFF	General Dynamics : Florham Park, NJ	0.515	-		0.388	Feb 2020	-		-		-	0.000	0.903	Continuing	
Prototype Development Contract 2	Option/CPFF	Nammo Tally : Mesa, AZ	0.515	-		0.388	Feb 2020	-		-		-	0.000	0.903	Continuing	
Subtotal			1.030	0.780		1.014		-		-		-	0.000	2.824	N/A	
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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	
Combat Capabilities Development Command Armaments Center (CCDC AC)	MIPR	Combat Capabilities Development Command Armaments Center (CCDC AC) : Picatinny, NJ	5.472	1.136	Oct 2018	0.564	Oct 2019	-		-		-	2.498	9.670	Continuing	
Development Support	Option/FFP	Leidos Inc. : Reston, VA	-	0.068	Feb 2019	-		-		-		-	0.000	0.068	-	
Subtotal			5.472	1.204		0.564		-		-		-	2.498	9.738	N/A	

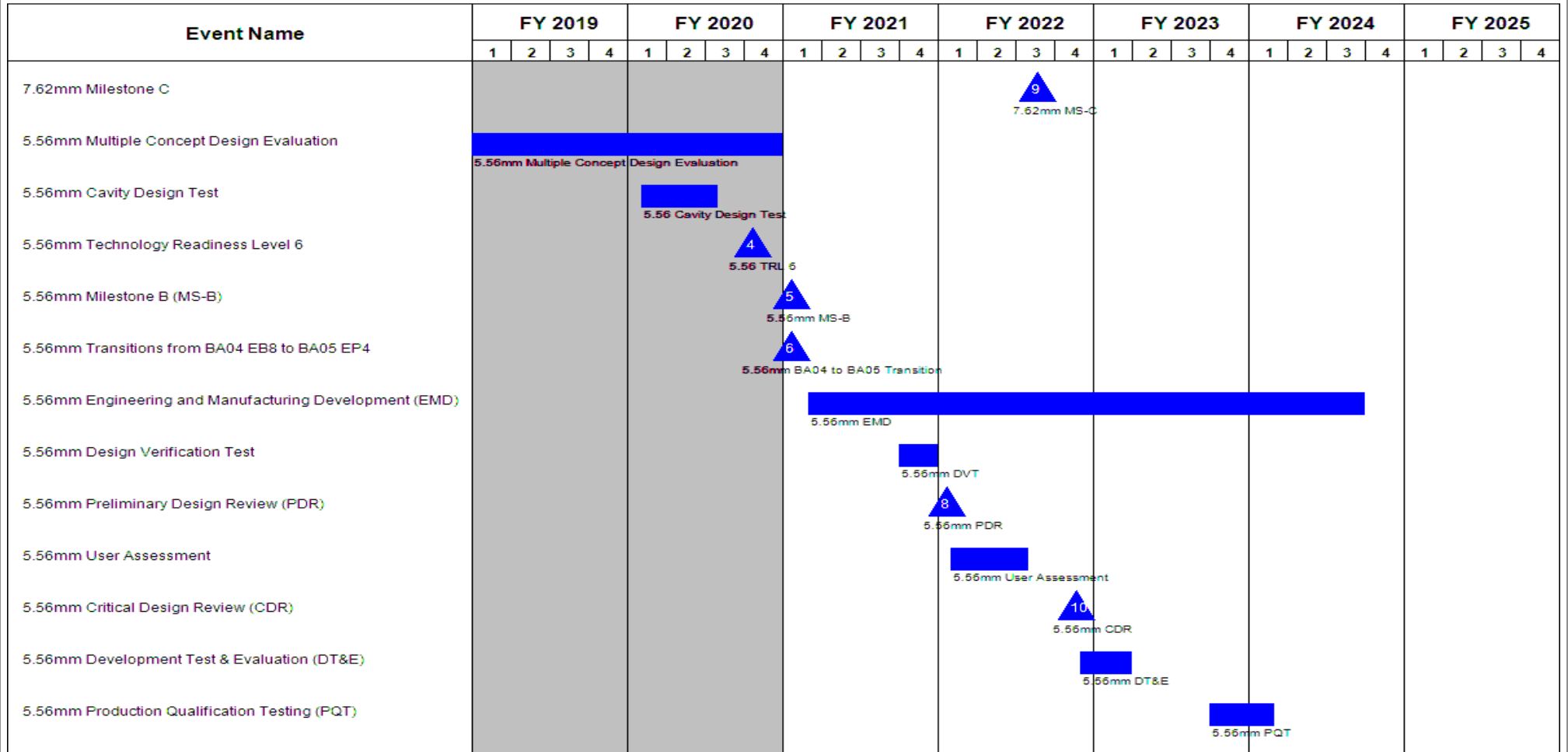
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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB8 / <i>OWL for Small Caliber Ammunition</i>

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	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
7.62mm Multiple Concept Design Evaluation																												
7.62mm Milestone B (MS-B)																												
7.62mm Transitions from BA04 EB8 to BA05 EP4																												
7.62mm Engineering and Manufacturing Development (EMD)																												
7.62mm Design Verification Test																												
7.62mm Preliminary Design Review (PDR)																												
7.62mm User Assessment																												
7.62mm Pre-Production Qualification Test (PPQT)																												
7.62mm Critical Design Review (CDR)																												
7.62mm Development Test & Evaluation (DT&E)																												
7.62mm Production Qualification Test (PQT)																												
7.62mm Live Fire Test and Evaluation (LFT&E)																												
7.62mm Limited User Evaluation (LUE)																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition	Project (Number/Name) EB8 / OWL for Small Caliber Ammunition



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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB8 / <i>OWL for Small Caliber Ammunition</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
7.62mm Materiel Development Decision (MDD)	4	2016	4	2016
7.62mm Multiple Concept Design Evaluation	1	2015	1	2019
7.62mm Milestone B (MS-B)	1	2019	1	2019
7.62mm Transitions from BA04 EB8 to BA05 EP4	1	2019	1	2019
7.62mm Engineering and Manufacturing Development (EMD)	1	2019	3	2022
7.62mm Design Verification Test	2	2019	3	2019
7.62mm Preliminary Design Review (PDR)	3	2019	3	2019
7.62mm User Assessment	4	2020	1	2021
7.62mm Pre-Production Qualification Test (PPQT)	4	2020	2	2021
7.62mm Critical Design Review (CDR)	2	2021	2	2021
7.62mm Development Test & Evaluation (DT&E)	3	2020	3	2021
7.62mm Production Qualification Test (PQT)	4	2021	1	2022
7.62mm Live Fire Test and Evaluation (LFT&E)	4	2021	1	2022
7.62mm Limited User Evaluation (LUE)	4	2021	1	2022
7.62mm Milestone C	3	2022	3	2022
5.56mm Materiel Development Decision (MDD)	3	2018	3	2018
5.56mm Project Starts on BA04 EB8	3	2018	3	2018
5.56mm Multiple Concept Design Evaluation	4	2018	4	2020
5.56mm Cavity Design Test	1	2020	3	2020
5.56mm Technology Readiness Level 6	4	2020	4	2020
5.56mm Milestone B (MS-B)	1	2021	1	2021
5.56mm Transitions from BA04 EB8 to BA05 EP4	1	2021	1	2021

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB8 / <i>OWL for Small Caliber Ammunition</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
5.56mm Engineering and Manufacturing Development (EMD)	1	2021	3	2024
5.56mm Design Verification Test	4	2021	4	2021
5.56mm Preliminary Design Review (PDR)	1	2022	1	2022
5.56mm User Assessment	1	2022	3	2022
5.56mm Critical Design Review (CDR)	4	2022	4	2022
5.56mm Development Test & Evaluation (DT&E)	4	2022	1	2023
5.56mm Production Qualification Testing (PQT)	4	2023	1	2024
5.56mm Live-Fire Test and Evaluation (LFT&E)	4	2023	1	2024
5.56mm Milestone C (MS-C)	4	2024	4	2024
NGSW & .50 caliber Concept Design Evaluation	1	2020	2	2021

Note
As the technology matures, Project EB8 One-Way Luminescence (OWL) for Small Caliber funding transitioned to Budget Activity (BA) 5 Program Element (PE) 0604802A Weapons and Munitions - Eng Dev Weapons and Munitions - Eng Dev Project EP4 OWL Small Caliber Ammo.

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army										Date: February 2020		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition				Project (Number/Name) EB9 / Aviation Airborne Expendable Countermeasures			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EB9: Aviation Airborne Expendable Countermeasures	-	5.004	3.186	4.496	-	4.496	6.054	0.000	0.000	0.000	0.000	18.740
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project EB9 / Aviation Airborne Expendable Countermeasures within PE 0603639A / Tank and Medium Caliber Ammunitions transitions to Engineering and Manufacturing Development (EMD) under Project EP7 / Aviation Airborne Expendable Countermeasures within PE 0604802A / Weapons and Munitions - Eng Dev.

A. Mission Description and Budget Item Justification

Project EB9 Aviation Airborne Expendable Countermeasure (AAECM) supports the advanced development activities and technology demonstrations of the AAECM to include the XM215 Flare and XM20 Radio Frequency (RF) expendables. These expendable countermeasures systems are essential parts of survivability equipment for Army aircraft. Army Research Development Technology & Evaluation (RDT&E) efforts are coordinated with Program Executive Office (PEO) Aviation to address the AAECM capability, a critical enabler for the Future Vertical Lift (FVL) - Aircraft Survivability Equipment (ASE) Cross Functional Team (CFT) within the Army's top modernization priorities.

These advanced decoys will address deficiencies in Army aircraft protection and the safety of its aircrews against advanced Man-Portable Air Defense Systems (MANPADS) and shoulder launched Surface-to-Air Missiles (SAM) systems. This program will evaluate integrated technologies and countermeasure prototype systems in realistic operating test environments. Prototypes will demonstrate component and subsystem maturity prior to integration into major Army aircraft platforms. FY 2021 supports initial developmental/operational testing on XM215 and RF Countermeasures (CM).

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

	FY 2019	FY 2020	FY 2021
Title: Expendable Countermeasures to Guided Missile Threats	5.004	3.041	4.496
Description: This program will develop expendable CM decoys which will protect Army aircraft from surface-to-air missiles.			
FY 2020 Plans: Conducted optimization for the XM215 during Technology Maturation & Risk Reduction (TMRR), System Requirements Review (SRR) and flight testing. Continued maturing prototype design and technology and Pre-Engineering and Manufacturing Development (EMD) review. Prepared Initial documentation to support Milestone B for Radio Frequency (RF) Countermeasures (CM). Conducted Pre-EMD review and Preliminary Design Review (PDR) for RF CM.			
FY 2021 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB9 / <i>Aviation Airborne Expendable Countermeasures</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Transition from Technology Maturation & Risk Reduction (TMRR) to EMD Phase of program and complete flight testing and Modeling and Simulation efforts.			
FY 2020 to FY 2021 Increase/Decrease Statement: Increase from FY 2020 to FY 2021 due to additional testing and modeling and simulation requirements.			
Title: FY 2020 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638	-	0.145	-
FY 2020 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2020 to FY 2021 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	5.004	3.186	4.496

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• EP7: <i>Aviation Airborne Expendable Countermeasures</i>	-	4.920	4.476	-	4.476	8.241	-	-	-	0.000	17.637

Remarks

D. Acquisition Strategy
A Technical Development Strategy (TDS) for the development and production of Flare, Aircraft: Countermeasure XM215 and RF Decoys under the AAECM program for the United States (U.S.) Army will be used. Prototyping contracts will be awarded competitively under the Department of Defense (DoD) Ordnance Technology Consortium (DOTC) Section 845 Other Transaction Authority (OTA) contract mechanism. Following Milestone B EMD activities will include continued design development, flight testing, design verification review, and developmental and operational testing ahead of Milestone C.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603639A / Tank and Medium Caliber Ammunition				EB9 / Aviation Airborne Expendable Countermeasures							
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.145		-		-		-	0.000	0.145	-
Subtotal			-	-		0.145		-		-		-	0.000	0.145	N/A
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
XM215 Development	MIPR	CCDC Armaments Center : Picatinny Arsenal, NJ	2.638	0.894	Nov 2018	-		-		-		-	0.000	3.532	-
RF Development	C/FFP	CCDC Armaments Center : Picatinny Arsenal, NJ	0.773	0.787	Jun 2019	1.401	Jan 2020	-		-		-	0.000	2.961	-
Subtotal			3.411	1.681		1.401		-		-		-	0.000	6.493	N/A
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
RF Engineering Support	MIPR	CCDC Armaments Center : Picatinny Arsenal, NJ	0.650	-		0.588	Jan 2020	0.500	Oct 2020	-		0.500	0.000	1.738	-
Subtotal			0.650	-		0.588		0.500		-		0.500	0.000	1.738	N/A
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
XM215 Flight Test and Evaluation	MIPR	Various : Various	2.732	1.468	Apr 2019	-		-		-		-	0.000	4.200	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB9 / <i>Aviation Airborne Expendable Countermeasures</i>

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				
	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	
XM215 Development																													
XM215 Milestone A	1 ▲ XM215 MS-A																												
XM215 Prototyping																													
XM215 Down Select					3 ▲ XM215 DS																								
XM215 Testing Efforts (Stability/Heat/Cold)																													
XM215 Flight Testing					4 ▲ XM215 MS-B																								
XM215 Milestone B					4 ▲ XM215 MS-B																								
XM215 Engineering and Manufacturing Development																													
XM215 Design Verification Test									2 ■ XM215 DVT																				
XM215 Flight Test									3 ■ XM215 Flight Test																				
XM215 Developmental and Operational Testing													3 ■ XM215 DT/OT																
XM215 Milestone C																	8 ▲ XM215 MS-C												
Radio Frequency (RF) Development																													

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB9 / <i>Aviation Airborne Expendable Countermeasures</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
XM215 Development	1	2019	4	2025
XM215 Milestone A	1	2019	1	2019
XM215 Prototyping	1	2019	2	2020
XM215 Down Select	3	2019	3	2019
XM215 Testing Efforts (Stability/Heat/Cold)	3	2019	2	2020
XM215 Flight Testing	1	2020	2	2020
XM215 Milestone B	2	2020	2	2020
XM215 Engineering and Manufacturing Development	2	2020	4	2022
XM215 Design Verification Test	2	2021	3	2021
XM215 Flight Test	3	2021	4	2021
XM215 Developmental and Operational Testing	2	2022	4	2022
XM215 Milestone C	2	2023	2	2023
Radio Frequency (RF) Development	1	2019	4	2025
RF Milestone A	1	2019	1	2019
RF Prototype Development	1	2019	4	2019
RF Demonstrations	2	2019	3	2019
RF Flight Testing 1	4	2019	4	2019
RF Data Analysis	4	2019	3	2020
RF Milestone B	3	2020	3	2020
RF Development Contract	3	2020	1	2022
RF Qualification Build	1	2021	2	2021
RF Critical Design Review	2	2021	2	2021

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EB9 / <i>Aviation Airborne Expendable Countermeasures</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
RF Production Qualification Testing	2	2021	3	2021
RF Developmental Test and Evaluation	3	2021	4	2021
RF Milestone C	1	2022	1	2022

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army										Date: February 2020		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition			Project (Number/Name) EC2 / Adv Armor-Piercing (ADVAP) for Small Cal Ammo				
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EC2: Adv Armor-Piercing (ADVAP) for Small Cal Ammo	-	5.334	6.821	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	12.155
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2020 Project EC2 Adv Armor-Piercing (ADVAP) Small Cal Ammo funding transitioned to Budget Activity (BA) 5 Program Element (PE) 0604802A Weapons and Munitions - Eng Dev Project FL4 Small Caliber Ammo Next Gen Squad Weapons.

A. Mission Description and Budget Item Justification

The Advanced Armor-Piercing (ADVAP) project is a critical technology development in response to the 7.62 millimeter (mm) and 5.56mm Family of Ammunition Capabilities Development Documents (CDD) and the Soldier Lethality Cross Functional Team (SL CFT) Initial Capability Document (ICD) which outlines the requirements for new ammunition to support the rapid prototyping/development of the Next Generation Squad Weapons (NGSW) under the Middle Tier of Acquisition (MTA) authority for rapid prototyping/rapid fielding. New ADVAP ammunition is designed to provide overmatch capability to defeat advanced light armored threats within typical machine gun engagement ranges.

The Next Generation Squad Weapons (NGSW) ammunition is split into two initial variants, the General Purpose (GP) and the Special Purpose (SP). The nomenclature for the GP ammunition is XM1186 and the nomenclature for the SP ammunition is XM1184. The overall objective of the ADVAP project is to develop and Full Materiel Release (FMR) ammunition to defeat hard targets.

There is no Fiscal Year (FY) 2021 funding request.

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

	FY 2019	FY 2020	FY 2021
Title: Small Caliber Ammunition Rapid Prototyping	5.334	6.821	-
Description: Develop, demonstrate, and qualify small caliber ADVAP cartridges that can defeat threat targets and provide overmatch capability versus a broad spectrum of hard targets.			
FY 2020 Plans: FY 2020 efforts were focused on continuing rapid prototyping/development of the SP projectile, built prototypes and maturing prototypes to provide to the weapon system contractors for performance evaluation, conducted a Critical Design Review (CDR), and conducted prototype testing. Also, conducted a Preliminary Design Review (PDR) for the SP projectile and performed activities to increase prototype capacity to support planned weapon system testing beginning in FY 2021 and FY 2022.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC2 / <i>Adv Armor-Piercing (ADVAP) for Small Cal Ammo</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Project EC2 Adv Armor-Piercing (ADVAP) Small Cal Ammo funding transitioned to BA 5 PE 0604802A Weapons and Munitions - Eng Dev Project EP5 Adv Armor Piercing (ADVAP) Small Caliber Ammo and Project FL4 Small Caliber Ammo Next Gen Squad Weapons.			
Accomplishments/Planned Programs Subtotals	5.334	6.821	-

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• EP5: <i>Adv Armor-Piercing (ADVAP) for Small Caliber Ammo</i>	20.247	-	0.000	-	0.000	-	-	-	-	0.000	20.247
• FL4: <i>Small Caliber Ammo for Next Gen Squad Weapons</i>	-	18.180	30.600	-	30.600	28.723	24.976	11.739	11.858	0.000	126.076

Remarks
 These funding lines support EMD activities for the 7.62mm ADVAP ammunition and rapid prototyping/development of GP and SP ammunition for the NGSW systems. Other Program Funding in Budget Activity 05 (BA 05) PE 0604802A, Project EP5 ADVAP for Small Cal Ammo and BA 05 PE 0604802A Weapons and Munitions - Eng Dev Project FL4 Small Caliber Ammo for Next Gen Squad Weapons

D. Acquisition Strategy
 New ammunition development effort for Next Generation Squad Weapons (NGSW) systems, will utilize the MTA authority for rapid prototyping/rapid fielding. The project will utilize Government developed projectile designs that will be delivered to development contractors as Government Furnished Material (GFM). The Government will select up to three contractors for the weapon system development and down-select to a single contractor in FY 2021, prior to production contract award.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603639A / Tank and Medium Caliber Ammunition				EC2 / Adv Armor-Piercing (ADVAP) for Small Cal Ammo							
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
Projectile Development	Option/CPFF	Northrop Grumman Innovation Systems : Independence, MO	-	1.046	Jan 2019	3.200	Jan 2020	-		-		-	Continuing	Continuing	Continuing
Ammo Cartridge Development 1	Option/CPFF	Sig Sauer : Newington, NH	-	0.500		-		-		-		-	0.000	0.500	-
Ammo Cartridge Development 2	Option/CPFF	General Dynamics : Florham Park, NJ	-	0.500		-		-		-		-	0.000	0.500	-
Subtotal			-	2.046		3.200		-		-		-	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
Combat Capabilities Development Command Armaments Center (CCDC AC)	MIPR	Picatinny Arsenal : New Jersey	6.387	1.680	Oct 2018	1.921	Oct 2019	-		-		-	Continuing	Continuing	Continuing
Army Research Lab (ARL)	MIPR	Aberdeen : Maryland	1.000	1.608	Oct 2018	1.000	Oct 2019	-		-		-	Continuing	Continuing	Continuing
Subtotal			7.387	3.288		2.921		-		-		-	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
Army Research Lab (ARL)	MIPR	Aberdeen : Maryland	3.200	-		0.500	Oct 2019	-		-		-	Continuing	Continuing	Continuing
U.S. Army Aberdeen Test Center	TBD	Aberdeen : Maryland	-	-		0.200	Oct 2019	-		-		-	Continuing	Continuing	Continuing
Subtotal			3.200	-		0.700		-		-		-	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army							Date: February 2020					
Appropriation/Budget Activity 2040 / 4			R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>				Project (Number/Name) EC2 / <i>Adv Armor-Piercing (ADVAP) for Small Cal Ammo</i>					
	Prior Years	FY 2019		FY 2020		FY 2021 Base	FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	10.587	5.334		6.821		-	-	-	-	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC2 / <i>Adv Armor-Piercing (ADVAP) for Small Cal Ammo</i>

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025							
	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				
NGSW Ammo Rapid Prototyping																																
NGSW Ammo Initial Product Review 1 (IPR 1) Special Purpose	1																															
NGSW Ammo Preliminary Design Review General Purpose (PDR-GP)		2																														
NGSW Ammo Initial Product Review 2 (IPR 2) Special Purpose			3																													
NGSW Ammo Preliminary Design Review Special Purpose (PDR-SP)				4																												
NGSW Ammo Critical Design Review General Purpose (CDR-GP)					5																											
NGSW Ammo Prototype Test 1									6																							
NGSW Ammo Full Materiel Release (FMR) Transitions from BA04 EC2 to BA05 FL4													7																			
NGSW Ammo Critical Design Review Special Purpose (CDR-SP)														8																		
NGSW Ammo Prototype Test 2																																
NGSW Ammo Safety Testing (SP)																																
NGSW Ammo Urgent Materiel Release General Purpose (UMR GP)																																

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC2 / <i>Adv Armor-Piercing (ADVAP) for Small Cal Ammo</i>

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025							
	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				
NGSW Ammo Urgent Materiel Release Special Purpose (UMR SP)																																
NGSW Ammo Rapid Fielding																																
NGSW Ammo Production Qualification Testing Special Purpose (PQT SP)																																
NGSW Ammo Full Materiel Release (FMR)																																

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC2 / <i>Adv Armor-Piercing (ADVAP) for Small Cal Ammo</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
NGSW Ammo Rapid Prototyping	1	2019	2	2024
NGSW Ammo Initial Product Review 1 (IPR 1) Special Purpose	2	2019	2	2019
NGSW Ammo Preliminary Design Review General Purpose (PDR-GP)	3	2019	3	2019
NGSW Ammo Initial Product Review 2 (IPR 2) Special Purpose	4	2019	4	2019
NGSW Ammo Preliminary Design Review Special Purpose (PDR-SP)	2	2020	2	2020
NGSW Ammo Critical Design Review General Purpose (CDR-GP)	3	2020	3	2020
NGSW Ammo Prototype Test 1	3	2020	4	2020
NGSW Ammo Initial Product Review 3 (IPR 3) Special Purpose	4	2020	4	2020
NGSW Ammo Full Materiel Release (FMR) Transitions from BA04 EC2 to BA05 FL4	2	2021	2	2021
NGSW Ammo Critical Design Review Special Purpose (CDR-SP)	2	2021	2	2021
NGSW Ammo Prototype Test 2	2	2021	3	2021
NGSW Ammo Safety Testing (SP)	1	2022	3	2022
NGSW Ammo Urgent Materiel Release General Purpose (UMR GP)	4	2022	4	2022
NGSW Ammo Urgent Materiel Release Special Purpose (UMR SP)	4	2022	4	2022
NGSW Ammo Rapid Fielding	4	2022	1	2026
NGSW Ammo Production Qualification Testing Special Purpose (PQT SP)	1	2023	2	2023
NGSW Ammo Full Materiel Release (FMR)	2	2024	2	2024

Note

Note: Next Generation Squad Weapon (NGSW)

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army										Date: February 2020		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition				Project (Number/Name) EC3 / Ammunition Logistics Prototyping			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EC3: Ammunition Logistics Prototyping	-	1.271	1.525	1.713	-	1.713	2.168	1.798	1.834	1.870	0.000	12.179
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project supports the future force by improving the distribution, management, reliability and survivability of ammunition through the advanced development, integration, and demonstration of logistics system enablers. These enablers will improve the efficiency and effectiveness of ammunition operations, to include retrograde, while reducing the logistics footprint on the battlefield. Technology areas addressed include handling, distribution, and management (strategic and tactical), prognostics, diagnostics, and asset visibility, explosives safety, and adaptive and environmentally friendly packaging and palletization. The efficient deployment and sustainment of reliable ammunition is vital to success on the battlefield. This Project enhances the operational effectiveness of the ammunition logistics system to ensure the distribution of reliable ammunition to the warfighter. Fiscal Year (FY) 2021 funding will be used to reduce device cost and establish an alternate source for monitoring devices as well as verifying that issues found during testing have been resolved. FY 2021 funding will also be used to demonstrate a suite of monitoring technologies, which will be used for assessing munitions reliability. All research and development initiatives will be supporting the cross functional teams and the multi domain operations modernization objectives through deployment of prototypes for user evaluation.

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

	FY 2019	FY 2020	FY 2021
Title: Munitions Health and Inventory Monitoring Systems	1.271	0.991	1.213
Description: Performance and reliability of certain munitions can be degraded by the environmental exposure history they experience during their lifetime. This Project will develop simple to complex environmental health and inventory monitoring systems to improve reliability and asset visibility and enable effective Condition Based Management for Ammunition.			
FY 2020 Plans: Conducted an extended operational demonstration of the environmental health monitoring system to enable condition based management of ammunition. Continued verification testing of a type II prototype next generation temperature/humidity sensor with batch interrogation and historical data retention capabilities for the assessment of munition reliability and completed an operational demonstration of the type I prototype. Completed operational demonstration of the low cost thermal indicator, which provides passive lifetime temperature exposure sensing.			
FY 2021 Plans: Conduct verification testing of a type II prototype next generation temperature/humidity sensor. Conduct verification testing of alternative form factor munitions health monitoring system on multiple packaging types. Conduct an assessment on the value of storing data in various formats from data rich to highly summarized to support a business case analysis of the transfer and long			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC3 / <i>Ammunition Logistics Prototyping</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
term storage of data in an overarching data system. Conduct environmental testing on phase 2 health monitoring suite (RRAPDS) prototypes. FY 2020 to FY 2021 Increase/Decrease Statement: Slight increase in labor costs.				
Title: Munitions Containerization Systems Description: For each family of munitions containers, optimize prototype container systems for automation compatibility, combat unit load quantity, sustainability/recyclability, Insensitive Munitions/explosives safety, environmental protection, load reconfiguration, unitization, and standardized interfaces. This will improve ammunition distribution efficiency while minimizing environmental and operational impacts. FY 2020 Plans: Performed qualification testing of production representative rectangular polymer container for family of 5.56 millimeter (mm) ammunition. Performed advanced development and prototype demonstration of the plastic cylindrical container in a realistic operating environment. FY 2021 Plans: Conduct test and evaluation on injection molded cylindrical container for integration with 105mm tank ammunition. FY 2020 to FY 2021 Increase/Decrease Statement: The slight increase from FY 2020 to FY 2021 is due to labor rate increases.		-	0.465	0.500
Title: FY 2020 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2020 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2020 to FY 2021 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	0.069	-
Accomplishments/Planned Programs Subtotals		1.271	1.525	1.713
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC3 / <i>Ammunition Logistics Prototyping</i>

D. Acquisition Strategy

Munitions Health Monitoring and Munitions Containerization systems will be developed through government and industry prototype efforts. FY 2021 funding will be used to reduce device cost and establish an alternate source for monitoring devices as well as verifying that issues found during testing have been resolved.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603639A / Tank and Medium Caliber Ammunition				EC3 / Ammunition Logistics Prototyping							
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.069		-		-		-	0.000	0.069	-
Subtotal			-	-		0.069		-		-		-	0.000	0.069	N/A
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
Next Generation Temperature Humidity Indicator	C/FFP	AGM : Tuscon, AZ	0.406	0.472	Aug 2019	0.387	Dec 2019	0.450	Mar 2021	-		0.450	0.000	1.715	-
Contract - Low Cost Thermal Indicator	C/FFP	Innosense : Torrance, CA	2.139	0.392	Aug 2019	0.186	Dec 2019	-		-		-	0.000	2.717	-
Contract - Remote Readiness Asset Prognostic/Diagnostic System (RRAPDS)	C/FFP	Karagozian & Case : Glendale, CA	1.152	-		-		0.450	Jun 2021	-		0.450	0.000	1.602	-
Contract-Plastic Cylindrical Container	C/FFP	SAVIT : Rockaway, NJ	0.647	-		0.261	Mar 2020	0.200	Mar 2021	-		0.200	0.000	1.108	-
Contract-Plastic Rectangular Container	C/FFP	Polymer Technologies Inc. : Clifton, NJ	-	-		-		0.200	Mar 2021	-		0.200	0.000	0.200	-
Subtotal			4.344	0.864		0.834		1.300		-		1.300	0.000	7.342	N/A
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
Combat Capabilities Development Command Armaments Center (CCDC AC)	MIPR	Picatinny Arsenal : NJ	3.593	0.407	Dec 2018	0.386	Dec 2019	0.213	Dec 2020	-		0.213	0.000	4.599	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC3 / <i>Ammunition Logistics Prototyping</i>

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	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
Advanced Concept Development-Munitions Health Monitoring-1																												
Advanced Concept Development-Munitions Health Monitoring-1A																												
Advanced Concept Development-Munitions Health Monitoring-2																												
Advanced Concept Development-Munitions Containerization-1																												
Advanced Concept Development-Munitions Containerization-1A																												
Advanced Concept Development-Munitions Health Monitoring-3																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EC3 / <i>Ammunition Logistics Prototyping</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Advanced Concept Development-Munitions Health Monitoring-1	2	2015	4	2020
Advanced Concept Development-Munitions Health Monitoring-1A	1	2021	4	2023
Advanced Concept Development-Munitions Health Monitoring-2	2	2015	4	2022
Advanced Concept Development-Munitions Containerization-1	1	2020	4	2021
Advanced Concept Development-Munitions Containerization-1A	1	2020	4	2021
Advanced Concept Development-Munitions Health Monitoring-3	3	2017	4	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition				Project (Number/Name) EL7 / Reduced Range Ammunition			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EL7: Reduced Range Ammunition	-	2.090	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.090
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The small caliber Reduced Range Ammunition (RRA) project is a critical technology development in response to the 7.62 millimeter (mm) and .50 caliber Capabilities Development Documents (CDD). The overall objective of RRA is to provide training ammunition suitable for use on military installations with Surface Danger Zone (SDZ) restrictions. The relatively long maximum range of the 7.62mm and .50 caliber service ammunition poses challenges on training ranges in range restricted areas. RRA will mitigate a training gap on installations by providing a materiel solution that meets training needs while shortening and condensing the SDZ. This will allow soldiers to train with 7.62mm and .50 caliber weapons on restricted ranges. The RRA cartridge design will be compatible with all Army 7.62mm and .50 caliber weapons but specifically optimized to work in the M240 and M2 Machine Guns. There is no funding requested in Fiscal Year (FY) 2021.

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

	FY 2019	FY 2020	FY 2021
Title: Technology Maturation and Risk Reduction (TMRR)	2.090	-	-
Description: Develop, demonstrate, and qualify small caliber 7.62mm and .50 caliber ammunition that will provide a reduced range training capability to the M240 and M2 gunners.			
Accomplishments/Planned Programs Subtotals	2.090	-	-

C. Other Program Funding Summary (\$ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• EP3: Reduced Range Ammunition - Small Caliber	4.432	8.376	15.377	-	15.377	14.873	5.095	-	-	0.000	48.153

Remarks

The 7.62mm effort under Budget Activity 04 Program Element (PE) 0603639A, Project EL7, Reduced Range Ammunition (RRA), transitioned in FY 2019 to Budget Activity 05 PE 0604802A, Project EP3, Reduced Range Ammunition - Small Caliber. Under PE 0604802A, Project EP3, Reduced Range Ammunition (RRA) funding continues the development work of 7.62mm and supports Engineering and Manufacturing Development (EMD) and development work on the .50 Caliber variant which transitions in FY 2020.

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EL7 / <i>Reduced Range Ammunition</i>

D. Acquisition Strategy

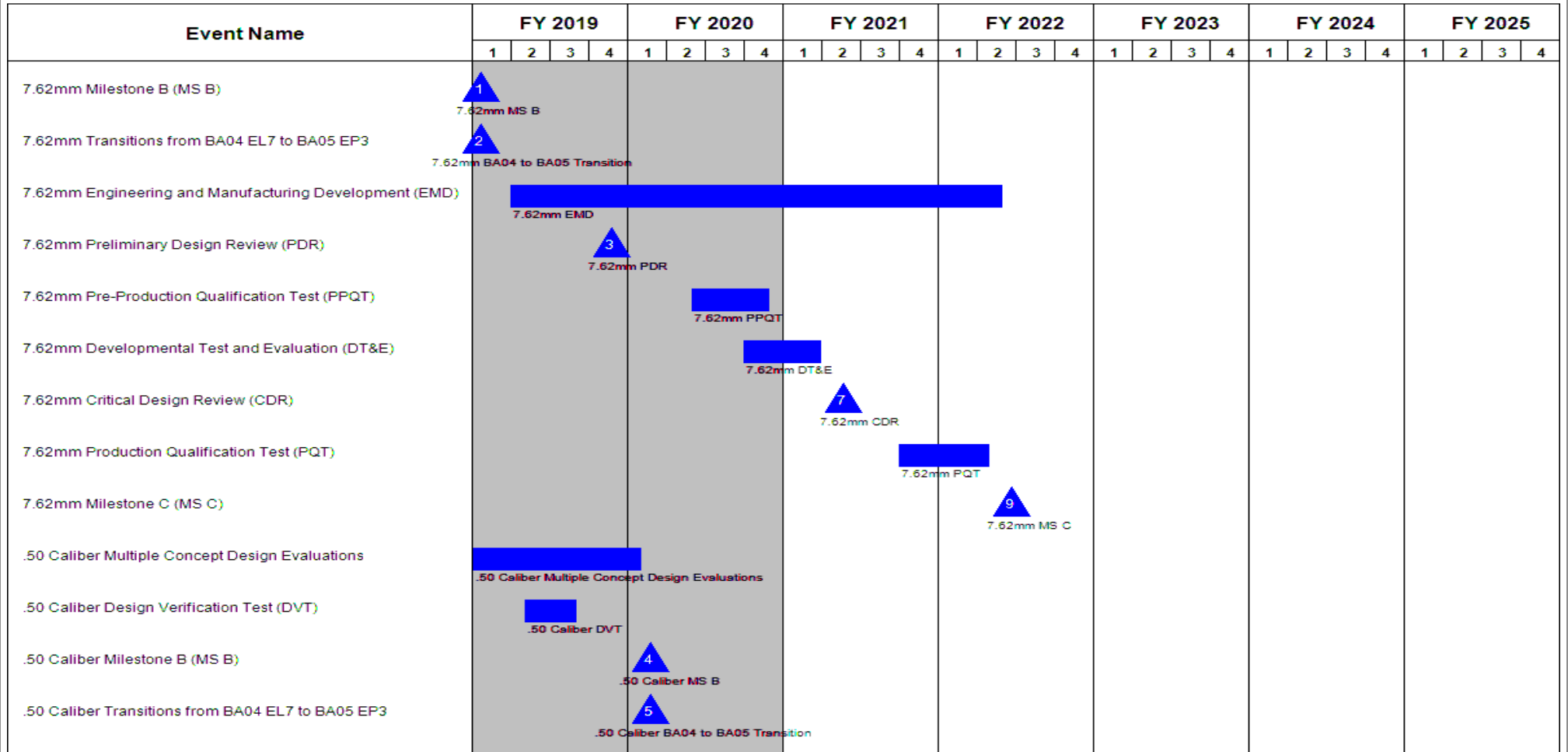
After 7.62mm Milestone (MS) B in FY 2019, the Government intends to award Engineering and Manufacturing Development (EMD) contracts. The Government will then award competitive contracts for 7.62mm Pre-Production Qualification Testing (PPQT) hardware in FY 2020 and down-select to a single contractor to complete EMD. The .50 Caliber program follows a similar strategy. The Government intends to award multiple competitive contracts for the .50 Caliber EMD.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army												Date: February 2020				
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)								
2040 / 4				PE 0603639A / Tank and Medium Caliber Ammunition				EL7 / Reduced Range Ammunition								
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total		Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost				
Development Contract # 1	C/CPFF	General Dynamics : Florham Park, NJ	-	0.770	Jan 2019	-		-		-		-	0.000	0.770	-	
Development Contract # 2	C/CPFF	Nammo Tally : Mesa, AZ	-	0.770	Jan 2019	-		-		-		-	0.000	0.770	-	
Subtotal			-	1.540		-		-		-		-	0.000	1.540	N/A	
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total		Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost				
Combat Capabilities Development Command Armaments Center (CCDC AC)	MIPR	Picatinny Arsenal : New Jersey	3.133	0.550	Oct 2018	-		-		-		-	0.000	3.683	-	
Army Research Lab (ARL)	MIPR	Aberdeen Proving Ground : Maryland	0.430	-		-		-		-		-	0.000	0.430	-	
Subtotal			3.563	0.550		-		-		-		-	0.000	4.113	N/A	
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total		Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost				
US Army Aberdeen Test Center (ATC)	MIPR	Aberdeen Proving Ground : Maryland	0.327	-		-		-		-		-	0.000	0.327	-	
Prototype testing	C/FFP	Double B Enterprises : Malvern, OH	0.052	-		-		-		-		-	0.000	0.052	-	
Subtotal			0.379	-		-		-		-		-	0.000	0.379	N/A	

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EL7 / <i>Reduced Range Ammunition</i>



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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EL7 / <i>Reduced Range Ammunition</i>

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	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
.50 Caliber Engineering and Manufacturing Development (EMD)																												
.50 Caliber Preliminary Design Review (PDR)																												
.50 Caliber Pre-Production Qualification Test (PPQT)																												
.50 Caliber Soldier Touch Point (STP)																												
.50 Caliber Critical Design Review (CDR)																												
.50 Caliber Production Qualification Test (PQT)																												
.50 Caliber Milestone C (MS C)																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EL7 / <i>Reduced Range Ammunition</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
7.62mm Multiple Concept Design Evaluations	1	2017	4	2018
7.62mm Materiel Development Decision (MDD)	4	2017	4	2017
7.62mm Design Verification Test (DVT)	2	2018	3	2018
7.62mm Milestone B (MS B)	1	2019	1	2019
7.62mm Transitions from BA04 EL7 to BA05 EP3	1	2019	1	2019
7.62mm Engineering and Manufacturing Development (EMD)	1	2019	2	2022
7.62mm Preliminary Design Review (PDR)	4	2019	4	2019
7.62mm Pre-Production Qualification Test (PPQT)	2	2020	4	2020
7.62mm Developmental Test and Evaluation (DT&E)	4	2020	1	2021
7.62mm Critical Design Review (CDR)	2	2021	2	2021
7.62mm Production Qualification Test (PQT)	4	2021	2	2022
7.62mm Milestone C (MS C)	2	2022	2	2022
.50 Caliber Project Starts on BA04 EL7	1	2018	1	2018
.50 Caliber Multiple Concept Design Evaluations	1	2018	1	2020
.50 Caliber Materiel Development Decision (MDD)	2	2018	2	2018
.50 Caliber Design Verification Test (DVT)	2	2019	3	2019
.50 Caliber Milestone B (MS B)	1	2020	1	2020
.50 Caliber Transitions from BA04 EL7 to BA05 EP3	1	2020	1	2020
.50 Caliber Engineering and Manufacturing Development (EMD)	1	2020	2	2023
.50 Caliber Preliminary Design Review (PDR)	4	2020	4	2020
.50 Caliber Pre-Production Qualification Test (PPQT)	4	2020	2	2021
.50 Caliber Soldier Touch Point (STP)	2	2021	3	2021

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EL7 / <i>Reduced Range Ammunition</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
.50 Caliber Critical Design Review (CDR)	4	2021	4	2021
.50 Caliber Production Qualification Test (PQT)	1	2022	3	2022
.50 Caliber Milestone C (MS C)	2	2023	2	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army										Date: February 2020		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition			Project (Number/Name) EU3 / .50 Caliber All-Purpose Tactical Cartridge (APTC)				
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EU3: .50 Caliber All-Purpose Tactical Cartridge (APTC)	-	0.000	4.250	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.250
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year (FY) 2021, the small caliber All-Purpose Tactical Cartridge (APTC) Project transitions to Budget Activity 05 (BA 05) Program Element (PE) 0604802A, Project EU5, .50 Caliber All-Purpose Tactical Cartridge (APTC) to continue development work and support Engineering and Manufacturing Development (EMD).

A. Mission Description and Budget Item Justification

The APTC project is a critical technology development in response to the .50 caliber Munitions Capabilities Development Documents (CDD). The overall objective of APTC is to deliver a single round that replaces and improves current legacy .50 caliber ammunition. The APTC will be compatible with all Army .50 caliber weapons but specifically optimized to work in the M2 Machine Guns. There is no FY 2021 funding request.

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

	FY 2019	FY 2020	FY 2021
<p>Title: Technology Maturation and Risk Reduction (TMRR)</p> <p>Description: Develop, demonstrate, and qualify new .50 Caliber ammunition to replace and/or improve current legacy .50 Caliber variants.</p> <p>FY 2020 Plans: Built, evaluated, and refined .50 Caliber APTC concepts/prototypes and performed Milestone B preparation activities. Evaluated M8 Armor Piercing Incendiary (API), M20 API Trace, M903 Saboted Light Armor Penetrator (SLAP), and M962 SLAP Trace ammunition for improvements that would satisfy the .50 APTC requirement.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: The effort under Budget Activity 04, Program Element (PE) 0603639A, Project EU3, .50 Caliber APTC, transitions in FY 2021 to Budget Activity 05, PE 0604802A, Project EU5.</p>	-	4.057	-
<p>Title: FY 2020 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2020 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement:</p>	-	0.193	-

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army	Date: February 2020
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EU3 / <i>.50 Caliber All-Purpose Tactical Cartridge (APTC)</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	-	4.250	-

C. Other Program Funding Summary (\$ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• EU5: <i>.50 Caliber All-Purpose Tactical cartridge (APTC)</i>	-	-	8.491	-	8.491	9.390	-	-	11.989	0.000	29.870

Remarks

Project EU3 A.50 Caliber APTC funding transitioned to BA 5 PE 0604802A Weapons and Munitions - Eng Dev, Project EU5, .50 Caliber All-Purpose Tactical Cartridge (APTC).

D. Acquisition Strategy

Evaluate competing concepts/prototypes from contractors and Government. In FY 2021, the Government intends to select up to two competing contractors to begin Engineering and Manufacturing Development (EMD). In FY 2022, the Government intends to select a single contractor to complete final qualification and testing in preparation for the transition to production in FY 2023.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0603639A / Tank and Medium Caliber Ammunition				EU3 / .50 Caliber All-Purpose Tactical Cartridge (APTC)							
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.193		-		-		-	0.000	0.193	-
Subtotal			-	-		0.193		-		-		-	0.000	0.193	N/A
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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	C/CPFF	To be Determined : To be Determined	-	-		2.435	Jan 2020	-		-		-	Continuing	Continuing	Continuing
Subtotal			-	-		2.435		-		-		-	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
Combat Capabilities Development Command Armaments Center (CCDC AC)	MIPR	Picatinny Arsenal : New Jersey	-	-		0.936	Jan 2020	-		-		-	Continuing	Continuing	Continuing
Subtotal			-	-		0.936		-		-		-	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
Verification Testing	MIPR	Army Research Lab (ARL) : Maryland	-	-		0.686	Jan 2020	-		-		-	Continuing	Continuing	Continuing
Subtotal			-	-		0.686		-		-		-	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army							Date: February 2020				
Appropriation/Budget Activity 2040 / 4			R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>			Project (Number/Name) EU3 / <i>.50 Caliber All-Purpose Tactical Cartridge (APTC)</i>					
	Prior Years	FY 2019	FY 2020		FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals	-	-	4.250		-	-	-	Continuing	Continuing	N/A	

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition	Project (Number/Name) EU3 / .50 Caliber All-Purpose Tactical Cartridge (APTC)

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				
	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	
APTC Materiel Development Decision (MDD)				▲ 1 APTC MDD																									
APTC Concept & Prototype Development					■ APTC Concept & Prototype Development																								
APTC Design Verification Test (DVT) 1					■ APTC DVT 1																								
APTC Preliminary Design Review (PDR)								▲ 2 APTC PDR																					
APTC Milestone B									▲ 3 APTC MS B																				
APTC Transitions from BA04 EU3 to BA05 EU5									▲ 4 APTC BA04 to BA05 Transition																				
APTC Engineering & Manufacturing Development (EMD)									■ APTC EMD																				
APTC Design Verification Test (DVT) 2									■ APTC DVT 2																				
APTC Pre-Production Qualification Testing (PPQT)													■ APTC PPQT																
APTC Critical Design Review (CDR)																	▲ 5 APTC CDR												
APTC Production Qualification Testing (PQT)																					■ APTC PQT								
APTC Milestone C (MS C)																									▲ 6 APTC MS C				

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) EU3 / <i>.50 Caliber All-Purpose Tactical Cartridge (APTC)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
APTC Materiel Development Decision (MDD)	1	2020	1	2020
APTC Concept & Prototype Development	1	2020	1	2021
APTC Design Verification Test (DVT) 1	2	2020	3	2020
APTC Preliminary Design Review (PDR)	4	2020	4	2020
APTC Milestone B	1	2021	1	2021
APTC Transitions from BA04 EU3 to BA05 EU5	1	2021	1	2021
APTC Engineering & Manufacturing Development (EMD)	2	2021	4	2022
APTC Design Verification Test (DVT) 2	2	2021	3	2021
APTC Pre-Production Qualification Testing (PPQT)	4	2021	4	2021
APTC Critical Design Review (CDR)	2	2022	2	2022
APTC Production Qualification Testing (PQT)	3	2022	4	2022
APTC Milestone C (MS C)	1	2023	1	2023

Note

Note: All-Purpose Tactical Cartridge (APTC)

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army										Date: February 2020		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition				Project (Number/Name) FA5 / Assured Precision Weapons and Munitions			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FA5: Assured Precision Weapons and Munitions	-	13.797	31.267	29.878	-	29.878	30.971	30.971	24.977	12.133	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Assured Precision Weapons and Munitions (APWM) - FA5 Project is focused on advanced risk mitigation, technology integration, prototyping, and product support to identify, evaluate, mature, test, and demonstrate various assured precision prototype technologies in weapon and munitions components and subsystems within a complex system of systems environment. The APWM Project reinforces the National Defense Strategy's major lines of effort through technology development and prototyping, which increases lethality and ensures future combat overmatch success of the Joint Force against peer/near-peer adversaries. This project also aims to improve program performance and affordability for multiple weapons and munitions Programs of Record (PoRs) via Joint Lethality Positioning, Navigation and Timing (PNT) and Army M-Code Global Positioning System (GPS) coordinated efforts. The APWM Project directly supports top Army Modernization Priorities via the Assured-PNT (A-PNT) and Long Range Precision Fires (LRPF) Cross Functional Team (CFT) imperatives in support of the National Defense Strategy. Funding will support engagement by Weapons and Munitions PNT experts in the development, evaluation, and technology delivery activities of the Air Force's M-Code GPS, Army's PNT related programs, and A-PNT CFT programs in support of LRPF and Counter Area Access/Area Denial missions. Funding will also enable component and subsystem architecture input essential for precision weapons and munitions operating in a NavWar system-of-systems environment, Army M-Code GPS technology integration and evaluation, planning for next generation M-Code GPS integration into the Long Range Precision Guidance Kit (LR-PGK) as the Department of Defense-selected representative Joint precision munition, and maturation of alternative PNT related technologies and solutions to enable informed A-PNT related PoR milestone and Army cross-functional modernization decisions.

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

	FY 2019	FY 2020	FY 2021
Title: APWM Integrated Product Support - Joint Lethality PNT SME Working Integrated Product Team (WIPT) & Program Management	2.255	3.397	3.616
Description: Provide assured precision weapons and munitions technical subject matter expertise and support to the Joint oversight board for assured precision weapons and munitions. Provide overall APWM Project Program Management support.			
FY 2020 Plans: The subject matter experts continued to coordinate with and supported the development and technology delivery activities of the Air Force's Military GPS User Equipment (MGUE) program and the Army's A-PNT program including participation in design reviews, evaluation and formal feedback on technology and systems requirements and performance, component and subsystem architecture input essential for precision weapons and munitions operating in a system-of-systems environment, and configuration			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>management of the evolving Joint Common GPS Specification and Interface Control Document for Precision Guided Munitions (PGMs). Specific support focus included requirements for MGUE Increment 2 and alternative PNT technology maturity.</p> <p>FY 2021 Plans: The subject matter experts will continue coordinating with and supporting the development and technology delivery activities of the A-PNT CFT, Air Force's MGUE program and the Army's PNT related programs including participation in design reviews, evaluation and formal feedback on technology and systems requirements and performance, component and subsystem architecture input essential for precision weapons and munitions operating in a system-of-systems environment, and configuration management of the evolving Joint Common GPS Specification and Interface Control Document for PGMs. Specific support focus includes requirements for MGUE Increment 2 and alternative PNT technology maturity.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Level of effort required in Fiscal Year (FY) 2021 is slightly higher than FY 2020 due to A-PNT CFT and Air Force's MGUE program efforts maturing and impacting collaborative efforts for the Joint Lethality community.</p>				
<p>Title: Assured PNT related Integration Risk Mitigation - A-PNT for Family of Scatterable Mines (FASCAM) Replacement</p> <p>Description: Evaluate, mature and test A-PNT system/subsystem components for terrain shaping enabling technologies.</p> <p>FY 2020 Plans: Down-select assured precision technologies including A-PNT technologies for future terrain shaping PoR communication capabilities through modeling and simulation based verification to initiate corresponding technology demonstrations.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Modeling and Simulation, Prototyping, and proof of concept evaluations of A-PNT technologies supporting terrain shaping PoR conclude in FY 2020 . Evaluation and design reports will support transition of A-PNT technologies to the terrain shaping PoR significantly reducing integration risk.</p>		0.767	1.904	-
<p>Title: Assured PNT related Integration Risk Mitigation - Network Assisted A-PNT (NA2) for Weapons & Munitions Phase 1</p> <p>Description: Evaluate, mature and demonstrate technologies for modifying Network Assisted GPS (NA GPS) and associated data exchange that support Alternative PNT and M-Code for Weapons and Munitions.</p>		6.300	-	-
<p>Title: Assured PNT related Integration Risk Mitigation - NA2 for Weapons and Munitions Phase 2</p> <p>Description: Perform NA2 systems of systems capability integration and pre system qualification integration risk reduction activities. Improve initial prototype NA2 capability and initiate improved prototype for subsequent transition to corresponding PoRs. Inform future NAVWAR related weapons and munitions platform dependencies. Integrate and synchronize AltNav capability</p>		-	5.494	3.700

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>delivery within NA2 to meet A-PNT CFT AltNav Directed Requirement which summarizes the urgent need for AltNav initial operational capability in two Brigade Combat Teams NLT 1QFY24.</p> <p>FY 2020 Plans: Included down-selected alternative Positioning, Navigation and Timing (PNT) technologies from initial Network Assisted Assured-PNT phase 1 prototype into improved phase 2 Network Assisted Assured-PNT system of system prototype solution. Performed Network Assisted Assured-PNT systems of systems capability integration and pre-system qualification integration risk reduction activities and finalize prototype software solutions.</p> <p>FY 2021 Plans: Perform Assured PNT system-of-systems integration risk reduction activities. Refine NA2 sub-system prototype software. Conduct full system of systems integration test event for NA2 to mitigate risk of transitioning NA2 capability to the field via multiple Programs of Record to meet A-PNT CFT AltNav Directed Requirement for Initial Operational Capability in FY 2024.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Majority of sub-system prototype software will be completed in FY 2020. FY 2021 focuses on refining prototype software solutions based on FY 2020 integration risk reduction activities and conducting a full system-of-systems integration developmental test which requires less effort than FY 2020 activities.</p>				
<p>Title: Assured PNT related Integration Risk Mitigation - NA2 for Guided Rocket/Missile Launcher Systems</p> <p>Description: Perform software development and prototyping activities to demonstrate NA2 capability for Rocket/Missile artillery launcher systems. Integrate and demonstrate upgraded artillery launcher system into the NA2 systems of systems networked capability to reduce subsequent PoR fielding risks. Integrate and synchronize AltNav capability delivery within NA2 to meet A-PNT CFT AltNav Directed Requirements which summarizes the urgent need for AltNav initial operational capability in two Brigade Combat Teams NLT 1QFY24.</p> <p>FY 2020 Plans: Conducted requirements refinement activities and initiated software development and prototyping activities to provide initial Network Assisted Assured-PNT (NA2) capability for Rocket/Missile artillery launcher systems. Initiated prototyping risk mitigation activities for Rocket/Missile artillery launcher systems.</p> <p>FY 2021 Plans: Perform Assured PNT Rocket/Missile system-of-systems integration risk reduction activities. Refine Rocket/Missile artillery launcher NA2 prototype software. Conduct full system-of-systems integration developmental test event utilizing Rocket/Missile</p>		-	2.823	2.000

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
artillery launchers for NA2 to mitigate risk of transitioning NA2 capability to the field to meet A-PNT CFT AltNav Directed Requirement for Initial Operational Capability in FY 2024. FY 2020 to FY 2021 Increase/Decrease Statement: Majority of Rocket/Missile artillery launcher software will be completed in FY 2020. FY 2021 focuses primarily on risk reduction integration activities which requires less effort than FY 2020 activities.				
Title: Assured PNT related Weapons & Munitions Prototyping - A-PNT upgrades for PGM Fuze Setter Description: Develop, prototype, and evaluate required emerging A-PNT technology enhancements to the PGM Fuze Setter needed to enable continued performance of PGMs) in a realistic operational threat environment.		2.137	-	-
Title: Assured PNT related Weapons & Munitions Prototyping - A-PNT upgrades for Towed Howitzer Platforms Description: Prototype and evaluate MGUE Increment 1 (M-code) GPS receiver cards in the M777A2 and M119A3 Towed Howitzer Platforms and evaluate technologies for providing Assured PNT to PGMs.		0.472	-	-
Title: Assured PNT related Weapons & Munitions Prototyping - Alternative Navigation Technologies (AltNav) Phase 1 Description: Develop, prototype, and evaluate non-Global Positioning System Radio Frequency (Non-GPS RF) Navigation prototype systems for indirect fires, including Long Range Precision Fires.		1.866	-	-
Title: Assured PNT related Weapons & Munitions Prototyping - AltNav Technologies (AltNav) Phase 2 Description: Conduct rapid development and prototyping of AltNav receivers for precision guided munitions (PGMs) and assess operational feedback (receivers, enterprise service, and integration)of solutions to maximize utility of AltNav for LRPF meeting the intent of the A-PNT CFT AltNav Directed Requirement. Demonstrate and conduct performance assessments of potential hardware and software solutions to support Artillery integration efforts as well as inform future Space-based PNT related alternatives for the Land Combat domain. FY 2020 Plans: Designed and developed an Alternative Navigation (AltNav) capable hardware and software prototype for Precision Guided Munition (PGM) applications to demonstrate and quantify AltNav performance. Performed integration efforts with the hardware and software prototype to conduct a ride-along performance evaluation of AltNav in a PGM environment. FY 2021 Plans:		-	4.962	3.175

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Perform AltNav prototype integration activities to facilitate and conduct guide-to-hit PGM experiments. Generate AltNav performance evaluation and technology transition reports that meet the intent of the A-PNT CFT AltNav Directed Requirement.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Majority of integration and risk reduction activities will occur in FY 2020. FY 2021 will focus on completing integration activities and preparing for and performing guide-to-hit experiments which requires less effort than FY 2020 activities.</p>				
<p>Title: Assured PNT related Weapons & Munitions Prototyping - Location Azimuth Determinations System (LADS)</p> <p>Description: Development and integration of prototype LADS to demonstrate an assured weapon survey capability within the M777A2 and M119A3 Howitzer Platforms</p> <p>FY 2020 Plans: Development and integration of prototype Location Azimuth Determination System (LADS) into the M777A2 and M119A3 Howitzer Platforms.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: LADS prototyping, evaluation reports, and technical documentation will be completed in FY 2020. Technology transitions to Program of Record (PoR) in FY 2021.</p>		-	1.223	-
<p>Title: Army M-Code Technology Integration and Evaluation</p> <p>Description: Provide technical assessment, coordination, and engineering support related to the development, prototyping, integration, and evaluation of Air Force's MGUE technology deliverables across all Army Weapons and Munitions, including participation in design reviews, testing, evaluation, and formal feedback on technology, component-level, card-level, sub-system-level, and systems-level requirements and performance. Reduce risk, support, and inform M-Code GPS related Army cross-functional modernization decisions for weapons and munitions operating in a peer/near threat system-of-systems environment as well as identifying complementary PNT solutions when M-Code GPS is not solely sufficient to enable Combat Overmatch.</p> <p>FY 2020 Plans: Established an Army M-Code GPS Weapons and Munitions Integrated Product Team (IPT). Initiated the definition, documentation, and representation of requirement and performance based needs for Army Weapons and Munitions to influence the Air Force's Military GPS User Equipment (MGUE) technology investments, including low power and high performance cross-functional Land Combat applications. Established a centralized Army evaluation and experimentation mechanism to assess the effectiveness of M-Code GPS focused weapon and munition platform capabilities operating in a peer/near Positioning, Navigation and Timing (PNT) threat system-of-systems environment.</p> <p>FY 2021 Plans:</p>		-	9.022	12.101

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Lead an Army M-Code GPS Weapons and Munitions IPT and influence the Air Force's MGUE technology investments via established requirements and performance based needs for Army Weapons and Munitions. Lead a centralized Army evaluation, prototyping, and experimentation mechanism to assess the effectiveness of M-Code GPS focused weapon and munition platform capabilities operating in a peer/near PNT threat system-of-systems environment. Lead a multi-organizational IPT to execute study, analysis, and integration imperatives for the Army M-Code Task Force.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 focuses on executing technology integration and migration strategies developed in FY 2020; as well as, actively participating in development of next generation M-Code technology which requires an increased level of effort.</p>				
<p>Title: MGUE Increment 2 (Inc2) with Precision Guidance Kit - Anti Jam (LR PGK)</p> <p>Description: Influence next generation Military GPS User Equipment (MGUE) development to ensure precision guided munition needs and requirements are met with the Air Force's next generation MGUE. Integrate and test next generation MGUE into the Long Range Precision Guidance Kit (LR-PGK) as the DoD-selected representative Joint precision munition to verify and validate needs and requirements are met by next generation MGUE.</p> <p>FY 2020 Plans: Finalized next generation Precision Guided Munition (PGM) Military GPS User Equipment (MGUE) technical requirements document for use by the MGUE program. Attended technical interchange meetings with MGUE vendors to influence MGUE designs to meet Precision Guided Munitions (PGM) needs and requirements for next generation performance. Performed risk reduction analysis and activities of MGUE vendor designs.</p> <p>FY 2021 Plans: Perform modeling and simulations on GPS threat scenarios on MGUE designs to assess performance for PGM applications. Perform risk reduction analysis and activities of MGUE vendor designs. Draft Inc2 Next Generation Application Specific Integrated Circuit (ASIC) (NGA) Technology Maturity Assessment (TMA) & Integration Risk Analysis (IRA) Report for PGMs.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: GPS vendor designs will be more mature in FY 2021 and a more formalized technology maturity assessment and integration risk analysis will be needed to track progress and assess future integration risk. A formalized process in FY 2021 will require an additional level of effort beyond FY 2020.</p>		-	1.023	1.500
<p>Title: Fires System-of-Systems APNT related AS and Navigation Warfare (NavWar)</p> <p>Description: Prototype PNT enabling technologies that are critical for executing Fires System-of-Systems NavWar missions to include munition-based offensive, defensive, and associated command and control (C2) functions. Prototyping efforts will focus on enabling combat lethality overmatch in PNT challenged environments for cannon and rocket/missile core missions. Provide long</p>		-	-	3.786

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020		
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>range stand-off NavWar capability to penetrate contested Anti Access/Area Denial (A2/AD) environments via use of long-range artillery, Fires systems-of-systems architectures enabling advanced NavWar attack, sense, and optimization, and advanced anti-jam/anti-spoof techniques for munitions.</p> <p>FY 2021 Plans: Prototype PNT enabling technologies that are critical to APNT and AS operational capabilities within the fires system-of-systems domain. Prototyping efforts will focus on enabling and or maintaining combat lethality overmatch in PNT challenged environments for cannon and rocket/missile applications. Design and develop a gun-hardened NavWar system prototype that can be demonstrated in a Live Fire Test from a 155mm artillery cargo round to prove its capability in FY 2022. Technical reports informing emerging gun-launched NavWar CONOPs and capability requirements.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 focuses on prototyping PNT technologies to fill Precision Weapons and Munitions NavWar gaps via enhancing fires system-of-systems APNT and Anti-Spoof operational capabilities and enabling munition-deployed NavWar payloads. This effort will take two years & utilizes previous system-of-systems efforts to further refine and develop PNT and NavWar enabling technologies.</p>				
<p>Title: FY 2020 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2020 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	1.419	-
Accomplishments/Planned Programs Subtotals		13.797	31.267	29.878
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
Acquisition Strategy: The Assured Precision Weapons and Munitions Project will utilize a combination of Other Transaction Authority (OTA) contract mechanisms such as the Defense Ordinance Technology Consortium (DOTC) Section 845 OTA and In-House government development and engineering capabilities to obtain				

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>
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prototypes and demonstrate/evaluate the maturity and integration risk of the M-Code GPS on Precision Munitions and Weapons, as well as other alternative PNT related capabilities.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army												Date: February 2020			
Appropriation/Budget Activity 2040 / 4				R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition				Project (Number/Name) FA5 / Assured Precision Weapons and Munitions							
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		1.419		-		-		-	0.000	1.419	-
Subtotal			-	-		1.419		-		-		-	0.000	1.419	N/A
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
PGM MGUE AS Risk Reduction	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD, Various : Various	7.785	-		-		-		-		-	0.000	7.785	-
Assured PNT related Weapons Integration Risk Mitigation	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD, Various : Various	3.265	3.585	Dec 2018	4.324	Dec 2019	4.400	Dec 2020	-		4.400	Continuing	Continuing	Continuing
Assured PNT related Weapons Integration Prototyping	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD, Various : Various	2.000	2.000	Dec 2018	1.271	Dec 2019	1.000	Dec 2020	-		1.000	Continuing	Continuing	Continuing
Assured PNT related Munitions Integration Risk Mitigation	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD, Various : Various	2.500	2.500	Dec 2018	4.571	Dec 2019	2.786	Dec 2020	-		2.786	Continuing	Continuing	Continuing
Assured PNT related Munitions Integration Prototyping	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD, Various : Various	2.000	2.000	Dec 2018	4.611	Dec 2019	3.175	Dec 2020	-		3.175	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army												Date: February 2020			
Appropriation/Budget Activity 2040 / 4				R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition				Project (Number/Name) FA5 / Assured Precision Weapons and Munitions							
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
Army M-Code Technology Integration and Evaluation	MIPR	Various : Various	-	-		6.521	Dec 2019	7.101	Dec 2020	-		7.101	Continuing	Continuing	Continuing
Subtotal			17.550	10.085		21.298		18.462		-		18.462	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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	Various	Joint Program Executive Office Armaments and Ammunition (JPEO A&A) : Picatinny Arsenal, NJ	1.013	1.169	Dec 2018	1.140	Dec 2019	1.275	Dec 2020	-		1.275	Continuing	Continuing	Continuing
Assured Precision Weapons and Munitions IPT Support	MIPR	Various : Various	2.861	1.086	Dec 2018	2.176	Dec 2019	2.341	Dec 2020	-		2.341	Continuing	Continuing	Continuing
Assured Technologies Engineering Support	MIPR	Combat Capability Development Command Armament Center (CCDC AC) : Picatinny Arsenal, NJ	0.835	0.657	Dec 2018	1.071	Dec 2019	1.100	Dec 2020	-		1.100	Continuing	Continuing	Continuing
Assured Technologies Engineering Support	MIPR	Communication Electronics Research, Development and Engineering Center (C5ISR) : Aberdeen Proving Ground, MD	-	0.800	Dec 2018	0.671	Dec 2019	0.200	Dec 2020	-		0.200	Continuing	Continuing	Continuing
Army M-Code Technology Integration and Evaluation Support	MIPR	Various : Various	-	-		2.421	Dec 2019	3.500	Dec 2020	-		3.500	Continuing	Continuing	Continuing
MGUE Inc 2 for LR-PGK Engineering Support	MIPR	Combat Capability Development	-	-		1.071	Dec 2019	1.500	Dec 2020	-		1.500	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>
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Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
		Command Armament Center (CCDC AC) : Picatinny Arsenal, NJ													
Army M-Code Technology Integration & Evaluation Support (Multiple PEOs)	MIPR	Various : Various	-	-		-		1.500	Dec 2020	-		1.500	Continuing	Continuing	Continuing
Subtotal			4.709	3.712		8.550		11.416		-		11.416	Continuing	Continuing	N/A

Remarks
Support consists of labor, travel and other non-labor costs in Fiscal Year (FY) 2021.

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	22.259	13.797	31.267	29.878	-	29.878	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	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
Integrated Product Support - Joint Lethality PNT SME WIPT & Pr	[Redacted]																											
Integration Risk Mitigation - Family of Scatterable Mines (FASCA	[Redacted]																											
Integration Risk Mitigation - NA2 for Weapons & Munitions Phas	[Redacted]																											
Integration Risk Mitigation - NA2 for Weapons & Munitions Phase 2	[Redacted]																											
Integration Risk Mitigation - NA2 for Rocket/Missile Launcher	[Redacted]																											
Integration Risk Mitigation - Fires System-of-Systems APNT related AS and NavWar	[Redacted]																											
Integration Risk Mitigation - Next Generation PNT Technologies Phase 1	[Redacted]																											
Weapons & Munitions Prototyping - APNT upgrades for PGM Fu	[Redacted]																											
Weapons & Munitions Prototyping - APNT upgrades for Towed H	[Redacted]																											
Weapons & Munitions Prototyping - Alternative Navigation Techn	[Redacted]																											
Weapons & Munitions Prototyping - Alternative Navigation Technologies Phase 2	[Redacted]																											
Weapons & Munitions Prototyping - Location Azimuth Determinations System (LADS)	[Redacted]																											
Weapons & Munitions Prototyping - Next Generation PNT Technologies Phase 1	[Redacted]																											

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	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
Army M-Code Technology Integration and Evaluation																												
MGUE Inc 2 for LR-PGK																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FA5 / <i>Assured Precision Weapons and Munitions</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Integrated Product Support - Joint Lethality PNT SME WIPT & Program Management	1	2017	4	2028
Integration Risk Mitigation - Implement Zero-Age-of-Data (ZAOD)	1	2018	4	2018
Integration Risk Mitigation - Family of Scatterable Mines (FASCAM) Replacement	1	2019	4	2020
Integration Risk Mitigation - NA2 for Weapons & Munitions Phase 1	1	2018	4	2019
Integration Risk Mitigation - NA2 for Weapons & Munitions Phase 2	1	2020	4	2021
Integration Risk Mitigation - NA2 for Rocket/Missile Launcher	1	2020	4	2021
Integration Risk Mitigation - Fires System-of-Systems APNT related AS and NavWar	1	2021	4	2022
Integration Risk Mitigation - Next Generation PNT Technologies Phase 1	1	2023	4	2024
Weapons & Munitions Prototyping - APNT upgrades for PGM Fuze Setter	1	2018	4	2019
Weapons & Munitions Prototyping - APNT upgrades for Towed Howitzer Platforms	1	2018	4	2019
Weapons & Munitions Prototyping - Alternative Navigation Technologies Phase 1	1	2018	4	2019
Weapons & Munitions Prototyping - Alternative Navigation Technologies Phase 2	1	2020	4	2021
Weapons & Munitions Prototyping - Location Azimuth Determinations System (LADS)	1	2020	4	2020
Weapons & Munitions Prototyping - Next Generation PNT Technologies Phase 1	1	2022	4	2023
Army M-Code Technology Integration and Evaluation	1	2020	4	2028
MGUE Inc 2 for LR-PGK	1	2020	4	2027

Note

- Notes:
- Positioning, Navigation and Timing (PNT)
 - Subject Matter Expert (SME)
 - Working Integrated Product Team (WIPT)
 - Network Assisted (NA)
 - Assured Positioning, Navigation and Timing (APNT)

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army										Date: February 2020		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition				Project (Number/Name) FG1 / Cannon-Delivered Area Effects Munitions (C-DAEM)			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
FG1: Cannon-Delivered Area Effects Munitions (C-DAEM)	-	5.713	21.447	40.961	-	40.961	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Cannon-Delivered Area Effects Munitions (C-DAEM) Project will provide United States (U.S). ground forces with the capability to engage area personnel through armored targets, while denying threat forces full operational freedom within the targeted area. An Analysis of Alternatives (AoA) was completed in January 2018 to inform Army acquisition and investment decisions regarding replacement of the current stockpile of 155 millimeter (mm) Dual Purpose Improved Conventional Munitions (DPICM) with Department of Defense (DoD) policy compliant munitions and address anti-armor and extended range capability requirements. The Army validated two materiel solutions for C-DAEM to be pursued in parallel. C-DAEM Armor (Increment 1) will destroy moved and moving infantry fighting vehicles, self-propelled howitzers, and tanks. C-DAEM DPICM Replacement (Increment 2) will destroy personnel to light-skinned vehicles. Fiscal Year (FY) 2021 funding will support the completion of the C-DAEM Armor competitive demonstration phase, which will identify the most promising candidate(s) to support the Army's modernization priorities in support of the National Defense Strategy.

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

	FY 2019	FY 2020	FY 2021
Title: C-DAEM Armor	5.463	20.473	40.961
Description: C-DAEM Armor will destroy infantry fighting vehicles, self-propelled howitzers, and tanks.			
FY 2020 Plans: FY 2020 funding supported a competitive demonstration phase to identify the most promising candidate(s) that address medium to heavy armored targets.			
FY 2021 Plans: FY 2021 funding will support the completion of the C-DAEM Armor competitive demonstration phase which will identify the most promising candidate(s) to support the Army's modernization priorities in support of the National Defense Strategy.			
FY 2020 to FY 2021 Increase/Decrease Statement: Increase in funding from FY 2020 to FY 2021 to support C-DAEM Armor prototyping hardware and continued risk reduction efforts in support of the competitive demonstration phase.			
Title: C-DAEM DPICM Replacement	0.250	-	-
Description: C-DAEM DPICM Replacement will destroy personnel to light-skinned vehicles.			
Title: FY 2020 SBIR/STTR Transfer	-	0.974	-

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army	Date: February 2020
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Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition	Project (Number/Name) FG1 / Cannon-Delivered Area Effects Munitions (C-DAEM)
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Description: Funding transferred in accordance with Title 15 USC ?638			
FY 2020 Plans: Funding transferred in accordance with Title 15 USC ?638			
FY 2020 to FY 2021 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	5.713	21.447	40.961

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• FJ4: Cannon-Delivered Area Effects Munitions (C-DAEM)	-	-	27.600	-	27.600	82.685	72.655	64.440	54.453	0.000	301.833
• E68603: PROJ, ARTY, 155MM C-DAEM INCREMENT 1	-	-	0.000	-	0.000	-	72.129	108.593	226.773	0.000	407.495

Remarks
 In FY 2021, Project FG1 supports C-DAEM Armor efforts. C-DAEM Armor will transition to Budget Activity 05 PE 0604802A Weapons and Munitions - Eng Dev Project FJ4, Cannon-Delivered Area Effects Munitions (C-DAEM), in FY 2022. In FY 2023, C-DAEM Armor will transition to production. A Procurement of Ammunition, Army (PAA) funding line, Standard Study Number (SSN) E68603, PROJ, ARTY, 155MM C-DAEM INCREMENT 1, is established for this effort.

In FY 2021, the C-DAEM DPICM Replacement effort will transition to BA 05 PE 0604802A Weapons and Munitions - Eng Dev Project FJ4, Cannon-Delivered Area Effects Munitions (C-DAEM). A PAA funding line for C-DAEM DPICM Replacement, SSN E68604, PROJ, ARTY, 155MM C-DAEM INCREMENT 2, will be established in FY 2024 for this effort.

D. Acquisition Strategy
 C-DAEM will employ an evolutionary acquisition approach to efficiently transition the unique ammunition products as they become available. The AoA completed on 31 January 2018 qualified a dramatic enhancement of operational Fires effectiveness, efficiency, and maneuver support when cannon artillery was equipped with a dedicated extended range, anti-armor projectile. The U.S. Government is currently reducing risk by executing prototype testing and evaluation efforts in parallel to decompose the AoA results into selection criteria. C-DAEM will use the selection criteria to sponsor a competitive demonstration for C-DAEM Armor to streamline the acquisition process by leveraging Section 815 of the FY 2016 National Defense Authorization Act (NDAA). C-DAEM will use the Defense Ordnance Technology Consortium (DOTC) Other Transaction Agreement (OTA) to further support the completion of the C-DAEM Armor competitive demonstration phase, in FY 2021, which will inform the Army's cluster munition replacement strategy. Upon completion of the competitive demonstration phase, C-DAEM will proceed to qualification testing of the most promising candidate(s) in accordance with the decisions granted at the Army Requirements Oversight Council (AROC), in April 2018.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition	Project (Number/Name) FG1 / Cannon-Delivered Area Effects Munitions (C-DAEM)
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Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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	Various	Office of the Project Manager (PM) Combat Ammunition Systems (CAS) : Picatinny Arsenal, NJ	0.410	0.950	Nov 2018	1.740	Nov 2019	0.950	Oct 2020	-		0.950	Continuing	Continuing	Continuing
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.974		-		-		-	0.000	0.974	-
Subtotal			0.410	0.950		2.714		0.950		-		0.950	Continuing	Continuing	N/A

Remarks
Program Management includes C-DAEM travel and milestone documentation support.

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
Armor TMRR Phase	MIPR	DoD Ordnance Technology Consortium (DOTC) : TBD	-	3.753		15.276	Apr 2020	22.100	Dec 2020	-		22.100	Continuing	Continuing	Continuing
Subtotal			-	3.753		15.276		22.100		-		22.100	Continuing	Continuing	N/A

Remarks
Additional funding required in Fiscal Year (FY) 2021 for the completion C-DAEM Armor competitive demonstration efforts.

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
Armor Engineering Support	MIPR	Combat Capabilities Development Command Armaments Center	0.550	0.760	Nov 2018	2.847	Nov 2019	3.011	Oct 2020	-		3.011	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition	Project (Number/Name) FG1 / Cannon-Delivered Area Effects Munitions (C-DAEM)
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Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
		(CCDC AC) : Picatinny Arsenal, NJ													
Armor Engineering Support	MIPR	Combat Capabilities Development Command Data Analysis Center (CCDC DAC) : Aberdeen, MD	-	-		0.055	Jan 2020	-		-		-	0.000	0.055	-
Armor Engineering Support	MIPR	Combat Capabilities Development Command Army Research Lab (CCDC ARL) : Aberdeen, MD	-	-		-		2.400	Oct 2020	-		2.400	Continuing	Continuing	Continuing
DPICM Replacement Engineering Support	MIPR	Combat Capabilities Development Command Armaments Center (CCDC AC) : Picatinny Arsenal, NJ	-	0.250	Nov 2018	-		-		-		-	0.000	0.250	-
Subtotal			0.550	1.010		2.902		5.411		-		5.411	Continuing	Continuing	N/A

Remarks
Additional Engineering Support required in FY 2021 in support of C-DAEM Armor competitive demonstration efforts.

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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
Armor Test Targets	MIPR	Targets Management Office : Redstone, AL	-	-		0.555	Jan 2020	10.000	Jan 2021	-		10.000	0.000	10.555	-
Armor Testing	MIPR	Army Test & Evaluation	-	-		-		2.500	Apr 2021	-		2.500	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition	Project (Number/Name) FG1 / Cannon-Delivered Area Effects Munitions (C-DAEM)
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Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
		Command (ATEC) : Yuma, AZ													
Subtotal			-	-		0.555		12.500		-		12.500	Continuing	Continuing	N/A

Remarks
C-DAEM is on Operational and Live Fire Test & Evaluation Oversight.

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.960	5.713	21.447	40.961	-	40.961	Continuing	Continuing	N/A

Remarks
Cannon-Delivered Area Effects Munitions (C-DAEM) Armor will destroy infantry fighting vehicles, self-propelled howitzers, and tanks. C-DAEM Dual Purposed Improved Conventional Munitions (DPICM) Replacement will destroy personnel to light-skinned vehicles.

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FG1 / <i>Cannon-Delivered Area Effects Munitions (C-DAEM)</i>

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	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
C-DAEM AoA, CDD, MS-A Efforts	AoA, CDD, MS-A Efforts																											
Armor Milestone A	1 MS-A																											
BONUS Deliveries (Bridging Strategy)					Bridging Strategy																							
Armor TMRR	TMRR																											
Armor Preliminary Design Review (PDR)									2 PDR																			
Armor Competitive Demonstration									3 Demo																			
Armor Milestone B									4 MS-B																			
Armor Engineering Manufacturing & Development (EMD)													EMD															
Armor Critical Design Review (CDR)													5 CDR															
Armor Milestone C																					6 MS-C							
DPICM Replacement Qualification and Testing									DPICM Replacement Qual & Testing																			

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) FG1 / <i>Cannon-Delivered Area Effects Munitions (C-DAEM)</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
C-DAEM AoA, CDD, MS-A Efforts	1	2018	4	2019
Armor Milestone A	1	2019	1	2019
BONUS Deliveries (Bridging Strategy)	1	2020	4	2022
Armor TMRR	1	2019	4	2021
Armor Preliminary Design Review (PDR)	1	2021	1	2021
Armor Competitive Demonstration	3	2021	3	2021
Armor Milestone B	4	2021	4	2021
Armor Engineering Manufacturing & Development (EMD)	1	2022	4	2024
Armor Critical Design Review (CDR)	2	2022	2	2022
Armor Milestone C	4	2024	4	2024
DPICM Replacement Qualification and Testing	1	2021	4	2023

Note

Cannon-Delivered Area Effects Munitions (C-DAEM) Armor will destroy infantry fighting vehicles, self-propelled howitzers, and tanks. C-DAEM Dual Purposed Improved Conventional Munitions (DPICM) Replacement will destroy personnel to light-skinned vehicles. C-DAEM Armor and DPICM Replacement are being developed simultaneously.

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army										Date: February 2020		
Appropriation/Budget Activity 2040 / 4					R-1 Program Element (Number/Name) PE 0603639A / Tank and Medium Caliber Ammunition			Project (Number/Name) XT5 / 30mm Anti-Personnel and Counter UAS				
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
XT5: 30mm Anti-Personnel and Counter UAS	-	3.730	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.730
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Lightweight 30x113 millimeter (mm) (LW30) Airburst is a new capability identified as a Warfighter requirement in the Capability Production Document (CPD), AH-64E Helicopter, Increment 1, Version 6. The LW30 airburst cartridge improves the ability of the warfighter to effectively engage anti-personnel/materiel targets due to increased lethality. Airburst capability provides the user with a much higher probability of achieving a first burst kill against enemy personnel targets in the open. The LW30 will retain its dual purpose warhead, allowing it to continue to defeat light armored threats through point detonation. The cartridge provides increased lethal effects against personnel and soft-skin vehicular targets increasing Soldier Survivability on the ground during troops in contact engagements and decreases the required number of rounds to reach the desired lethal effects. There is no funding requested in Fiscal Year (FY) 2021.

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

	FY 2019	FY 2020	FY 2021
Title: Technology Maturation and Risk Reduction (TMRR)	3.730	-	-
Description: Demonstrating Technology Readiness Level 6 and achieving pre-Milestone (MS) B approval.			
Accomplishments/Planned Programs Subtotals	3.730	-	-

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

The development of the Lightweight 30mm (LW30, 30mmx113mm) Airburst cartridge during the Technology Maturation and Risk Reduction (TMRR) phase was awarded through an Other Transaction Authority (OTA). The TMRR effort will consist of critical technology prototyping, testing, and demonstrating in the relevant environment that will conclude with a TRL 6 demonstration.

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) XT5 / <i>30mm Anti-Personnel and Counter UAS</i>

Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	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
Technology Maturation and Risk Reduction (TMRR)																												
30mm Prototype Development																												
Fuze Level Bench Testing Award GD-OTS					1 GD-OTS																							
Safe & Arm Miniaturization Award NGIS									2 NGIS																			
Technology Readiness Level (TRL) 6 Demonstration													TRL6 Demo															

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0603639A / <i>Tank and Medium Caliber Ammunition</i>	Project (Number/Name) XT5 / <i>30mm Anti-Personnel and Counter UAS</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Technology Maturation and Risk Reduction (TMRR)	1	2018	4	2020
30mm Prototype Development	4	2018	4	2020
Fuze Level Bench Testing Award GD-OTS	3	2019	3	2019
Safe & Arm Miniaturization Award NGIS	2	2020	2	2020
Technology Readiness Level (TRL) 6 Demonstration	4	2020	4	2020

Note

Note:
 General Dynamics Ordnance and Tactical Systems (GD-OTS)
 Northrop Grumman Information Systems (NGIS)