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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 5: System Development & Demonstration (SDD)					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	144.389	172.744	181.023	-	181.023	134.960	99.386	64.788	27.801	0.000	825.091
613: MORTAR SYSTEMS	-	17.582	28.071	5.792	-	5.792	1.410	0.000	0.000	0.000	0.000	52.855
EC4: Non-Standard Simulator Munitions	-	0.863	3.146	2.644	-	2.644	2.121	2.159	0.000	0.000	0.000	10.933
ED7: Advanced Multipurpose (AMP) Cartridge	-	30.390	21.802	14.100	-	14.100	0.000	0.000	0.000	0.000	0.000	66.292
EL9: Ammunitions Logistics Prototyping	-	0.684	2.014	2.329	-	2.329	1.703	0.705	1.000	1.020	0.000	9.455
EP2: Shoulder-Launched Munitions	-	3.000	0.000	4.100	-	4.100	10.400	0.000	0.000	0.000	0.000	17.500
EP3: Reduced Range Ammunition - Small Caliber	-	0.000	2.470	8.376	-	8.376	15.000	15.250	13.200	0.000	0.000	54.296
EP4: One-Way Luminescence for Small Caliber Ammo	-	0.000	6.077	8.547	-	8.547	12.391	5.387	6.500	3.000	0.000	41.902
EP5: Adv Armor-Piercing (ADVAP) for Small Caliber Ammo	-	13.318	16.748	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	30.066
EP7: Aviation Airborne Expendable Countermeasures	-	0.000	7.213	4.920	-	4.920	4.480	8.250	0.000	0.000	0.000	24.863
EU4: 40mm HV Improved High Explosive Dual Purpose	-	2.191	7.201	13.055	-	13.055	2.935	2.313	0.000	0.000	0.000	27.695
EU5: .50 Caliber All-Purpose Tactical cartridge (APTC)*	-	0.000	0.000	0.000	-	0.000	8.500	9.400	0.000	0.000	0.000	17.900
EU6: 155mm HE Rocket Assist Project Extended Range	-	0.000	6.917	8.943	-	8.943	5.966	3.000	0.000	0.000	0.000	24.826
EU7: Enhanced Lethality Cannon Munitions	-	25.600	7.905	7.908	-	7.908	0.000	0.000	0.000	0.000	0.000	41.413
EU8: Improved Multi-Option Fuze	-	9.730	7.905	10.000	-	10.000	0.000	0.000	0.000	0.000	0.000	27.635

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EW1: 40mm Low Velocity Ammunition	-	13.469	13.253	14.032	-	14.032	17.402	5.963	2.000	0.000	0.000	66.119	
FA6: 30mm Lethality	-	13.344	13.834	22.897	-	22.897	15.860	9.797	8.000	3.000	0.000	86.732	
FL4: Small Caliber Ammo for Next Gen Squad Weapons	-	0.000	0.000	22.880	-	22.880	30.630	28.750	25.000	11.750	0.000	119.010	
S36: Precision Guidance Kit	-	14.218	28.188	30.500	-	30.500	3.691	3.174	3.753	3.531	0.000	87.055	
XV2: Extended Range 120mm Mortar*	-	0.000	0.000	0.000	-	0.000	2.471	5.238	5.335	5.500	0.000	18.544	

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2020

Note

Project EP2, Shoulder-Launched Munitions is a New Start in FY 2020.

Project EP5, Adv Armor-Piercing (ADVAP) for Small Cal Ammo will be realigned to PE 0604601 in FY2021.

A. Mission Description and Budget Item Justification

This Program Element funds multiple efforts for engineering development of weapons and munitions systems.

Project 613, Mortar Systems: This Project supports Fire Control Modernization (FCM) and High Explosive Guided Mortar (HEGM).

The Fire Control Modernization (FCM) Project funds engineering development of Common / Universal Fire Control Systems applicable to Indirect Fire mortar weapon systems. This includes a modernized digital pointing system that will be integrated with the M120A1 120mm mortar weapon systems, M121 120mm mortar weapon systems, and potentially digitize the M252 81mm mortar weapon systems. Fire Control Modernization will replace the current M67 sight unit and upgrade the M95 and M150 fire control systems with modernized pointing device and mount. The modernized pointing device will enhance responsiveness, survivability, mobility, maintainability, and minimize mortar crew exposure to enemy fire. Fire Control Modernization intends to include the addition of round counting capabilities, muzzle velocity sensing, reduced power draw, streamlined communication, and employ a common fire control software solution across mortar systems. FY 2020 funds will support engineering initiatives and prototyping of fire control line replaceable units (LRU) and software.

The High Explosive Guided Mortar (HEGM) Project funded engineering development of precision guidance systems applicable to Indirect Fire mortar weapon systems. HEGM provides a precision capability to support the close fight in urban and complex terrain, while at the same time, reducing collateral damage. HEGM provides precision accuracy and effectiveness for 120mm mortar systems using precision guidance systems that will effectively reduce target delivery error. The HEGM capability will be developed through the use of improved guidance and control components and advanced airframe design that allow sufficient maneuver of the cartridge in flight to correct for induced error providing the ability to engage targets without the need to adjust fire. The HEGM Project was terminated in FY 2018 with close-out completion in FY 2019.

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<p>Project EC4, Non-Standard Simulator Munitions: The Non-Standard Simulator Munitions Project will standardize various pyrotechnics that simulate battlefield effects. The Army's Combat Training Centers (CTCs) are currently using non-standard munitions to replicate both conventional and asymmetric warfare battlefield effects. These modified commercial-off-the-shelf products have not been type classified, material released, and are not safe or sustainable for use by Soldiers. This effort will develop and demonstrate various pyrotechnics/simulators to replicate both conventional and asymmetric warfare battlefield effects such as: Black smoke signature (burning vehicles, buildings, and equipment); Yellow smoke signature (chemical, biological or nuclear effects); Macro pyrotechnics to simulate hostile fire and small Improvised Explosive Devices (IEDs) during mounted operations in urban terrain; Micro pyrotechnics to simulate indoor hostile fire and IED effects that are capable of being integrated into existing facilities; Rocket Propelled Grenade (RPG) on a wire to replicate the flight of a Rocket Propelled Grenade; High Order Blast Effect (HiOBE) used to replicate a Vehicle Borne Improvised Explosive Device (VBIED), building explosions, and other significant explosive events; Artillery airburst (LA45) simulator to replicate indirect fire; simulator to replicate a STINGER (LA47) firing; Tracer Fire-back simulator to replicate enemy small arms fire and anti-aircraft fire. Standardization will reduce training costs, eliminate redundancies between systems, mitigate environmental concerns and safety risks associated with realistic scenario based training.</p> <p>Project ED7, Advanced Multipurpose (AMP) Cartridge: The Advanced Multi Purpose (AMP) Project is a direct fire line of sight 120mm large caliber munition under development for the Abrams Main Battle Tank. AMP has three modes of operation including point detonate, point detonate delay, and airburst. AMP is the materiel solution for breaching double reinforced concrete walls and defeating Anti Tank Guided Missile (ATGM) teams from 50m to 2000m threshold and 50m to 4500m objective, a validated gap that cannot currently be met with existing stockpiled ammunition. In addition to added capability, AMP will also consolidate the capabilities of four existing stockpiled 120mm munitions, thereby addressing the users' battle carry dilemma by allowing them to load a single munition that is capable of defeating multiple targets including Anti Tank Guided Missile teams, reinforced walls, personnel, light armor, bunkers, and obstacles. The full performance of the AMP is obtained with an Abrams equipped Ammunition Data Link breach modification, the same required by the 120mm M829A4 cartridge that achieved Milestone C in FY 2014 and achieved Full Materiel Release in FY 2015. FY 2020 funds supports continuation of Engineering and Manufacturing Development (EMD) efforts and testing in preparation for Milestone C and transition into Procurement.</p> <p>Project EL9, Ammunition Logistics Prototyping: The Ammunition Logistics Prototyping 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 2020 funding will be used to continue integrating the munitions health monitoring system with additional ammunition items and conduct qualification tests and continue to integrate passive time/temperature exposure sensors with additional ammunition items and conduct qualification testing.</p> <p>Project EP2, Shoulder-Launched Munitions: This project previously funded the one-time acceleration of the Tandem Warhead type classification and completion of development and testing for use in the Shoulder Launched AT-4 Single-use 84mm Anti-Tank Weapon. The AT-4 Tandem Warhead provides a single shot solution with increased lethality for infantry crew formations against anti-armor and to defeat hardened structures. The AT-4 effort was part of the Secretary of Defense's Close Combat Lethality task force.</p>		

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<p>The Individual Assault Munition (IAM) will be a lightweight Shoulder Launched Munition (SLM) capability for combat units at the individual Soldier level. As an improvement over existing Shoulder Launched Munitions, the solution will allow Soldiers to conduct Urban Operations with an ability to defeat the enemy protected by a variety of field expedient, structural and lightly armored vehicles. This solution will be effective day or night at close ranges with an ability to safely engage targets from within enclosures using single hearing protection. This solution will combine the capability of multiple existing shoulder-launched munitions which will allow for reduced Soldier load, training complexity and logistics burden for Light Infantry, Combat Engineers and Special Operations Forces. FY 2020 funding will provide the Army the opportunity to evaluate various prototype munitions to achieve emerging increased capability as an Individual Assault Munition. The Individual Assault Munition Capabilities Development Document (CDD) was approved on 11 March 2016. The Individual Assault Munition effort is a new start in FY 2020.</p>		
<p>Project EP3, Reduced Range Ammunition - Small Caliber: The small caliber Reduced Range Ammunition (RRA) Project is a critical technology development in response to the 7.62mm and .50 caliber Capabilities Development Documents (CDD). The overall objective of Reduced Range Ammunition 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. Reduced Range Ammunition 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 Reduced Range Ammunition 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. FY 2020 funding supports continuing Engineering and Manufacturing Development (EMD) efforts and performing design/verification testing on the 7.62mm variant. FY 2020 funds also support Milestone (MS) B activities to include Preliminary Design Review (PDR) and Engineering and Manufacturing Development (EMD) Contract Award for the .50 caliber variant. FY 2020 funds also supports Reduced Range Ammunition concept development/evaluation for the Next Generation Squad Weapon (NGSW) systems.</p>		
<p>Project EP4, One-Way Luminescence for Small Caliber Ammo: The One Way Luminescence (OWL) project is a critical technology development in response to the 7.62mm 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 projects objective is to develop and field a full day/night tracer round, replace the current pyrotechnic cartridges with trace cartridges that are only visible to the shooter and soldiers in close proximity, increasing soldier survivability. 7.62mm is the immediate focus followed by 5.56mm OWL cartridges and later followed by .50 Caliber cartridges and Next Generation Squad Weapons (NGSW) ammunition. FY 2020 funding will support continuing Engineering and Manufacturing Development (EMD) efforts, conducting a Critical Design review (CDR), performing development tests, and a User Assessment (UA) for the 7.62mm variant. FY 2020 also supports concept development/evaluation of OWL tracer solutions for .50 Caliber weapons and NGSW.</p>		
<p>Project EP5, Adv Armor-Piercing (ADVAP) for Small Caliber Ammo: This Project supports both the Advanced Armor-Piercing ammunition and the Next Generation Squad Weapon (NGSW) Family of Ammunition.</p>		
<p>- Advanced Armor-Piercing (ADVAP): The ADVAP project is a critical technology development in response to the 7.62mm and 5.56mm Family of Ammunition Capabilities Development Documents (CDD). The nomenclature for the 7.62mm ADVAP is XM1158. The overall objective of the ADVAP project is to develop and Full Materiel Release (FMR) both 7.62mm XM1158 cartridge for the M240 machine gun and ADVAP ammunition in calibers below 7.62mm. The ADVAP ammunition in</p>		

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calibers below 7.62mm for the Next Generation Squad Weapons is referred to as the Special Purpose ammunition. The objective is to provide overmatch capability to defeat advanced light armored threats within typical machine gun engagement ranges. No funding has been requested for ADVAP in FY 2020.		
- Next Generation Squad Weapon (NGSW) Family of Ammunition: The NGSW ammo is a new ammunition technology under development for use in the Next Generation Squad Weapon systems. The objective is to develop and Full Materiel Release (FMR) the new ammunition. No funding requested in FY 2020.		
Project EP7, Aviation Airborne Expandable Countermeasures: The Aviation Airborne Expandable Countermeasures Project will support Integrated System Design (ISD), System Capability (SC) and Manufacturing Process Demonstrations (MPD) on current pyrotechnic munitions and tunable pyrotechnic aircraft counter measures and decoys. The project will also support ISD, SC and MPD on new expendable countermeasure munitions that will protect Army aircraft from advanced and current guided missile threats. Activities include modeling and simulation, flight testing, qualification testing, engineering to reduce size and weight, environmental considerations, safety enhancements, manufacturing enhancements, qualification of other service and foreign munitions that could meet current requirements, product improvements, insertion of new technologies to increase performance, and enhancement of current flare solutions for new and existing aircraft. Systems include impulse cartridges and aircraft expendables (to include Radio Frequency (RF) expendables).		
Project EU4, 40mm HV Improved High Explosive Dual Purpose: 40mm High Velocity (HV) High Explosive Dual Purpose - Airburst (HEDP-AB) is a new capability identified in the 40mm High Velocity Improved High Explosive Dual Purpose Cartridge Capability Development Document (CDD) and will provide the Mk19 Mod 3 Grenade Machine Gun (GMG) an airburst capable cartridge with the ability of achieving required lethal effects against enemy targets in the open and in defilade while maintaining the capability to defeat unarmored and lightly armored vehicles. FY 2020 funding supports Engineering and Manufacturing Development (EMD) activities including Design Engineering Test (DET) 1, DET 2, Soldier Touch Point (Limited User Evaluation), Family of Weapon Sights - Crew Served (FWS-CS) Integration, and preparation for the contractor down-selection.		
Project EU6: The XM1113 High Explosive Extended Range Artillery Projectile is a critical munition that supports the Army's modernization priorities in support of the National Defense Strategy. The XM1113 is a government owned materiel solution for long-range cannon artillery projectiles that will attain ranges of 40km in 39 caliber weapon systems and 70km in future systems. The XM1113 will provide 33% increased range over obsolete and aging M549A1 Rocket Assisted Projectile using a larger, modern rocket motor and optimized aerodynamic airframe. The XM1113 will leverage enhanced lethality cannon munition technologies to compensate for increased rocket motor volume. The projectile body is filled with an insensitive munition (IM) high explosive (HE) and a supplementary charge to aid in soldier survivability. FY 2020 funds will support fuze performance evaluation and confirmation with XM1113 for Urgent Materiel Release (UMR) in FY 2021, as well as the continued engineering efforts of the XM1113 maturation in support of a Milestone C in FY 2022.		
Project EU7: The Enhanced Lethality Cannon Munitions (ELCM) Project will evaluate, develop, and qualify new lethality technologies for 155mm cannon artillery munitions and evaluate their effectiveness in mitigating evolving and derived capability gaps, and support transition to production. The ELCM Project supports testing and assessment of the Israeli Military Industries (IMI) Systems M999 advanced anti-personnel munition and also accelerates the qualification of the 155mm XM1128 High Explosive Projectile including the evaluation of Lithographic Fragmentation Technology (LFT); both of these initiatives support the Army Directed Requirement for a Rapid Bridging Solution for the replacement of the 155mm Dual Purpose Improved Conventional Munition (DPICM). FY 2020 funds will support fuze performance evaluation and confirmation with XM1128, as well as continued Insensitive Munitions (IM) testing, Sequential Environmental Test - Safety (SET-S), and Military Standard		

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<p>Environmental Engineering Considerations and Laboratory Tests (MIL-STD-810). Engineering efforts will support the evaluation of the XM1128 test data to determine that the Program is safe, suitable and operationally effective, as well as the gathering of all statutory and regulatory requirements in support of a Milestone C in FY 2021.</p> <p>Project EU8: The Improved Multi-Option Fuze Project (MOFA II/iMOFM) is a technology refresh and modernization effort that provides an incremental capability with technology advancements and performance improvements on the current non-precision artillery and mortar ammunition proximity multi-option fuzes that will increase robustness to electronic countermeasures (ECM), eliminates the susceptibility of reverse engineering (RE), incorporates power source advancements, improves delay mode reliability, and integrates safe & arm improvements. This will develop and qualify safe, affordable, reliable Proximity Height of Burst fuzing solutions with robust Defense Exportability Features (DEF) for non-precision conventional Cannon artillery and Mortar munitions that are resistant to adversary exploitation via ECM and RE threats. FY 2020 will support the preparation and incrementing of Engineering and Manufacturing Development (EMD) contracts, the fabrication of MOFA II and iMOFM hardware to conduct developmental verification tests and Product Qualification Tests (PQT), the iMOFM Critical Design Review (CDR), and the preparations for transition into production.</p> <p>Project EW1: The 40mm Low Velocity High Explosive Air Burst (HEAB) is a new capability identified as a Warfighter requirement in the Capability Development Document (CDD), 40mm Low Velocity (LV) Family of Ammunition Annex. The 40mm Low Velocity HEAB tactical cartridge allows the warfighter to engage targets at increased effective ranges using the 40mm M320 Grenade Launcher. The HEAB cartridge provides the grenadier with a higher probability of achieving a first shot kill against enemy personnel, coupled with the ability to defeat personnel targets in defilade positions. When deployed against point and area targets, the cartridge inflicts incapacitating effects against personnel beyond those offered by the current M433 High Explosive Dual Purpose (HEDP) cartridge. The cartridge provides lethal effects against targets with improved accuracy and greater standoff ranges increasing Soldier Survivability. FY 2020 will support Design Engineering Test (DET) 2 and DET 3 build, Soldier Touch Point (Limited User Evaluation), Test Readiness Reviews (TRRs) and DET 2 Testing.</p> <p>The 40mm Low Velocity (LV) Door Breach (DB), XM1167, cartridge allows the grenadier to conduct a ballistic breach of an existing door to create an entry point into a building or other structure. This capability is critical during Urban Operations, while having stand-off ability to conduct ballistic breach at ranges up to 50 meters away, with a single-shot, and without pause between actual breach and entry of initial force. The 40mm DB cartridge will provide the small unit with the capability to conduct efficient breaching operations; allowing the Warfighter to create an entry point into a structure for an assault element to enter and begin clearing operations, one of the most difficult types of operations that Soldiers may face in an urban environment. The 40mm DB cartridge will reduce collateral damage and friendly casualties associated with breaching operations. The deployment of 40mm Door Breach cartridges will enable the small unit to gain and maintain a tactical advantage through efficiency of combat power and momentum. No funding requested in FY 2020.</p> <p>Project FA6: The 30mm Lethality project funds the development of a suite of 30x173mm caliber cartridges, which includes anti-personnel tactical and training cartridges and anti-materiel tactical and training cartridges as well as Airburst Munition cartridges for Urgent Materiel Release (UMR) and Full Materiel Release (FMR). The objective is to enhance the operational effectiveness and lethality of the Stryker Infantry Carrier Vehicle (ICV), Next Generation Combat Vehicle (NGCV), and any Army Fighting Vehicles that are equipped with a 30x173mm weapon system. The tactical cartridges will provide an organic direct fire capability to support infantry at a greater range and will improve lethality when engaging dismounted infantry and light armored vehicles. The training cartridges will be ballistically matched to the tactical cartridges, allowing the Warfighter to train in a cost effective manner. The Airburst munitions will provide the Warfighter with increased lethality against troops in the open, counter defilade and anti-tank guided missiles (ATGM). This project will leverage earlier efforts in support of the Stryker Operational Needs Statement (ONS)</p>		

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for Increased Lethality for the 2nd Calvary Regiment (2CR), United States Army Europe (USAREUR) (HQDA ONS 15-20590). FY 2020 funding will support three Design Engineering Tests (DET) and a Design Verification Test (DVT) for the non-airburst 30x173mm suite of ammunition. FY 2020 will also support Milestone B and Engineering and Manufacturing Development (EMD) contract award for the 30x173mm Airburst munition.						
Project FL4: Next Generation Squad Weapons (NGSW) Family of Ammunition: The Small Caliber Ammo for Next Gen Squad Weapons project is a critical technology development in response to the Soldier Lethality Cross Functional Team (SL CFT) Initial Capability Document (ICD) for the ammunition required to support the rapid prototyping, development, and fielding of the Next Generation Squad Weapons (NGSW) under Section 804 Authority. The objective is to develop and Full Materiel Release (FMR) the new ammunition. The NGSW ammunition is split into two initial variants, the General Purpose (GP) and the Special Purpose (SP). FY 2020 funding supports continuing rapid prototyping/development of the GP projectile, building prototypes and maturing prototypes to provide to the weapon system contractors for performance evaluation, conducting a Critical Design Review (CDR), and conducting prototype testing. FY 2020 also supports continuing rapid prototyping for the SP projectile, conducting a Preliminary Design Review (PDR), conducting an Initial Product Review (IPR), and performing activities to increase prototype capacity to support planned weapon system testing. Follow-on NGSW ammunition types include: tracer ammunition, blank ammunition, reduced range ammunition, and Close Combat Mission Capability Kit (CCMCK) ammunition. Development efforts on the follow-on NGSW ammunition variants are scheduled to begin in FY 2022. FY 2020 supports initial activities to evaluate potential solutions/prototypes and concepts to satisfy follow-on NGSW ammunition requirements.						
Project S36: The Precision Guidance Kit (PGK) is a course correcting fuze that provides precision accuracy and efficiency for current and future 155mm High Explosive (HE) projectiles by eliminating a portion of the inherent errors associated with ballistic firing solutions which effectively reduces the number of projectiles required to execute fire missions. PGK utilizes a Global Positioning System (GPS) receiver and internal Guidance and Navigation Computer to accomplish its mission with point detonating and height of burst fuzing functions. The PGK M1156E1 effort will incorporate and qualify state of the art technologies to increase the functionality of PGK in GPS degraded environments as well as compatibility with the Army's new long range cannon (Extended Range Cannon Artillery (ERCA)) and projectiles which will be fielded during the PGK Life Cycle. PGK Anti-Jam (PGK-AJ) supports future 155mm projectiles and M777 Long Range Cannon (LRC) initiatives and Army Modernization Priorities in support of the National Defense Strategy. FY 2020 funding supports the award of the Engineering and Manufacturing Development (EMD) contract initiating system design and prototype development for PGK Anti-Jam.						
B. Program Change Summary (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget		145.232	183.100	153.853	-	153.853
Current President's Budget		144.389	172.744	181.023	-	181.023
Total Adjustments		-0.843	-10.356	27.170	-	27.170
• Congressional General Reductions		-0.119	-0.215			
• Congressional Directed Reductions		-	-10.141			
• Congressional Rescissions		-	-			
• Congressional Adds		4.178	-			
• Congressional Directed Transfers		-	-			
• Reprogrammings		0.781	-			
• SBIR/STTR Transfer		-5.683	-			
• Adjustments to Budget Years		-	-	27.170	-	27.170

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<p><u>Change Summary Explanation</u></p> <p>FY 2020 increase of \$13.070 million supports the Army's modernization priorities in support of the National Defense Strategy.</p>		

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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
613: MORTAR SYSTEMS	-	17.582	28.071	5.792	-	5.792	1.410	0.000	0.000	0.000	0.000	52.855
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
The Fire Control Modernization (FCM) Project funds engineering development of Common / Universal Fire Control Systems applicable to Indirect Fire mortar weapon systems. This includes a modernized digital pointing system that will be integrated with the M120A1 120mm mortar weapon systems, M121 120mm mortar weapon systems, and potentially digitize the M252 81mm mortar weapon systems. FCM will replace the current M67 sight unit and upgrade the M95 and M150 fire control systems with modernized pointing device and mount. The modernized pointing device will enhance responsiveness, survivability, mobility, maintainability, and minimize mortar crew exposure to enemy fire. FCM intends to include the addition of round counting capabilities, muzzle velocity sensing, reduced power draw, streamlined communication, and employ a common fire control software solution across mortar systems. FY 2020 funds will support engineering initiatives and prototyping of fire control line replaceable units (LRU) and software.												
The High Explosive Guided Mortar (HEGM) Project funded engineering development of precision guidance systems applicable to Indirect Fire mortar weapon systems. HEGM provides a precision capability to support the close fight in urban and complex terrain, while at the same time, reducing collateral damage. HEGM provides precision accuracy and effectiveness for 120mm mortar systems using precision guidance systems that will effectively reduce target delivery error. The HEGM capability will be developed through the use of improved guidance and control components and advanced airframe design that allow sufficient maneuver of the cartridge in flight to correct for induced error providing the ability to engage targets without the need to adjust fire. The HEGM Project was terminated in FY 2018 with close-out completion in FY 2019.												
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Fire Control Modernization								2.242	-	5.792	-	5.792
Description: The Fire Control Modernization (FCM) initiatives include a modernized digital pointing system that will be integrated with the M120A1 120mm mortar weapon systems, M121 120mm mortar weapon systems, intends to digitize the M252 81mm mortar weapon systems, and will upgrade the M95 and M150 fire control systems with a modernized pointing device, mount displays and streamlined communications.												
FY 2020 Base Plans: FY 2020 funds will support engineering initiatives and prototyping of fire control line replaceable units (LRU) and software.												
FY 2019 to FY 2020 Increase/Decrease Statement:												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army								Date: March 2019				
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) 613 / MORTAR SYSTEMS				
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2020 funding increase supports continuation of Fire Control Modernization efforts.												
Title: HEGM Description: Engineering and Manufacturing Development Phase (EMD). FY 2019 Plans: Project continues in the Detailed Design EMD phase. Activities will include System Design Review (SDR) and initiation of Production Prove Out phase. FY 2019 to FY 2020 Increase/Decrease Statement: The HEGM Project was terminated in FY2018 with close-out completion in FY 2019.								15.340	27.042	-	-	-
Title: FY 2019 SBIR / STTR Transfer FY 2019 Plans: FY 2019 SBIR / STTR Transfer FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer								-	1.029	-	-	-
Accomplishments/Planned Programs Subtotals								17.582	28.071	5.792	-	5.792
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost	
• K99200: Computer Ballistics: LHMBC XM32	12.407	9.513	3.268	0.570	3.838	8.110	7.249	7.242	7.246	0.000	55.605	
• K99300: Mortar Fire Control System	46.490	29.149	13.199	15.975	29.174	27.274	8.379	9.699	11.996	0.000	162.161	
Remarks												
Other Procurement, Army (OPA) Funding												
D. Acquisition Strategy												
The Fire Control Modernization (FCM) strategy is using the DoD Ordnance Technology Consortium (DOTC) Other Transaction Agreement (OTA) initiatives for hardware and software development and will transition into a Federal Acquisition Regulation (FAR) contract for production using Performance Specifications (P-Specs).												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) 613 / <i>MORTAR SYSTEMS</i>
<p>The High Explosive Guided Mortar (HEGM) strategy used a DoD Ordnance Technology Consortium (DOTC) transaction Agreement (OTA) initiative with multiple contractors. The Program was terminated in FY 2018 with close-out completion in FY 2019. The DOTC initiatives will be completed in FY 2019 with guided flight tests of possible solutions and a preliminary design review.</p> <p><u>E. Performance Metrics</u> N/A</p>		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) 613 / MORTAR SYSTEMS					
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Fire Control Modernization - Project Manager Office Support	Various	Office of the Project Manager (PM) Combat Ammunition Systems (CAS) : Picatinny Arsenal, NJ	0.080	0.098	Dec 2017	-		0.150	Nov 2019	-		0.150	0.000	0.328	-
HEGM - Project Manager Office	Various	Office of the Project Manager (PM) Combat Ammunition Systems (CAS) : Picatinny Arsenal, NJ	0.575	0.225	Jan 2018	-		-		-		-	0.000	0.800	-
Subtotal			0.655	0.323		-		0.150		-		0.150	0.000	1.128	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Fire Control Modernization - Software Development	MIPR	Armament Research, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	-	-		-		4.142	Nov 2019	-		4.142	0.000	4.142	-
Fire Control Modernization - Development	MIPR	DoD Ordnance Technology Consortium (DOTC) - Inertial Labs : Paeonian Springs, VA	1.100	1.094	Mar 2018	-		1.000	Mar 2020	-		1.000	0.000	3.194	-
HEGM System Engineering Phase 1	MIPR	DoD Ordnance Technology Consortium (DOTC) - General Dynamics OTS : Bothell, WA	4.413	0.831	Feb 2018	-		-		-		-	0.000	5.244	5.163
HEGM System Engineering Phase 1	MIPR	DoD Ordnance Technology	4.413	0.831	Feb 2018	-		-		-		-	0.000	5.244	5.163

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) 613 / MORTAR SYSTEMS					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
		Consortium (DOTC) - BAE Systems : Nashu, NH													
HEGM System Engineering Phase 1	MIPR	DoD Ordnance Technology Consortium (DOTC) - Orbital ATK : Plymouth, MN	4.413	2.067	Feb 2018	-		-		-		-	0.000	6.480	5.163
HEGM System Development Phase 2	MIPR	DoD Ordnance Technology Consortium (DOTC) - GDOTS : Bothell, WA	-	6.235	Jun 2018	-		-		-		-	0.000	6.235	44.593
HEGM - Fire Control	MIPR	Armament Reasech, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	0.115	0.250	Mar 2018	-		-		-		-	0.000	0.365	-
XM1113 Prototype Hardware	MIPR	DoD Ordnance Technology Consortium : Various	-	-		19.450	Jan 2019	-		-		-	0.000	19.450	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		1.029		-		-		-	0.000	1.029	-
Subtotal			14.454	11.308		20.479		5.142		-		5.142	0.000	51.383	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Fire Control Modernization - ARDEC Engineering Support	MIPR	Armament Reasech, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	0.743	1.050	Dec 2017	-		0.500	Dec 2019	-		0.500	0.000	2.293	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) 613 / MORTAR SYSTEMS			
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
HEGM - ARDEC Engineering Support	MIPR	Armament Reasech, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	1.440	3.218	Dec 2017	-		-		-		-	0.000	4.658	-
XM1113 Software Updates	MIPR	Armament Research, Development, and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	-	-		1.750	Feb 2019	-		-		-	0.000	1.750	-
Project Management	MIPR	Armament Research, Development, and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	-	-		0.742	Mar 2019	-		-		-	0.000	0.742	-
Subtotal			2.183	4.268		2.492		0.500		-		0.500	0.000	9.443	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
HEGM - Developmental Testing	MIPR	Army Test and Evaluation Command (ATEC) Yuma Proving Ground (YPG) : Yuma, AZ	0.350	1.683	Apr 2018	-		-		-		-	0.000	2.033	-
XM1113 Lethality Testing	MIPR	Naval Surface Warfare Center (NSWC) : Dahlgren, VA	-	-		1.500	Mar 2019	-		-		-	0.000	1.500	-
XM1113 Urgent Materiel Release (UMR) Qualification Testing	MIPR	Army Test and Evaluation Command (ATEC)	-	-		3.600	Mar 2019	-		-		-	0.000	3.600	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) 613 / MORTAR SYSTEMS			
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
		Yuma Proving Ground (YPG) : Yuma, AZ													
Subtotal			0.350	1.683		5.100		-		-		-	0.000	7.133	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			17.642	17.582		28.071		5.792		-		5.792	0.000	69.087	N/A
Remarks FY 2019 funding from Project 613, MORTAR SYSTEMS, was realigned to Project EU6, 155mm HE Rocket Assist Project Extended Range. Both Projects are within the 0604802A Program Element. This funding will be utilized to complete XM1113 lethality testing, firing tables software updates, development of fuze integration efforts, and development of prototype hardware for qualification in support of the Urgent Materiel Release of 2,000 projectiles in FY 2021 to support the Army's modernization priorities in support of the National Defense Strategy.															

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

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) 613 / <i>MORTAR SYSTEMS</i>
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Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Fire Control Modernization																												
FCM- Engineering & Manufacturing Development (EMD)																												
FCM-Software Development																												
FCM- Preliminary Design (SYS Eng Phase 1)																												
FCM- Preliminary Design Review (PDR)																												
FCM- EMD Detailed Design (Sys Dev Phase 2)																												
FCM- Critical Design Review (CDR)																												
HEGM																												
HEGM - Engineering & Manufacturing Development (EMD)																												
HEGM - Preliminary Design (SYS Eng Phase 1)																												
HEGM - Preliminary Design Review (PDR)																												

Note
 Footnote FY18 Carryover funding used to continue WULF efforts due to cut in FY19 funding

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) 613 / <i>MORTAR SYSTEMS</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Fire Control Modernization	1	2020	1	2020
FCM- Engineering & Manufacturing Development (EMD)	1	2018	4	2021
FCM-Software Development	1	2020	4	2021
FCM- Preliminary Design (SYS Eng Phase 1)	1	2020	1	2021
FCM- Preliminary Design Review (PDR)	1	2021	1	2021
FCM- EMD Detailed Design (Sys Dev Phase 2)	2	2021	4	2021
FCM- Critical Design Review (CDR)	4	2021	4	2021
HEGM	1	2018	1	2018
HEGM - Engineering & Manufacturing Development (EMD)	1	2018	4	2019
HEGM - Preliminary Design (SYS Eng Phase 1)	3	2017	4	2018
HEGM - Preliminary Design Review (PDR)	4	2018	4	2018

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EC4 / Non-Standard Simulator Munitions			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EC4: Non-Standard Simulator Munitions	-	0.863	3.146	2.644	-	2.644	2.121	2.159	0.000	0.000	0.000	10.933
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project will standardize various pyrotechnics that simulate battlefield effects. The Army's Combat Training Centers (CTCs) are currently using non-standard munitions to replicate both conventional and asymmetric warfare battlefield effects. These modified commercial-off-the-shelf products have not been type classified, material released, and are not safe or sustainable for use by Soldiers. This effort will develop and demonstrate various pyrotechnics/simulators to replicate both conventional and asymmetric warfare battlefield effects such as: Black smoke signature (burning vehicles, buildings, and equipment); Yellow smoke signature (chemical, biological or nuclear effects); Macro pyrotechnics to simulate hostile fire and small Improvised Explosive Devices (IEDs) during mounted operations in urban terrain; Micro pyrotechnics to simulate indoor hostile fire and IED effects that are capable of being integrated into existing facilities; Rocket Propelled Grenade (RPG) on a wire to replicate the flight of a Rocket Propelled Grenade; High Order Blast Effect (HiOBE) used to replicate a Vehicle Borne Improvised Explosive Device (VBIED), building explosions, and other significant explosive events; Artillery airburst (LA45) simulator to replicate indirect fire; simulator to replicate a STINGER (LA47) firing; Tracer Fire-back simulator to replicate enemy small arms fire and anti-aircraft fire. Standardization will reduce training costs, eliminate redundancies between systems, mitigate environmental concerns and safety risks associated with realistic scenario based training.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Standardize Special Use Ammunition	0.863	3.045	2.644	-	2.644
Description: Standardize non-standard pyrotechnic battlefield effects currently used by Combat Training Centers (CTCs) .					
FY 2019 Plans: This project will provide documentation support for Milestone C, Type Classification and Material Release. LA45/A47 adoption memo to transition TDP from the Marines to conduct type Classification/Material Release (TC/MR). Black and Yellow smoke Type Classification/ Full Material Release (TC/FMR). Evaluate the following COTS items:, Macro/Micro, Rocket Propelled Grenade (RPG) on a wire, High Order Blast Effect (HiOBE) and Tracer-Fire back.					
FY 2020 Base Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019	
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev		Project (Number/Name) EC4 / Non-Standard Simulator Munitions	

B. Accomplishments/Planned Programs (\$ in Millions) This project will support the Engineering Manufacturing and Development (EMD) phases for LA45/47, Black and Yellow smoke to include Energetic Material Qualification (EMQ) testing. Evaluate the following COTs items for environmental and safety considerations: Macro/Micro, RPG on a wire, HiOBE and Tracer-Fire back. FY 2019 to FY 2020 Increase/Decrease Statement: Program Requirements have been further defined resulting in more concise funding requirements. Title: FY 2019 SBIR / STTR Transfer FY 2019 Plans: FY 2019 SBIR / STTR Transfer FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Accomplishments/Planned Programs Subtotals	0.863	3.146	2.644	-	2.644

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• E88404: <i>SIMULATORS, Non-Standard, Special Effects, f/CTCs</i>	-	1.652	0.000	1.699	1.699	1.750	0.283	0.289	0.289	0.000	5.962
Remarks											
D. Acquisition Strategy											
The Acquisition strategy is for a family of special use ammunition that will be developed in incremental phases as funding and requirements are approved. Milestone Decision Document (MDD) Approval 4th Qtr FY 2018. Initial special use ammunition will be black and yellow smoke munitions followed by new increments that will defeat threats outlined in the requirements documents developed by US Army Training and Doctrine Command (TRADOC).											
E. Performance Metrics											
N/A											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EC4 / Non-Standard Simulator Munitions					
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	MIPR	PM Close Combat Systems : PICATINNY ARSENAL	0.289	-		0.061	Feb 2019	0.031	Feb 2020	-		0.031	0.000	0.381	-
Subtotal			0.289	-		0.061		0.031		-		0.031	0.000	0.381	N/A
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	C/FFP	ARDEC : PICATINNY ARSENAL	1.134	-		1.384	May 2019	0.800	May 2020	-		0.800	0.000	3.318	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.101		-		-		-	0.000	0.101	-
Subtotal			1.134	-		1.485		0.800		-		0.800	0.000	3.419	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support	MIPR	ARDEC : Picatinny Arsenal	0.802	0.863	Feb 2018	0.600	Feb 2019	1.163	Feb 2020	-		1.163	0.000	3.428	-
Subtotal			0.802	0.863		0.600		1.163		-		1.163	0.000	3.428	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	MIPR	ARDEC : Picatinny	0.541	-		1.000	Jun 2019	0.650	Jun 2020	-		0.650	0.000	2.191	-
Subtotal			0.541	-		1.000		0.650		-		0.650	0.000	2.191	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army										Date: March 2019			
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev					Project (Number/Name) EC4 / Non-Standard Simulator Munitions			
	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	2.766	0.863		3.146		2.644		-		2.644	0.000	9.419	N/A
Remarks													

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>		Project (Number/Name) EC4 / <i>Non-Standard Simulator Munitions</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Materiel Development Decision Approval Special Use Ammunition Pyrotechnics MDD																												
LA 45/47 Transition TDP from Marines																												
Energetic Material Qualification Testing Black and Yellow Smoke																												
MS C for LA 45/47																												
MS C for Black & Yellow Smokes																												
Evaluate RPG on a wire, HIOBE, Macro/Micro Pyrotechnics and Tracer-Fireback COTS																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) EC4 / <i>Non-Standard Simulator Munitions</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Materiel Development Decision Approval Special Use Ammunition Pyrotechnics	1	2018	2	2019
LA 45/47 Transition TDP from Marines	2	2018	3	2019
Energetic Material Qualification Testing Black and Yellow Smoke	1	2020	2	2021
MS C for LA 45/47	2	2021	2	2021
MS C for Black & Yellow Smokes	2	2021	2	2021
Evaluate RPG on a wire, HIOBE, Macro/Micro Pyrotechnics and Tracer-Fireback COTS	3	2019	4	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) ED7 / Advanced Multipurpose (AMP) Cartridge			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
ED7: Advanced Multipurpose (AMP) Cartridge	-	30.390	21.802	14.100	-	14.100	0.000	0.000	0.000	0.000	0.000	66.292
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

The project is not a new start.

A. Mission Description and Budget Item Justification

The Advanced Multi Purpose (AMP) program is a direct fire line of sight 120mm large caliber munition under development for the Abrams Main Battle Tank. AMP has three modes of operation including point detonate, point detonate delay, and airburst. AMP is the materiel solution for breaching double reinforced concrete walls and defeating Anti Tank Guided Missile (ATGM) teams from 50m to 2000m threshold and 50m to 4500m objective, a validated gap that cannot currently be met with existing stockpiled ammunition. In addition to added capability, AMP will also consolidate the capabilities of four existing stockpiled 120mm munitions, thereby addressing the users' battlecarry dilemma by allowing them to load a single munition that is capable of defeating multiple targets including ATGM teams, reinforced walls, personnel, light armor, bunkers, and obstacles. The full performance of the AMP is obtained with an Abrams equipped Ammunition Data Link breech modification, the same required by the 120mm M829A4 cartridge that achieved Milestone C in FY 2014 and achieved Full Materiel Release in FY 2015. In FY 2020 the program will transition into Procurement.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Engineering and Manufacturing Development (EMD) Phase 2	29.890	20.064	14.100	-	14.100
Description: Design, develop and test components and cartridges leading to a design freeze. The final design will then be carried forward to Developmental Test and Evaluation (DT&E) qualification testing to demonstrate the cartridge's ability to meet performance requirements prior to production.					
FY 2019 Plans: Continue engineering efforts to further mature the design and conduct testing to verify performance expectations will be met prior to the Critical Design Review (CDR). Begin manufacture of mature long lead components required for the DT&E build and delivery. Initiate efforts in preparation for CDR.					
FY 2020 Base Plans: Engineering Manufacturing Development Phase 2 will continue with the completion of the Developmental Test & Evaluation (DT&E) build, initiation and completion of DT&E which will include Limited User and Live Fire Testing,					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019			
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev	Project (Number/Name) ED7 / Advanced Multipurpose (AMP) Cartridge				
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Initial Operation Test Planning, preparation for transition to Low Rate Initial Production at Milestone C, and Milestone C approval.						
FY 2019 to FY 2020 Increase/Decrease Statement: AMP Program transitioning from RDTE to Procurement in FY 2020						
Title: Evaluation for Future Combat Platforms Description: Evaluation of the scalability for future combat platforms.		0.500	0.250	-	-	-
FY 2019 Plans: Efforts will continue on the evaluation of the scalability for future combat platforms						
FY 2019 to FY 2020 Increase/Decrease Statement: AMP Program transitioning from RDTE to Procurement in FY 2020						
Title: Training Round Demonstration Description: Demonstrate feasibility of a training round for AMP		-	0.500	-	-	-
FY 2019 Plans: Feasibility of a training round for AMP will be demonstrated.						
FY 2019 to FY 2020 Increase/Decrease Statement: AMP Program transitioning from RDTE to Procurement in FY 2020						
Title: FY 2019 SBIR / STTR Transfer		-	0.988	-	-	-
FY 2019 Plans: FY 2019 SBIR / STTR Transfer						
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer						
Accomplishments/Planned Programs Subtotals		30.390	21.802	14.100	-	14.100

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019	
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) ED7 / Advanced Multipurpose (AMP) Cartridge			
C. Other Program Funding Summary (\$ in Millions)											
			<u>FY 2020</u>	<u>FY 2020</u>	<u>FY 2020</u>					<u>Cost To</u>	
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>Base</u>	<u>OCO</u>	<u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Complete</u>	<u>Total Cost</u>
• E88105: CTG, 120MM TANK, HEMP-T, XM1147	-	16.398	0.000	15.002	15.002	39.029	46.941	46.949	44.507	0.000	208.826
Remarks											
D. Acquisition Strategy											
The AMP Program achieved Milestone B and entered EMD in FY 2015. EMD consists of two phases; Phase 1 awarded two contracts in FY 2015 to competitively prototype. A cartridge demonstration test was conducted and was used to support downselect to a single contractor for EMD Phase 2, which will lead to Milestone C in 2020 followed by two Low Rate Initial Productions in FY 2020 and FY 2021 and one optional year of full procurement in FY 2023. Explore options to increase future competition and facilitate effective training.											
E. Performance Metrics											
N/A											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) ED7 / Advanced Multipurpose (AMP) Cartridge					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Manager Maneuver Ammunition Systems (PM-MAS)	Various	Picatinny : NJ	3.497	1.550	Oct 2017	0.624	Dec 2018	0.426	Dec 2019	-		0.426	Continuing	Continuing	Continuing
Northrop Grumman Innovation Systems (NGIS)	C/CPIF	NGIS : Plymouth, MN	54.804	22.188	Nov 2017	5.759	Dec 2018	3.365	Nov 2019	-		3.365	Continuing	Continuing	Continuing
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.988		-		-		-	0.000	0.988	-
Subtotal			58.301	23.738		7.371		3.791		-		3.791	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Army Research, Development and Engineering Center (ARDEC)	MIPR	Picatinny : NJ	6.361	3.582	Jan 2018	2.565	Feb 2019	1.565	Nov 2019	-		1.565	Continuing	Continuing	Continuing
Subtotal			6.361	3.582		2.565		1.565		-		1.565	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Yuma Test Center	MIPR	Yuma Proving Ground : AZ	3.923	2.570	Aug 2018	9.931	Jan 2019	7.604	Jan 2020	-		7.604	Continuing	Continuing	Continuing
Aberdeen Test Center	MIPR	Aberdeen Proving Ground : MD	3.756	0.500	Aug 2018	1.935	Jan 2019	1.140	Jan 2020	-		1.140	Continuing	Continuing	Continuing
Subtotal			7.679	3.070		11.866		8.744		-		8.744	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army											Date: March 2019			
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev					Project (Number/Name) ED7 / Advanced Multipurpose (AMP) Cartridge				
		Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals		72.341	30.390		21.802		14.100		-		14.100	Continuing	Continuing	N/A

Remarks

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

Date: March 2019

Appropriation/Budget Activity

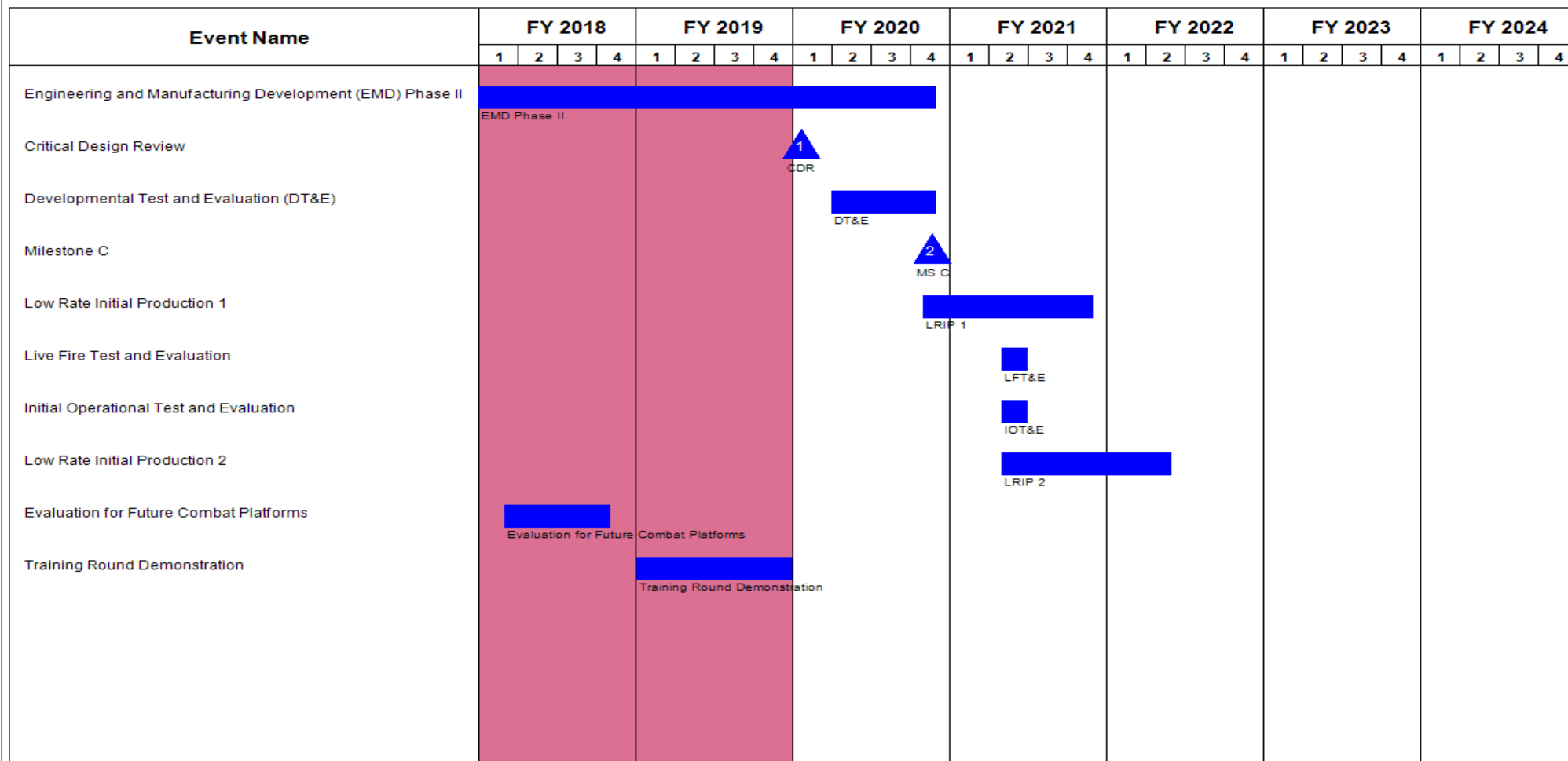
2040 / 5

R-1 Program Element (Number/Name)

PE 0604802A / Weapons and Munitions -
Eng Dev

Project (Number/Name)

ED7 / Advanced Multipurpose (AMP)
Cartridge



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) ED7 / <i>Advanced Multipurpose (AMP) Cartridge</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Engineering and Manufacturing Development (EMD) Phase I	4	2015	1	2017
Engineering and Manufacturing Development (EMD) Phase II	2	2017	4	2020
Critical Design Review	1	2020	1	2020
Developmental Test and Evaluation (DT&E)	2	2020	4	2020
Milestone C	4	2020	4	2020
Low Rate Initial Production 1	4	2020	4	2021
Live Fire Test and Evaluation	2	2021	2	2021
Initial Operational Test and Evaluation	2	2021	2	2021
Low Rate Initial Production 2	2	2021	2	2022
Evaluation for Future Combat Platforms	1	2018	4	2018
Training Round Demonstration	1	2019	4	2019

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EL9 / Ammunitions Logistics Prototyping			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EL9: Ammunitions Logistics Prototyping	-	0.684	2.014	2.329	-	2.329	1.703	0.705	1.000	1.020	0.000	9.455
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. FY 2020 funding will be used to continue integrating the munitions health monitoring system with additional ammunition items and conduct qualification tests and continue to integrate passive time/temperature exposure sensors with additional ammunition items and conduct qualification testing.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Munitions Survivability and Logistics Enablers	0.684	1.949	2.329	-	2.329
Description: This program will develop ammunition logistics systems that improve munitions survivability and logistics					
FY 2019 Plans: Integrate the munitions health monitoring system with additional developmental ammunition items and conduct qualification tests. Continue to integrate passive time/temperature exposure sensor with developmental ammunition items and conduct qualification testing.					
FY 2020 Base Plans: Continue to integrate the munitions health monitoring system with additional ammunition items and conduct qualification tests. Continue to integrate passive time/temperature exposure sensor with ammunition items and conduct qualification testing.					
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding is slightly higher than FY 2019 due to anticipated increase in labor costs.					
Title: FY 2019 SBIR/STTR Transfer	-	0.065	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev	Project (Number/Name) EL9 / Ammunitions Logistics Prototyping			
B. Accomplishments/Planned Programs (\$ in Millions)					
	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: FY 2019 SBIR/STTR Transfer					
FY 2019 Plans: FY 2019 SBIR/STTR Transfer					
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR/STTR Transfer					
Accomplishments/Planned Programs Subtotals	0.684	2.014	2.329	-	2.329
C. Other Program Funding Summary (\$ in Millions) N/A					
Remarks					
D. Acquisition Strategy The acquisition strategy is to develop and test the Munitions Health Monitoring items and conduct a Technology Readiness Assessment (TRA) to ensure readiness for insertion into families of end items.					
E. Performance Metrics N/A					

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army													Date: March 2019		
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 5				PE 0604802A / Weapons and Munitions - Eng Dev				EL9 / Ammunitions Logistics Prototyping							
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor	C/FFP	Karagozian & Case : Glendale, CA	-	0.534	Aug 2018	0.750	Feb 2019	1.629	Dec 2019	-		1.629	0.000	2.913	-
Subtotal			-	0.534		0.750		1.629		-		1.629	0.000	2.913	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
ARDEC	MIPR	Picatinny Arsenal : NJ	0.102	0.150	Jun 2018	0.614	Dec 2018	0.400	Dec 2019	-		0.400	0.000	1.266	-
Subtotal			0.102	0.150		0.614		0.400		-		0.400	0.000	1.266	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Operational Testing - RRAPDS	RO	Yuma Prooving Ground : Yuma Arizona	-	-		0.650	Mar 2019	0.300	Mar 2020	-		0.300	0.000	0.950	-
Subtotal			-	-		0.650		0.300		-		0.300	0.000	0.950	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			0.102	0.684		2.014		2.329		-		2.329	0.000	5.129	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>		Project (Number/Name) EL9 / <i>Ammunitions Logistics Prototyping</i>	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
System Development - Munitions Health Monitoring System																												
System Development - Low Cost Thermal Indicator																												
System Development - Plastic Cylindrical Container																												
System Development - Plastic Rectangular Container																												
System Development - Next Generation Temperature/Humidity Sensor																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) EL9 / <i>Ammunitions Logistics Prototyping</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
System Development - Munitions Health Monitoring System	2	2018	4	2023
System Development - Low Cost Thermal Indicator	3	2017	2	2023
System Development - Plastic Cylindrical Container	1	2021	4	2022
System Development - Plastic Rectangular Container	1	2021	4	2023
System Development - Next Generation Temperature/Humidity Sensor	2	2019	4	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EP2 / Shoulder-Launched Munitions			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EP2: Shoulder-Launched Munitions	-	3.000	0.000	4.100	-	4.100	10.400	0.000	0.000	0.000	0.000	17.500
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

The Individual Assault Munition effort is a new start in FY 2020.

A. Mission Description and Budget Item Justification

Project EP2, Shoulder-Launched Munitions: This project previously funded the one-time acceleration of the Tandem Warhead type classification and completion of development and testing for use in the Shoulder Launched AT-4 Single-use 84mm Anti-Tank Weapon. The AT-4 Tandem Warhead provides a single shot solution with increased lethality for infantry crew formations against anti-armor and to defeat hardened structures. The AT-4 effort was part of the Secretary of Defense's Close Combat Lethality task force.

The Individual Assault Munition (IAM) will be a lightweight Shoulder Launched Munition (SLM) capability for combat units at the individual Soldier level. As an improvement over existing Shoulder Launched Munitions, the solution will allow Soldiers to conduct Urban Operations with an ability to defeat the enemy protected by a variety of field expedient, structural and lightly armored vehicles. This solution will be effective day or night at close ranges with an ability to safely engage targets from within enclosures using single hearing protection. This solution will combine the capability of multiple existing shoulder-launched munitions which will allow for reduced Soldier load, training complexity and logistics burden for Light Infantry, Combat Engineers and Special Operations Forces. FY 2020 funding will provide the Army the opportunity to evaluate various prototype munitions to achieve emerging increased capability as an Individual Assault Munition. The Individual Assault Munition Capabilities Development Document (CDD) was approved on 11 March 2016.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Individual Assault Munition (IAM)	-	-	4.100	-	4.100
FY 2020 Base Plans: FY 2020 funding support the Shoulder Launched Munitions team to evaluate and develop system technology advancements to ensure the soldier has increased capabilities to engage targets at close ranges within enclosures.					
FY 2019 to FY 2020 Increase/Decrease Statement: This is a new start in FY 2020.					
Title: Shoulder Launched AT-4 Single Use 84mm Anti-tank Weapon	3.000	-	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019	
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>		Project (Number/Name) EP2 / <i>Shoulder-Launched Munitions</i>	

B. Accomplishments/Planned Programs (\$ in Millions)					
	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Accomplishments/Planned Programs Subtotals	3.000	-	4.100	-	4.100

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

Remarks

D. Acquisition Strategy
The Individual Assault Munition (IAM) acquisition strategy is to conduct market research on draft Capability Production Document (CPD) requirements for developing product improvements such as making the system lighter with more anti armor protection capabilities. These improvements will then be incorporated into the technical data package for future procurements.

E. Performance Metrics
N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) EP2 / Shoulder-Launched Munitions			
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Dept of Defense Ordnance Technology Consortium (DOTC)	MIPR	DOTC : Picatinny Arsenal, NJ	-	3.000		-		3.400	Mar 2020	-		3.400	0.000	6.400	-
Subtotal			-	3.000		-		3.400		-		3.400	0.000	6.400	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering in Support of Items in Production (ESIP)	MIPR	ARDEC : Picatinny Arsenal, NJ	-	-		-		0.700	Dec 2019	-		0.700	0.000	0.700	-
Subtotal			-	-		-		0.700		-		0.700	0.000	0.700	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	3.000		0.000		4.100		-		4.100	0.000	7.100	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev		Project (Number/Name) EP2 / Shoulder-Launched Munitions	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
ENGINEERING IN SUPPORT OF ITEMS IN PRODUCTION (ESIP)																												
DOD DEFENSE ORDNANCE TECHNOLOGY CONSORTIUM AWARD 1 & 2																												
PROTOTYPE HARDWARE BUILD																												
GOVERNMENT RANGE TESTING																												
CRITICAL DESIGN REVIEW																												
HARDWARE BUILD																												
TEST EVALUATION																												
MS C / TYPE CLASSIFICATION DOCUMENTATION																												
MS C / TYPE CLASSIFICATION DECISION																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) EP2 / <i>Shoulder-Launched Munitions</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
ENGINEERING IN SUPPORT OF ITEMS IN PRODUCTION (ESIP)	1	2021	1	2022
DOD DEFENSE ORDNANCE TECHNOLOGY CONSORTIUM AWARD 1 & 2	2	2020	2	2020
PROTOTYPE HARDWARE BUILD	2	2020	3	2020
GOVERNMENT RANGE TESTING	3	2020	4	2020
CRITICAL DESIGN REVIEW	3	2021	3	2021
HARDWARE BUILD	3	2021	1	2022
TEST EVALUATION	2	2022	3	2022
MS C / TYPE CLASSIFICATION DOCUMENTATION	3	2022	4	2022
MS C / TYPE CLASSIFICATION DECISION	4	2022	4	2022

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EP3 / Reduced Range Ammunition - Small Caliber			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EP3: Reduced Range Ammunition - Small Caliber	-	0.000	2.470	8.376	-	8.376	15.000	15.250	13.200	0.000	0.000	54.296
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

The small caliber Reduced Range technology applies to multiple calibers. The effort under Budget Activity 04, Program Element (PE) 0603639A, Project EL7, Reduced Range Ammunition (RRA), transitions in FY 2019 to Budget Activity 05, PE 0604802A, Project EP3, Reduced Range Ammunition - Small Caliber. PE 0604802A, Project EP3, RRA funding continues the development work of 7.62mm and supports Engineering and Manufacturing Development (EMD) in FY 2019 and the .50 Caliber EMD effort beginning in FY 2020. RRA technologies will be assessed for adaptability to the new Next Generation Squad Weapons (NGSW) ammunition; which will be further developed and fielded under a separate funding line in the future.

A. Mission Description and Budget Item Justification

The small caliber Reduced Range Ammunition (RRA) Project is a critical technology development in response to the 7.62mm 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. FY 2020 funding supports continuing Engineering and Manufacturing Development (EMD) efforts and performing design/verification testing on the 7.62mm variant. FY 2020 funds also support Milestone (MS) B activities to include Preliminary Design Review (PDR) and Engineering and Manufacturing Development (EMD) Contract Award for the .50 caliber variant. FY 2020 funds also supports RRA concept development/evaluation for the Next Generation Squad Weapon (NGSW) systems.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Engineering and Manufacturing Development 7.62mm	-	2.391	3.500	-	3.500
Description: Engineering and Manufacturing Development (EMD) Activities for 7.62mm Reduced Range Ammunition.					
FY 2019 Plans: FY 2019 activities will include various Milestone B activities for 7.62mm to include Industry Day, release Request for Proposal (RFP), perform a System Functional Review, conduct bid sample testing in support of contract					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev		Project (Number/Name) EP3 / Reduced Range Ammunition - Small Caliber		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
award for Engineering and Manufacturing Development (EMD), and conduct a Preliminary Design Review (PDR). FY 2020 Base Plans: Continue EMD efforts and perform 7.62mm RRA design review and qualification testing. FY 2019 to FY 2020 Increase/Decrease Statement: Planned increase for 7.62mm EMD contract efforts.						
Title: Engineering and Manufacturing Development .50 Caliber Description: Engineering and Manufacturing Development (EMD) Activities for .50 Cal Reduced Range Ammunition. FY 2020 Base Plans: Continue EMD efforts and perform .50 Cal RRA Preliminary Design Review (PDR) and qualification testing. FY 2019 to FY 2020 Increase/Decrease Statement: Planned EMD contract award for the .50 Cal RRA effort.		-	-	4.676	-	4.676
Title: NGSW Reduced Range Technology Evaluation Description: Concept development/evaluation of RRA ammunition for the Next Generation Squad Weapons. FY 2020 Base Plans: Explore/evaluate RRA ammunition concepts for the NGSW. FY 2019 to FY 2020 Increase/Decrease Statement: Begin exploring RRA ammunition solutions for the new NGSW.		-	-	0.200	-	0.200
Title: FY 2019 SBIR / STTR Transfer FY 2019 Plans: FY 2019 SBIR / STTR Transfer FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer		-	0.079	-	-	-
Accomplishments/Planned Programs Subtotals		-	2.470	8.376	-	8.376

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019	
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EP3 / Reduced Range Ammunition - Small Caliber			
C. Other Program Funding Summary (\$ in Millions)											
			<u>FY 2020</u>	<u>FY 2020</u>	<u>FY 2020</u>					<u>Cost To</u>	
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>Base</u>	<u>OCO</u>	<u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Complete</u>	<u>Total Cost</u>
• EL7: Reduced Range Ammunition	3.429	7.609	0.000	-	0.000	-	-	-	-	0.000	11.038
Remarks											
Budget Activity 05, Program Element 0604802A, Project EP3, Reduced Range Ammunition transitioned from Budget Activity 04, PE 0603639A, Project EL7, RRA in FY 2019 for the 7.62mm variant. The .50 Caliber variant transitions in FY 2020.											
D. Acquisition Strategy											
After 7.62mm Milestone (MS) B in FY 2019, the Government intends to award an Engineering and Manufacturing Development (EMD) contracts. The Government will then award a competitive contract 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 effort follows a similar strategy. After .50 Caliber Reduced Range Ammunition (RRA) MS B in FY 2020, the Government intends to award a competitive EMD contract.											
E. Performance Metrics											
N/A											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) EP3 / Reduced Range Ammunition - Small Caliber			
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Contract 7.62mm	Option/CPFF	OLIN Winchester Corporation : Oxford, MS	-	-		0.855	Jan 2019	1.550	Jan 2020	-		1.550	Continuing	Continuing	Continuing
Development Contract .50 Cal	C/CPFF	To be Determined : To be Determined	-	-		-		2.500	Jan 2020	-		2.500	Continuing	Continuing	Continuing
NGSW RRA Concept Evaluation	MIPR	Armament Research Development and Engineering Center (ARDEC) : New Jersey	-	-		-		0.200	Oct 2019	-		0.200	Continuing	Continuing	Continuing
Prototype Development	Option/CPAF	Booz Allen Hamilton : Dover, NJ	-	-		0.103	Nov 2018	-		-		-	0.000	0.103	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.079		-		-		-	0.000	0.079	-
Subtotal			-	-		1.037		4.250		-		4.250	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Armament Research Development and Engineering Center (ARDEC) 7.62mm	MIPR	Picatinny Arsenal : New Jersey	-	-		0.950	Oct 2018	1.250	Oct 2019	-		1.250	Continuing	Continuing	Continuing
Armament Research Development and Engineering Center (ARDEC) .50 Cal	MIPR	Picatinny Arsenal : New Jersey	-	-		-		1.750	Oct 2019	-		1.750	Continuing	Continuing	Continuing
Subtotal			-	-		0.950		3.000		-		3.000	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EP3 / Reduced Range Ammunition - Small Caliber					
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Tests 7.62mm	MIPR	U.S. Army Test Center : Aberdeen, Maryland	-	-		0.483	Oct 2018	0.500	Oct 2019	-		0.500	Continuing	Continuing	Continuing
Engineering Tests .50 Cal	MIPR	Aberdeen Test Center : Aberdeen, Maryland	-	-		-		0.626	Oct 2019	-		0.626	Continuing	Continuing	Continuing
Subtotal			-	-		0.483		1.126		-		1.126	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-		2.470		8.376		-		8.376	Continuing	Continuing	N/A
Remarks															

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

Date: March 2019

Appropriation/Budget Activity

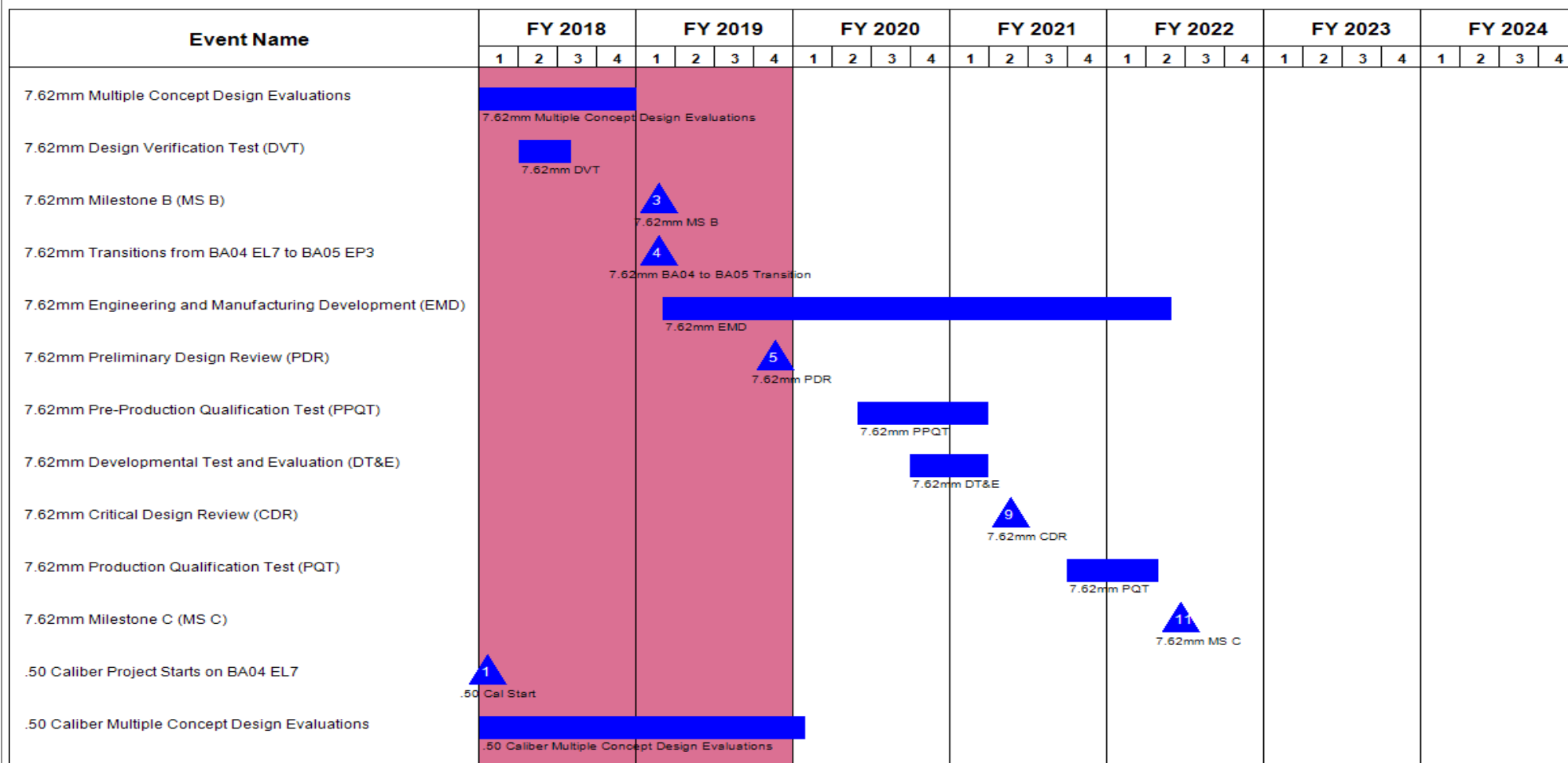
2040 / 5

R-1 Program Element (Number/Name)

PE 0604802A / Weapons and Munitions -
Eng Dev

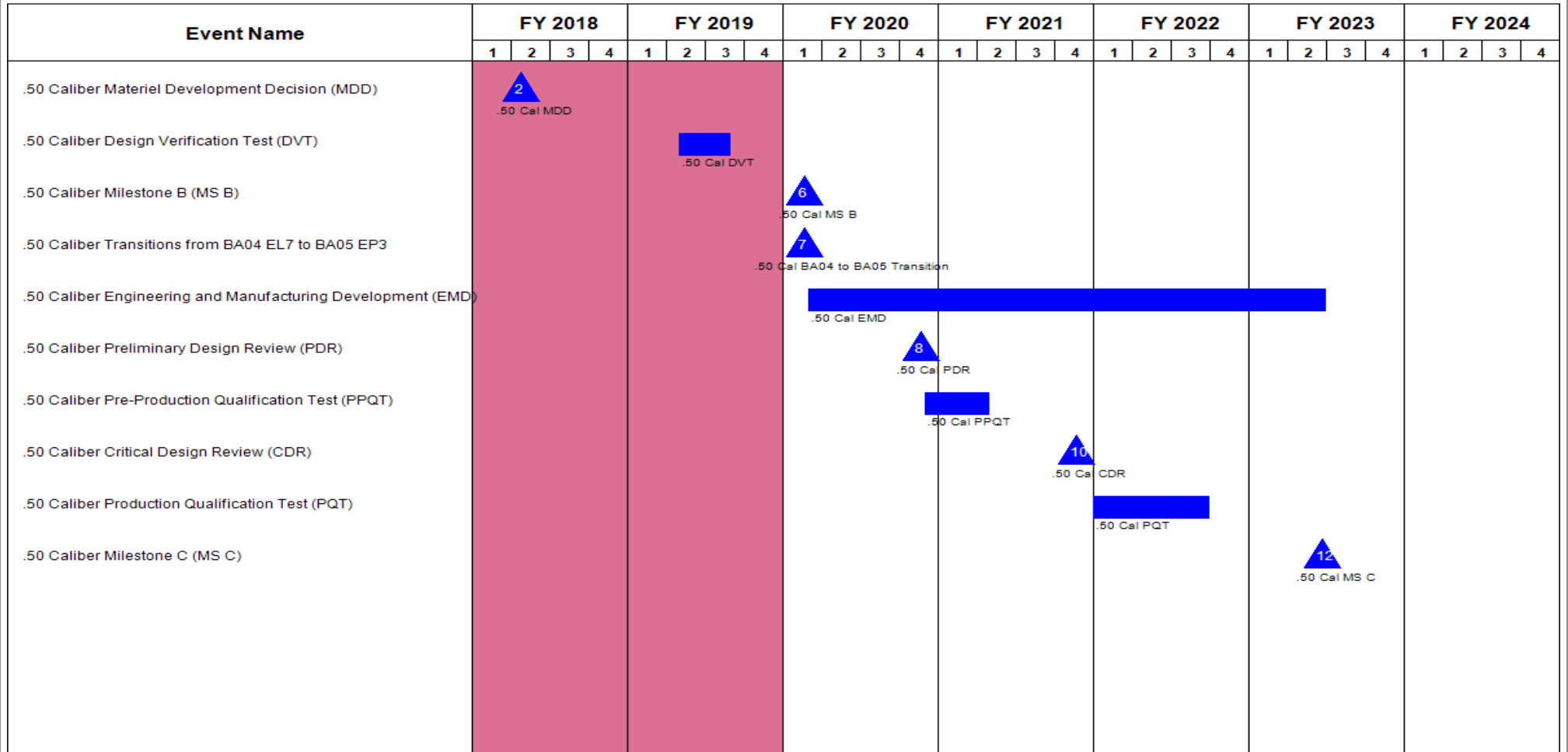
Project (Number/Name)

EP3 / Reduced Range Ammunition - Small
Caliber



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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev		Project (Number/Name) EP3 / Reduced Range Ammunition - Small Caliber	



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev	Project (Number/Name) EP3 / Reduced Range Ammunition - Small Caliber	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
7.62mm Multiple Concept Design Evaluations	1	2017	4	2018
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	1	2021
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 Critical Design Review (CDR)	4	2021	4	2021
.50 Caliber Production Qualification Test (PQT)	1	2022	3	2022

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev	Project (Number/Name) EP3 / Reduced Range Ammunition - Small Caliber	

Events	Start		End	
	Quarter	Year	Quarter	Year
.50 Caliber Milestone C (MS C)	2	2023	2	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EP4 / One-Way Luminescence for Small Caliber Ammo			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EP4: One-Way Luminescence for Small Caliber Ammo	-	0.000	6.077	8.547	-	8.547	12.391	5.387	6.500	3.000	0.000	41.902
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

The small caliber One Way Luminescence (OWL) technology applies to multiple calibers. In FY 2019, Budget Activity 4 Program Element (PE) 0603639A, Project EB8, 7.62mm OWL transitions to Budget Activity 5 (BA5) PE 0604802A, Project EP4, 7.62mm OWL. OWL technologies will be assessed for adaptability to the new Next Generation Squad Weapons (NGSW) ammunition; which will be further developed and fielded under a separate funding line in the future.

A. Mission Description and Budget Item Justification

The One Way Luminescence (OWL) project is a critical technology development in response to the 7.62mm 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 projects objective is to develop and field a full day/night tracer round, replace the current pyrotechnic cartridges with trace cartridges that are only visible to the shooter and soldiers in close proximity, increasing soldier survivability. 7.62mm is the immediate focus followed by 5.56mm OWL cartridges and later followed by .50 Caliber cartridges and Next Generation Squad Weapons (NGSW) ammunition. FY 2020 funding will support continuing Engineering and Manufacturing Development (EMD) efforts, conducting a Critical Design review (CDR), performing development tests, and a User Assessment (UA) for the 7.62mm variant. FY 2020 also supports concept development/evaluation of OWL tracer solutions for .50 Caliber weapons and NSGW.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Engineering and Manufacturing Development (EMD)	-	5.855	8.347	-	8.347
Description: Engineering and Manufacturing Development (EMD) efforts for the 7.62mm variant followed by OWL tracer solutions for .50 Caliber weapons.					
FY 2019 Plans: FY 2019 activities supports EMD and early manufacturing efforts with the 7.62mm OWL design. 7.62mm designs will undergo Verification Testing, Preliminary Design Review (PDR), and a User Assessment (UA).					
FY 2020 Base Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army							Date: March 2019				
Appropriation/Budget Activity 2040 / 5			R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EP4 / One-Way Luminescence for Small Caliber Ammo				
B. Accomplishments/Planned Programs (\$ in Millions)							FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue Engineering and Manufacturing Development (EMD) efforts, conduct a Critical Design review (CDR), perform development tests, and a User Assessment (UA) for the 7.62mm OWL ammunition. Evaluate OWL prototypes/concepts ammunition for .50 Caliber Weapons.											
FY 2019 to FY 2020 Increase/Decrease Statement: Planned EMD contract.											
Title: Prototype and Concept Evaluation for Next Generation Squad Weapons (NGSW)							-	-	0.200	-	0.200
Description: Supports concept development/evaluation of OWL tracer solutions for .50 Caliber weapons and NGSW.											
FY 2020 Base Plans: Evaluate OWL prototypes/concepts ammunition for the Next Generation Squad Weapons (NGSW). Assess OWL technologies for potential to adapt the technology into the NGSW ammunition.											
FY 2019 to FY 2020 Increase/Decrease Statement: Planned assessment of OWL technologies.											
Title: FY 2019 SBIR / STTR Transfer							-	0.222	-	-	-
FY 2019 Plans: FY 2019 SBIR / STTR Transfer											
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer											
Accomplishments/Planned Programs Subtotals							-	6.077	8.547	-	8.547
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• EB8: OWL for Small Caliber Ammunition	4.097	2.174	2.000	-	2.000	-	-	-	-	0.000	8.271
Remarks											
One Way Luminescence (OWL) is a new tracer technology that will be applied to multiple calibers. The initial focus was on 7.62mm ammunition in FY 2015 followed by 5.56mm in FY 2018; and later followed by the .50 Caliber and NGSW ammunition. As the technology matures the effort transitions from Budget Activity 4 (BA4) Program Element 0603639A, Project EB8 to Budget Activity 5 (BA5) Program Element 0604802A, Project EP4 in FY 2019 for 7.62mm, and FY 2021 for 5.56mm. The											

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army								Date: March 2019			
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>				Project (Number/Name) EP4 / <i>One-Way Luminescence for Small Caliber Ammo</i>			
C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
OWL cartridge will be compatible with all Army Small Caliber weapon systems, but optimized for Machine Guns and will provide improved lethality/target effects over the current tracer munition.											
D. Acquisition Strategy											
The OWL concept will be developed through Government and Industry prototyping efforts. A Technology Readiness Assessment (TRA) was conducted in FY 2015 and FY 2016 to measure the progress of the designs. The FY 2017 and FY 2018 TRAs were conducted to evaluate the industry and Government concepts in order to proceed with the 7.62mm Engineering and Manufacturing Development (EMD). The 5.56mm, NGSW, and .50 Caliber cartridges will follow the 7.62mm schedule with Engineering and Manufacturing Development (EMD) starting in FY 2021 for the 5.56mm variant. The new tracer cartridges will replace legacy tracers in each of the various small caliber configurations.											
E. Performance Metrics											
N/A											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EP4 / One-Way Luminescence for Small Caliber Ammo					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Manager Maneuver Ammunition Systems (PM MAS)	Various	Picatinny Arsenal : New Jersey	-	-		0.028	Oct 2018	0.027	Oct 2019	-		0.027	Continuing	Continuing	Continuing
EMD Contractor # 1	Option/ CPFF	General Dynamics : Florham Park, NJ	-	-		1.300	Jan 2019	2.100	Jan 2020	-		2.100	Continuing	Continuing	Continuing
EMD Contractor # 2	Option/ CPFF	Nammo Tally : Mesa, AZ	-	-		1.300	Jan 2019	2.100	Jan 2020	-		2.100	Continuing	Continuing	Continuing
OWL Manufacturing Tooling Development	Option/ CPFF	JAK Tool Engineering Solutions : Cranbury, NJ	-	-		0.206	Nov 2018	-		-		-	0.000	0.206	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.222		-		-		-	0.000	0.222	-
Subtotal			-	-		3.056		4.227		-		4.227	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Armament Research Development and Engineering Center (ARDEC)	MIPR	Picatinny Arsenal : New Jersey	-	-		1.716	Oct 2018	2.070	Oct 2019	-		2.070	Continuing	Continuing	Continuing
Subtotal			-	-		1.716		2.070		-		2.070	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
U.S. Army Aberdeen Test Center (ATC)	MIPR	Aberdeen Proving Ground : Maryland	-	-		0.650	Oct 2018	1.250	Oct 2019	-		1.250	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EP4 / One-Way Luminescence for Small Caliber Ammo					
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Independent Testing	MIPR	Joint Munitions Command/ Bullet Suuply Organization : Lake City, MO	-	-		0.035	Oct 2018	-		-		-	0.000	0.035	-
User Evaluation	MIPR	US Army Maneuver Battle Labs : Fort Benning, GA	-	-		0.400	Oct 2018	-		-		-	0.000	0.400	-
Development Testing & Evaluation	TBD	To Be Determined : To Be Determined	-	-		-		1.000	Oct 2019	-		1.000	Continuing	Continuing	Continuing
Radar Testing	MIPR	US Army Research Lab : Aberdeen, MD	-	-		0.200	Oct 2018	-		-		-	0.000	0.200	-
Tracer Testing	MIPR	US Army Night Vision Lab : Aberdeen, MD	-	-		0.020	Oct 2018	-		-		-	0.000	0.020	-
Subtotal			-	-		1.305		2.250		-		2.250	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-		6.077		8.547		-		8.547	Continuing	Continuing	N/A
Remarks															

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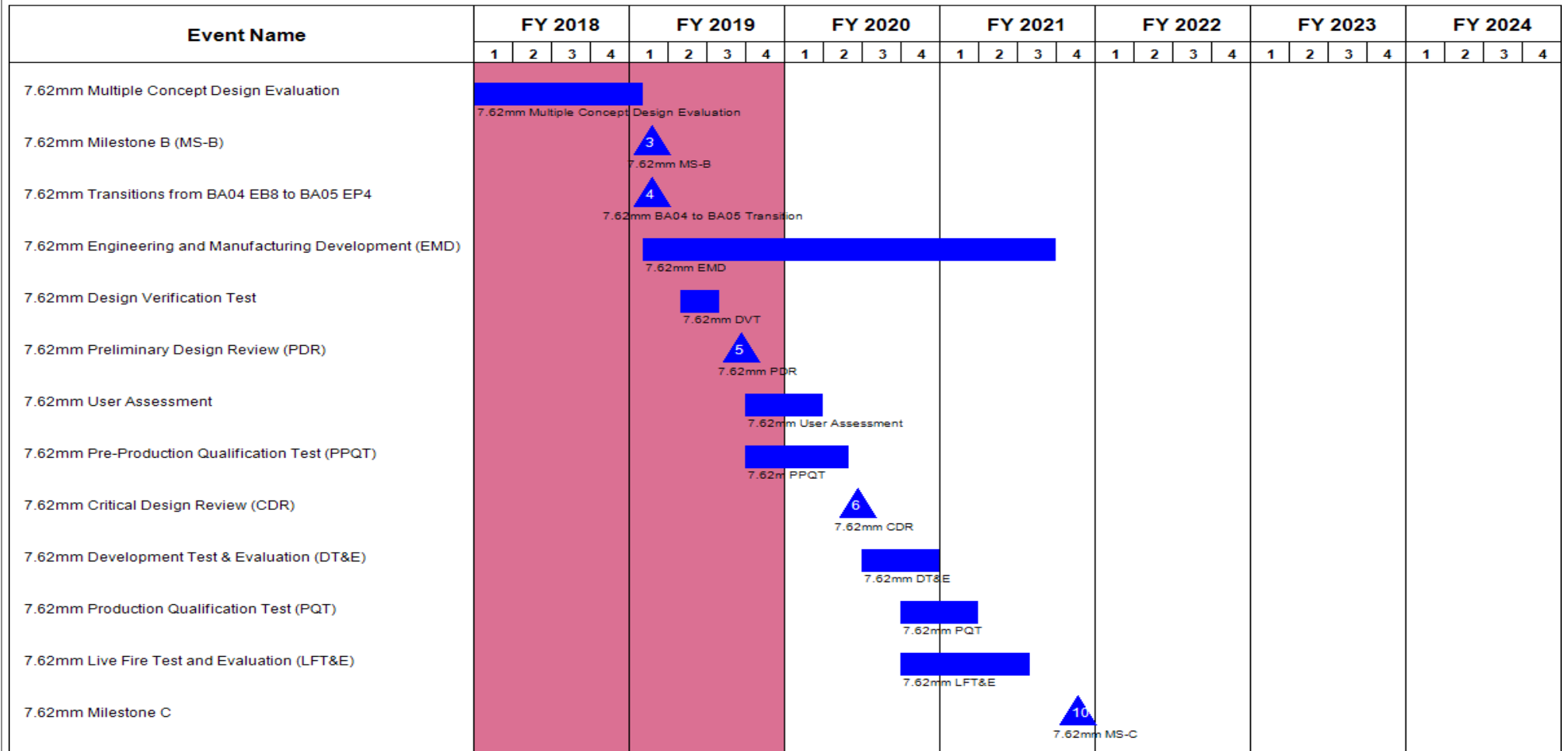
Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army

Date: March 2019

Appropriation/Budget Activity
2040 / 5

R-1 Program Element (Number/Name)
PE 0604802A / Weapons and Munitions -
Eng Dev

Project (Number/Name)
EP4 / One-Way Luminescence for Small
Caliber Ammo



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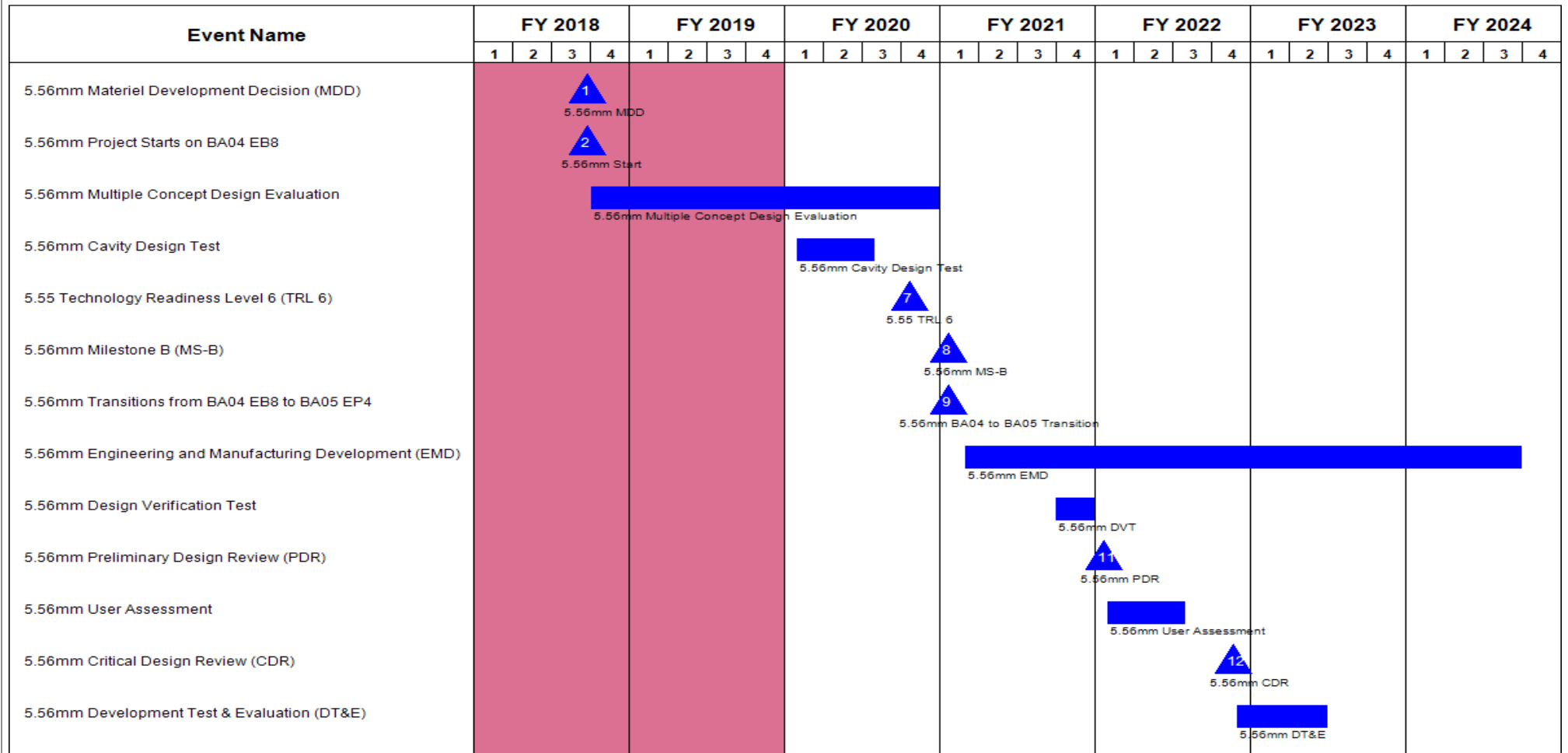
Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army

Date: March 2019

Appropriation/Budget Activity
2040 / 5

R-1 Program Element (Number/Name)
PE 0604802A / Weapons and Munitions -
Eng Dev

Project (Number/Name)
EP4 / One-Way Luminescence for Small
Caliber Ammo



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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army																Date: March 2019												
Appropriation/Budget Activity 2040 / 5									R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev								Project (Number/Name) EP4 / One-Way Luminescence for Small Caliber Ammo											
Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
5.56mm Production Qualification Testing (PQT)																												
5.56mm Live-Fire Test and Evlauation (LFT&E)																												
5.56mm Milestone C (MS-C)																												
NGSW & .50 caliber Concept Design Evaluation																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) EP4 / <i>One-Way Luminescence for Small Caliber Ammo</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
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	2021
7.62mm Design Verification Test	2	2019	3	2019
7.62mm Preliminary Design Review (PDR)	3	2019	3	2019
7.62mm User Assessment	4	2019	1	2020
7.62mm Pre-Production Qualification Test (PPQT)	4	2019	2	2020
7.62mm Critical Design Review (CDR)	2	2020	2	2020
7.62mm Development Test & Evaluation (DT&E)	3	2020	4	2020
7.62mm Production Qualification Test (PQT)	4	2020	1	2021
7.62mm Live Fire Test and Evaluation (LFT&E)	4	2020	3	2021
7.62mm Milestone C	4	2021	4	2021
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
5.55 Technology Readiness Level 6 (TRL 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
5.56mm Engineering and Manufacturing Development (EMD)	1	2021	3	2024
5.56mm Design Verification Test	4	2021	4	2021

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

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) EP4 / <i>One-Way Luminescence for Small Caliber Ammo</i>
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Events	Start		End	
	Quarter	Year	Quarter	Year
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	2	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	3	2020

Note

As the technology matures, the One Way Luminescence (OWL) projects transitions from Budget Activity 4 (BA4) PE 0603639A, Project EB8 to Budget Activity 5 (BA5) PE 0604802A, Project EP4.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EP5 / Adv Armor-Piercing (ADVAP) for Small Caliber Ammo			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EP5: Adv Armor-Piercing (ADVAP) for Small Caliber Ammo	-	13.318	16.748	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	30.066
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

The small caliber Advanced Armor-Piercing (ADVAP) technology applies to multiple calibers. In FY 2017, Program Element (PE) 0603639A, Project EC2, Adv Armor-Piercing (ADVAP) for Small Cal Ammo transitioned to PE 0604802A, Project EP5, Adv Armor-Piercing (ADVAP) for Small Cal Ammo for development of the 7.62mm ammunition. The follow-on effort for ADVAP ammunition calibers below 7.62mm begins in FY 2019. In FY 2020, PE 0604802A, Project EP5, Adv Armor-Piercing (ADVAP) for Small Cal Ammo transitions to PE 0604802A, Project FL4, Small Caliber Ammo for Next Gen Squad Weapons (NGSW) to continue development efforts on ADVAP ammunition for the NGSW.

A. Mission Description and Budget Item Justification

Advanced Armor-Piercing (ADVAP): The ADVAP project is a critical technology development in response to the 7.62mm and 5.56mm Family of Ammunition Capabilities Development Documents (CDD). The nomenclature for the 7.62mm ADVAP is XM1158. The overall objective of the ADVAP project is to develop and Full Materiel Release (FMR) both 7.62mm XM1158 cartridge for the M240 machine gun and ADVAP ammunition in calibers below 7.62mm. The ADVAP ammunition in calibers below 7.62mm for the Next Generation Squad Weapons is referred to as the Special Purpose ammunition. The objective is to provide overmatch capability to defeat advanced light armored threats within typical machine gun engagement ranges. No funding requested in FY 2020.

Next Generation Squad Weapon (NGSW) Family of Ammunition: The NGSW ammo is a new ammunition technology under development for use in the Next Generation Squad Weapon systems. The objective is to develop and Full Materiel Release (FMR) the new ammunition. No funding requested in FY 2020.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: 7.62mm Engineering & Manufacturing Development (EMD)	13.318	11.978	-	-	-
Description: Develop, demonstrate, and qualify XM1158 Small Caliber Ammunition 7.62mm Advanced Armor Piercing (ADVAP) cartridges in order to defeat threat targets and provide overmatch capability versus a broad spectrum of hard targets.					
FY 2019 Plans: FY 2019 efforts will focus on continuing the support of Engineering and Manufacturing Development (EMD) activities such as Developmental Testing and Evaluation (DT&E). FY 2019 also includes an Urgent Materiel					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army									Date: March 2019		
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EP5 / Adv Armor-Piercing (ADVAP) for Small Caliber Ammo			
B. Accomplishments/Planned Programs (\$ in Millions)							FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Release (UMR) to accelerate the fielding of the 7.62mm ADVAP cartridge and preparation for an accelerated Milestone C accomplishment at the end of FY 2019. FY 2019 to FY 2020 Increase/Decrease Statement: The project has a planned Milestone C in FY 2019. No RDTE funding in FY 2020 because the project transitions to production.											
Title: NGSW Rapid Prototyping and Development Description: Develop, demonstrate, and qualify new ammunition for the Next Generation Squad Weapon (NGSW) systems. FY 2019 Plans: Begin rapid prototyping/development efforts on the General Purpose (GP) projectile for the Next Generation Squad Weapons (NGSW), build and evaluate concepts/prototypes, conduct Initial Product Reviews (IPRs), and perform activities to prepare for the Preliminary Design Review (PDR) and Prototype Testing planned in FY 2020. FY 2019 to FY 2020 Increase/Decrease Statement: The effort transitions to PE 0604802A / Project FL4 in FY 2020.							-	4.019	-	-	-
Title: FY 2019 SBIR / STTR Transfer FY 2019 Plans: FY 2019 SBIR / STTR Transfer FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer							-	0.751	-	-	-
Accomplishments/Planned Programs Subtotals							13.318	16.748	-	-	-
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• EC2: Adv Armor-Piercing (ADVAP) for Small Cal Ammo	-	3.755	6.821	-	6.821	-	-	-	-	0.000	10.576
• F57510: CTG, 7.62mm Advanced Armor Piercing, XM1158	-	25.000	0.000	21.013	21.013	22.984	25.682	25.692	-	0.000	120.371

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army									Date: March 2019		
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EP5 / Adv Armor-Piercing (ADVAP) for Small Caliber Ammo			
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• FL4: Small Caliber Ammo for Next Gen Squad Weapons	-	-	22.880	-	22.880	30.630	28.750	25.000	11.750	0.000	119.010
Remarks											
Budget Activity 4 PE 0603639A, Project EC2-RDTE/Adv Armor-Piercing (ADVAP) for Small Cal Ammo: This funding line started the development, technology maturation, and Pre-Engineering & Manufacturing Development (Pre-EMD) work on 7.62mm ADVAP cartridges and initiates rapid prototyping work on the Special Purpose (SP)/ADVAP ammunition in calibers below 7.62mm.											
Procurement of Ammunition, Army F57510-AMMO/CTG, 7.62mm Advanced Armor Piercing, XM1158: This funding line supports the procurement of 7.62mm XM1158 Advanced Armor-Piercing (ADVAP) Ball Cartridges 4Ball/1 M62A1 Tracer linked Cartridges.											
Budget Activity 5 PE 0604802A, Project FL4-RDTE/Small Caliber Ammo for Next Gen Squad Weapons: This funding line continues rapid development/prototyping work on the Next Gen General Purpose (GP) ammunition and Special Purpose (SP) ammunition.											
D. Acquisition Strategy											
Advanced Armor-Piercing (ADVAP): The ADVAP ammunition programs will use a Government developed design and manufacturing processes. Multiple component contracts will be awarded to purchase raw materials and equipment. In FY 2017, the 7.62mm variant, achieved Milestone B; completed Production Decision Review (PDR), and Integrated Baseline Review (IBR) leading to the establishment of the Performance Measurement Baseline and the approval to begin manufacturing the Pre-Production Qualification Testing (PPQT) sample.											
Next Generation Squad Weapon (NGSW) Family of Ammunition: The Next Generation Squad Weapon (NGSW) ammunition program will utilize rapid prototyping acquisition strategy under Section 804 Authority to develop ammunition concepts/designs for the General Purpose (GP) variant and the Special Purpose (SP) variant. Contractors will be funded to rapidly develop projectile designs/concepts with a final down-select to one design prior to Urgent Material Release (UMR) in FY 2022. Follow-on development efforts for additional NSGW ammunition variants including tracer ammunition, blank ammunition, reduced range ammunition, and Close Combat Mission Capability Kit (CCMCK) ammunition will start in FY 2022.											
E. Performance Metrics											
N/A											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EP5 / Adv Armor-Piercing (ADVAP) for Small Caliber Ammo					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
ADVAP Program Manager Maneuver Ammunition Systems (PM MAS)	Various	Picatinny Arsenal : New Jersey	0.190	0.230	Oct 2017	0.048	Oct 2018	-		-		-	0.000	0.468	-
ADVAP Raw Materials	Various	Various : New Jersey	3.196	1.812	Mar 2018	2.622	Jan 2019	-		-		-	0.000	7.630	-
ADVAP Facilitization and Prototyping	MIPR	Picatinny Arsenal : New Jersey	1.142	1.200	Mar 2018	1.200	Jan 2019	-		-		-	0.000	3.542	4.900
NGSW Program Manager Maneuver Ammunition Systems (PM MAS)	Various	Picatinny Arsenal : New Jersey	-	-		0.028	Oct 2018	-		-		-	0.000	0.028	-
NGSW Rapid Prototyping Contract (Vendor 1)	C/CPFF	Northrop Grumman Innovation Systems : Independence, MO	-	-		2.564	Jan 2019	-		-		-	0.000	2.564	-
NGSW Rapid Prototyping Contract (Vendor 2)	C/CPFF	JAK Tool Engineering Solutions : Cranbury, NJ	-	-		1.151	Jan 2019	-		-		-	0.000	1.151	-
Prototype Packaging Development	Option/ CPFF	JAK Tool Engineering Solutions : Cranbury, NJ	-	0.284	Mar 2018	-		-		-		-	0.000	0.284	-
Packaging Components	Option/ FFP	OLIN Winchester Corporation : Oxford, MS	-	0.438	Apr 2018	-		-		-		-	0.000	0.438	-
Propellant Dvelopment	Option/ CPFF	St. Marks Powder : Summerville, SC	-	0.083	Oct 2017	-		-		-		-	0.000	0.083	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.751		-		-		-	0.000	0.751	-
Subtotal			4.528	4.047		8.364		-		-		-	0.000	16.939	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) EP5 / Adv Armor-Piercing (ADVAP) for Small Caliber Ammo			
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
ADVAP Armament Research Development and Engineering Center (ARDEC)	MIPR	Picatinny Arsenal : New Jersey	4.687	5.441	Oct 2017	4.303	Oct 2018	-		-		-	0.000	14.431	-
ADVAP Army Research Lab (ARL)	MIPR	Aberdeen Proving Ground : Maryland	1.566	1.250	Oct 2017	1.010	Oct 2018	-		-		-	0.000	3.826	-
ADVAP Manufacturing Support	C/FP	UTRS : New Jersey	0.600	1.330	Oct 2017	-		-		-		-	0.000	1.930	-
ADVAP Facilitization Support	MIPR	Armament Research Development and Engineering Center : Picatinny Arsenal, New Jersey	0.618	-		-		-		-		-	0.000	0.618	-
NGSW Armament Research Development and Engineering Center (ARDEC)	MIPR	Picatinny Arsenal : New Jersey	-	-		0.201	Oct 2018	-		-		-	0.000	0.201	-
NGSW Army Research Lab (ARL)	MIPR	Aberdeen Proving Ground : Maryland	-	-		0.075	Oct 2018	-		-		-	0.000	0.075	-
Subtotal			7.471	8.021		5.589		-		-		-	0.000	21.081	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
ADVAP U.S. Army Aberdeen Test Center (ATC)	MIPR	Aberdeen Proving Ground : Maryland	0.103	0.400	Jan 2018	0.870	Oct 2018	-		-		-	0.000	1.373	-
ADVAP Limited User Test	MIPR	Maneuver Battle Labs : Fort Benning, Georgia	-	-		0.150	Oct 2018	-		-		-	0.000	0.150	-
ADVAP ARDEC Testing	MIPR	ARDEC : Picatinny Arsenal, New Jersey	0.350	0.850	Feb 2018	0.650	Oct 2018	-		-		-	0.000	1.850	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army													Date: March 2019		
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EP5 / Adv Armor-Piercing (ADVAP) for Small Caliber Ammo					

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
ADVAP ARL Live Fire Test and Evaluation	MIPR	ARL : Aberdeen, Maryland	-	-		1.125	Oct 2018	-		-		-	0.000	1.125	-
Subtotal			0.453	1.250		2.795		-		-		-	0.000	4.498	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	12.452	13.318	16.748	-		-		-	0.000	42.518	N/A

Remarks

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

Date: March 2019

Appropriation/Budget Activity

2040 / 5

R-1 Program Element (Number/Name)

PE 0604802A / Weapons and Munitions -
Eng Dev

Project (Number/Name)

EP5 / Adv Armor-Piercing (ADVAP) for
Small Caliber Ammo

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
ADVAP 7.62mm Engineering & Manufacturing Development																												
ADVAP 7.62mm Pre-Production Qualification Testing (PPQT)																												
ADVAP 7.62mm Critical Design Review (CDR)																												
ADVAP 7.62mm Development Test & Evaluation																												
ADVAP 7.62mm Urgent Materiel Release (UMR)																												
ADVAP 7.62mm Milestone C																												
ADVAP 7.62mm Full Materiel Release (FMR)																												
NGSW Ammo Rapid Prototyping																												
NGSW Ammo Initial Product Review 1 (IPR 1) Special Purpose																												
NGSW Ammo Preliminary Design Review General Purpose (PDR-GP)																												
NGSW Ammo Initial Product Review 2 (IPR 2) Special Purpose																												
NGSW Ammo Project BA05 EP5 to Project BA05 FL4 Transition																												
NGSW Ammo Preliminary Design Review Special Purpose (PDR-SP)																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev		Project (Number/Name) EP5 / Adv Armor-Piercing (ADVAP) for Small Caliber Ammo	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
NGSW Ammo Critical Design Review General Purpose (CDR-GP)																												
NGSW Ammo Prototype Test 1																												
NGSW Ammo Initial Product Review 3 (IPR 3) Special Purpose																												
NGSW Ammo Critical Design Review Special Purpose (CDR-SP)																												
NGSW Ammo Prototype Test 2																												
NGSW Ammo Urgent Materiel Release General Purpose (UMR GP)																												
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 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev	Project (Number/Name) EP5 / Adv Armor-Piercing (ADVAP) for Small Caliber Ammo	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
ADVAP 7.62mm Advanced Concept Development	1	2015	1	2017
ADVAP 7.62mm Prototype Test & Evaluation	1	2015	1	2017
ADVAP 7.62mm Engineering & Manufacturing Development	2	2017	4	2019
ADVAP 7.62mm Pre-Production Qualification Testing (PPQT)	1	2018	1	2018
ADVAP 7.62mm Critical Design Review (CDR)	2	2018	2	2018
ADVAP 7.62mm Development Test & Evaluation	1	2019	3	2019
ADVAP 7.62mm Urgent Materiel Release (UMR)	2	2019	2	2019
ADVAP 7.62mm Milestone C	4	2019	4	2019
ADVAP 7.62mm Full Materiel Release (FMR)	2	2020	2	2020
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 Project BA05 EP5 to Project BA05 FL4 Transition	1	2020	1	2020
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 Critical Design Review Special Purpose (CDR-SP)	2	2021	2	2021
NGSW Ammo Prototype Test 2	2	2021	3	2021
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

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019	
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev		Project (Number/Name) EP5 / Adv Armor-Piercing (ADVAP) for Small Caliber Ammo	
	Start		End	
Events	Quarter	Year	Quarter	Year
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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EP7 / Aviation Airborne Expendable Countermeasures			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EP7: Aviation Airborne Expendable Countermeasures	-	0.000	7.213	4.920	-	4.920	4.480	8.250	0.000	0.000	0.000	24.863
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
This project will support Integrated System Design (ISD), System Capability (SC) and Manufacturing Process Demonstrations (MPD) on current pyrotechnic munitions and tunable pyrotechnic aircraft counter measures and decoys. The project will also support ISD, SC and MPD on new expendable countermeasure munitions that will protect Army aircraft from advanced and current guided missile threats. Activities include modeling and simulation, flight testing, qualification testing, engineering to reduce size and weight, environmental considerations, safety enhancements, manufacturing enhancements, qualification of other service and foreign munitions that could meet current requirements, product improvements, insertion of new technologies to increase performance, and enhancement of current flare solutions for new and existing aircraft. Systems include impulse cartridges and aircraft expendables (to include Radio Frequency (RF) expendables).												
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Improvements to countermeasure flares								-	6.948	4.920	-	4.920
Description: This program will develop improvements to legacy countermeasure flare solutions and qualify them for Army use.												
FY 2019 Plans: Develop required documentation to support milestone A decision. Develop and execute demonstration efforts to analyze various potential solutions. Conduct flight effectiveness testing on Army platforms based on Modeling and Simulation (M&S) results.												
FY 2020 Base Plans: Continue data analysis and evaluation of prototypes and flight effectiveness testing on Army platforms based on modelling and simulation (M&S) results. Down select potential solutions to transition to the Engineering, Manufacturing and Development (EMD) Phase for XM215 and Radio Frequency (RF) Passive countermeasure solutions.												
FY 2019 to FY 2020 Increase/Decrease Statement: Funding has been adjusted from FY19 to FY20 as the program approaches Milestone B.												
Title: FY 2019 SBIR / STTR Transfer								-	0.265	-	-	-
FY 2019 Plans:												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019	
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev		Project (Number/Name) EP7 / Aviation Airborne Expendable Countermeasures	

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 SBIR / STTR Transfer					
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2019 SBIR / STTR Transfer					
Accomplishments/Planned Programs Subtotals	-	7.213	4.920	-	4.920

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• EB9: Aviation Airborne Expandable Countermeasures	8.500	2.471	3.186	-	3.186	4.500	6.060	-	-	0.000	24.717
Remarks											
D. Acquisition Strategy											
The Acquisition strategy is under development and Milestone Decision Authority (MDA) was approved in 3Q FY2017. It is anticipated that these items will be restricted to the National Technology and Industrial Base (NTIB).											
E. Performance Metrics											
N/A											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) EP7 / Aviation Airborne Expendable Countermeasures			
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	C/FFP	ACC : PICATINNY ARSENAL	-	-		2.550	Apr 2019	2.570	May 2020	-		2.570	0.000	5.120	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.265		-		-		-	0.000	0.265	-
Subtotal			-	-		2.815		2.570		-		2.570	0.000	5.385	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support XM215	MIPR	ARDEC : Picatinny Arsenal	-	-		2.598	Feb 2018	0.103	Dec 2019	-		0.103	0.000	2.701	-
Engineering Support RF	MIPR	ARDEC : Picatinny Arsenal	-	-		-		0.250	Dec 2019	-		0.250	0.000	0.250	-
Subtotal			-	-		2.598		0.353		-		0.353	0.000	2.951	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Flight Testing RF	MIPR	AED : Redstone Arsenal	-	-		1.800	Aug 2019	1.997	Jun 2020	-		1.997	0.000	3.797	-
Subtotal			-	-		1.800		1.997		-		1.997	0.000	3.797	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-		7.213		4.920		-		4.920	0.000	12.133	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army												Date: March 2019																				
Appropriation/Budget Activity 2040 / 5								R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev								Project (Number/Name) EP7 / Aviation Airborne Expendable Countermeasures																
Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024							
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
Develop Modeling and Simulation solutions and payload configurations																																
Milestone B XM 215																																
Milestone C XM215																																
Milestone B RF																																
RF Final Prototype Development																																
RF Flight Effectiveness Testing																																
Milestone C RF																																

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev	Project (Number/Name) EP7 / Aviation Airborne Expendable Countermeasures	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Develop Modeling and Simulation solutions and payload configurations	4	2018	1	2021
Milestone B XM 215	4	2020	4	2020
Milestone C XM215	4	2022	4	2022
Milestone B RF	3	2020	3	2020
RF Final Prototype Development	4	2020	1	2021
RF Flight Effectiveness Testing	4	2020	1	2021
Milestone C RF	1	2022	1	2022

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EU4 / 40mm HV Improved High Explosive Dual Purpose			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EU4: 40mm HV Improved High Explosive Dual Purpose	-	2.191	7.201	13.055	-	13.055	2.935	2.313	0.000	0.000	0.000	27.695
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
40mm High Velocity (HV) High Explosive Dual Purpose - Airburst (HEDP-AB) is a new capability identified in the 40mm High Velocity Improved High Explosive Dual Purpose Cartridge Capability Development Document (CDD) and will provide the Mk19 Mod 3 Grenade Machine Gun (GMG) an airburst capable cartridge with the ability of achieving required lethal effects against enemy targets in the open and in defilade while maintaining the capability to defeat unarmored and lightly armored vehicles. FY 2020 funding supports Engineering and Manufacturing Development (EMD) activities including Design Engineering Test (DET) 1, DET 2, Soldier Touch Point (Limited User Evaluation), Family of Weapon Sights - Crew Served (FWS-CS) Integration, and preparation for the contractor down-selection.												
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Engineering Manufacturing Development Activities								2.191	-	-	-	-
Description: Prepare for Milestone B approval, develop Request for Proposal (RFP) documentation, and create test plans.												
Title: Engineering Manufacturing Development								-	6.937	13.055	-	13.055
Description: Award EMD contracts to support Design Engineering Testing (DET) and Design Verification Testing (DVT) of the 40mm dual purpose airburst capability.												
FY 2019 Plans: Funding in FY 2019 supports EMD activities including Source Selection, Contract Award, Design Engineering Test (DET) 1, and Test Readiness Review.												
FY 2020 Base Plans: FY 2020 funding supports EMD activities including Design Engineering Test (DET) 1, DET 2, Limited User Evaluation (LUE), Family of Weapon Sights - Crew Served (FWS-CS) Integration, and preparation for the contractor down-selection.												
FY 2019 to FY 2020 Increase/Decrease Statement: Program increase required for continued contractor development, DET, and LUE.												
Title: FY 2019 SBIR / STTR Transfer								-	0.264	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019	
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev		Project (Number/Name) EU4 / 40mm HV Improved High Explosive Dual Purpose	

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 Plans: FY 2019 SBIR / STTR Transfer					
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer					
Accomplishments/Planned Programs Subtotals	2.191	7.201	13.055	-	13.055

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• E70505: CTG, 40mm HV GMG, I-HEDP	-	-	0.000	-	0.000	11.549	15.222	17.535	-	0.000	44.306

Remarks

D. Acquisition Strategy

The 40mm High Velocity High Explosive Dual Purpose Airburst (HEDP-AB) cartridge will be developed through a competitive Engineering and Manufacturing Development (EMD) program. Milestone B approval will be followed by a competitive award for up to two EMD contractors for Design Engineering Test (DET) 1 and DET 2 to qualify the design to support requirements with sufficient confidence to enter into Developmental Test and Evaluation (DT&E). The contractors will develop an Airburst capable fuze to be retrofitted onto the currently fielded, High Explosive Point Detonating cartridges and develop a Programming Unit. Shortcomings and deficiencies will be corrected prior to subjecting the final design to DT&E. Down-select to a single contractor will occur before DT&E and production options. Test results will support the documentation for Milestone C and Type Classification-Limited Procurement (TC-LP). After Milestone C is achieved, a contract will be awarded for Low Rate Initial Production (LRIP) and two production year options.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) EU4 / 40mm HV Improved High Explosive Dual Purpose			
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Manager Maneuver Ammunition Systems (PM MAS)	MIPR	Picatinny Arsenal : NJ	0.014	0.228	Nov 2017	-		-		-		-	0.000	0.242	-
EMD Contract Award 1	C/CPFF	TBD : TBD	-	-		2.430	Jun 2019	4.548	Oct 2019	-		4.548	Continuing	Continuing	Continuing
EMD Contract Award 2	C/CPFF	TBD : TBD	-	-		2.430	Jun 2019	4.548	Oct 2019	-		4.548	Continuing	Continuing	Continuing
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.264		-		-		-	0.000	0.264	-
Subtotal			0.014	0.228		5.124		9.096		-		9.096	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Armament Research Development Engineering Center (ARDEC)	MIPR	Picatinny Arsenal : NJ	0.278	1.875	Oct 2017	1.927	Oct 2018	2.000	Oct 2019	-		2.000	Continuing	Continuing	Continuing
Defense Information Systems Agency (DISA)	MIPR	Defense Information Systems Agency (DISA) : Annapolis, MD	-	0.088	Jul 2018	-		-		-		-	0.000	0.088	-
Subtotal			0.278	1.963		1.927		2.000		-		2.000	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Design Engineering Test (DET) 1	MIPR	Aberdeen Test Center : Aberdeen Proving Ground, MD	-	-		0.150	Aug 2019	0.584	Oct 2019	-		0.584	0.000	0.734	-
Design Engineering Test (DET) 2	MIPR	Aberdeen Test Center : Aberdeen Proving Ground, MD	-	-		-		1.375	Mar 2020	-		1.375	0.000	1.375	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev					Project (Number/Name) EU4 / 40mm HV Improved High Explosive Dual Purpose				

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Subtotal			-	-		0.150		1.959		-		1.959	0.000	2.109	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.292	2.191	7.201	13.055	-	13.055	Continuing	Continuing	N/A

Remarks

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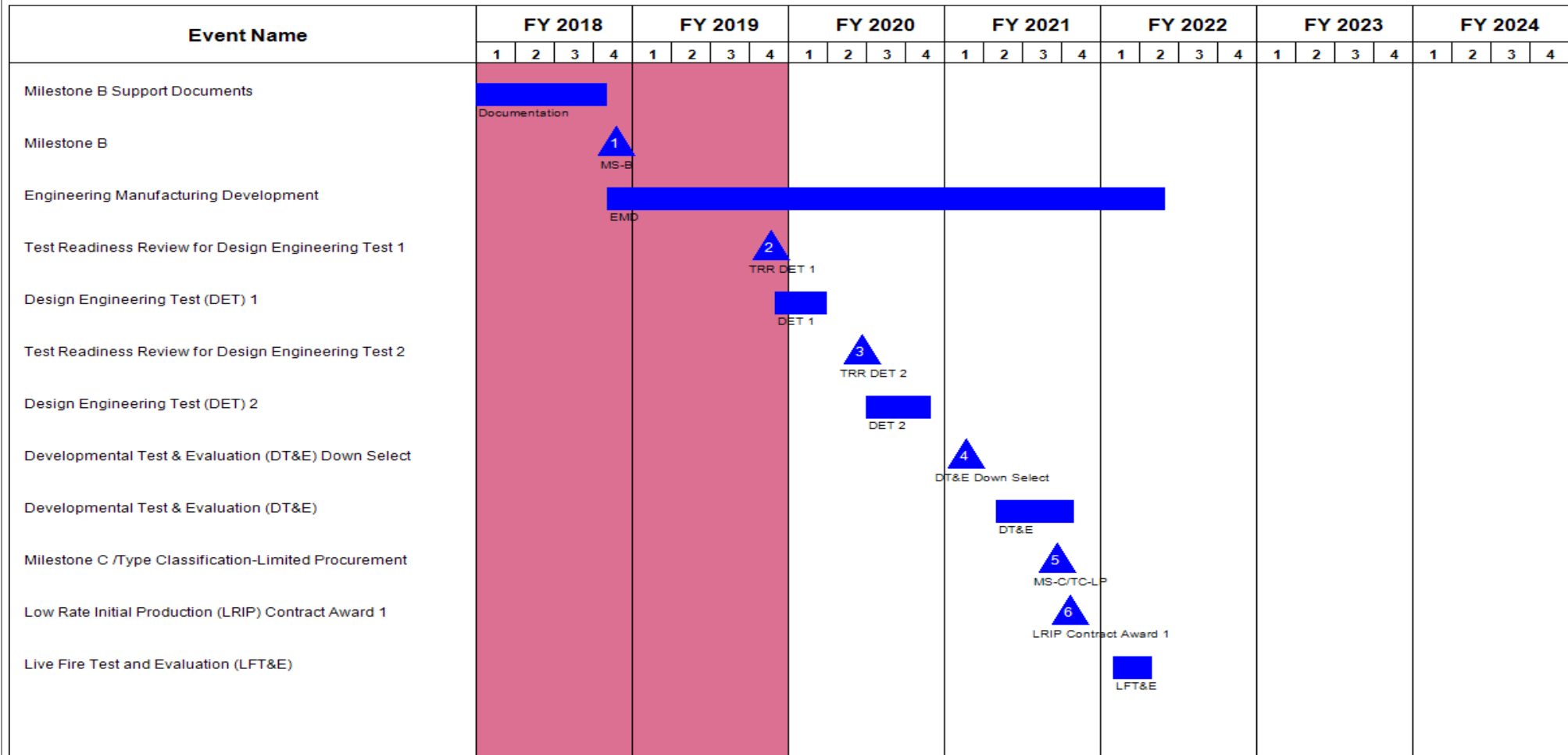
Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army

Date: March 2019

Appropriation/Budget Activity
2040 / 5

R-1 Program Element (Number/Name)
PE 0604802A / Weapons and Munitions -
Eng Dev

Project (Number/Name)
EU4 / 40mm HV Improved High Explosive
Dual Purpose



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev	Project (Number/Name) EU4 / 40mm HV Improved High Explosive Dual Purpose	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Milestone B Support Documents	2	2017	4	2018
Milestone B	4	2018	4	2018
Engineering Manufacturing Development	4	2018	2	2022
Test Readiness Review for Design Engineering Test 1	4	2019	4	2019
Design Engineering Test (DET) 1	4	2019	1	2020
Test Readiness Review for Design Engineering Test 2	2	2020	2	2020
Design Engineering Test (DET) 2	3	2020	4	2020
Developmental Test & Evaluation (DT&E) Down Select	1	2021	1	2021
Developmental Test & Evaluation (DT&E)	2	2021	4	2021
Milestone C /Type Classification-Limited Procurement	3	2021	3	2021
Low Rate Initial Production (LRIP) Contract Award 1	4	2021	4	2021
Live Fire Test and Evaluation (LFT&E)	1	2022	2	2022

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EU6 / 155mm HE Rocket Assist Project Extended Range			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EU6: 155mm HE Rocket Assist Project Extended Range	-	0.000	6.917	8.943	-	8.943	5.966	3.000	0.000	0.000	0.000	24.826
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

FY 2020 funding increase supports the Army's modernization priorities in support of the National Defense Strategy.

A. Mission Description and Budget Item Justification

The XM1113 High Explosive Extended Range Artillery Projectile is a critical munition that supports the Army's modernization priorities in support of the National Defense Strategy. The XM1113 is a government owned materiel solution for long-range cannon artillery projectiles that will attain ranges of 40km in 39 caliber weapon systems and 70km in future systems. The XM1113 will provide 33% increased range over obsolete and aging M549A1 Rocket Assisted Projectile using a larger, modern rocket motor and optimized aerodynamic airframe. The XM1113 will leverage enhanced lethality cannon munition technologies to compensate for increased rocket motor volume. The projectile body is filled with an insensitive munition (IM) high explosive (HE) and a supplementary charge to aid in soldier survivability. FY 2020 funds will support fuze performance evaluation and confirmation with XM1113 for Urgent Materiel Release (UMR) in FY 2021, as well as the continued engineering efforts of the XM1113 maturation in support of a Milestone C in FY 2022.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: 155mm High Explosive Rocket Assist Project (RAP) Extended Range	-	6.664	8.943	-	8.943
Description: Evaluate, Develop, and Qualify Extended Range Technologies.					
FY 2019 Plans: FY 2019 supports the completion of the Developmental Test phase of Engineering & Manufacturing Development (EMD) and the completion of the Critical Design Review (CDR) in 4Q FY 2019.					
FY 2020 Base Plans: FY 2020 funds will support fuze performance evaluation and confirmation with XM1113 for Urgent Materiel Release (UMR) in FY 2021, as well as the continued engineering efforts of the XM1113 maturation in support of a Milestone C in FY 2022.					
FY 2019 to FY 2020 Increase/Decrease Statement:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army							Date: March 2019				
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev			Project (Number/Name) EU6 / 155mm HE Rocket Assist Project Extended Range				
B. Accomplishments/Planned Programs (\$ in Millions)							FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Increase in funding in FY 2020 due to acceleration of qualification efforts per Long Range Precision Fires (LRPF) Cross Functional Team (CFT) priority.											
Title: FY 2019 SBIR / STTR Transfer							-	0.253	-	-	-
FY 2019 Plans: FY 2019 SBIR / STTR Transfer											
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer											
Accomplishments/Planned Programs Subtotals							-	6.917	8.943	-	8.943
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• E66501: PROJ, 155mm ARTY HE RAP, XM1113	-	-	0.000	30.000	30.000	36.000	53.000	-	-	0.000	119.000
Remarks Procurement of Ammunition, Army (PAA) Funding											
D. Acquisition Strategy The XM1113 Project is utilizing four DoD Ordnance Technology Consortium (DOTC) Other Transaction Agreement (OTA) initiatives for early development and prototyping: One DOTC OTA will be with General Dynamics Ordnance and Tactical Systems (GD-OTS) at Scranton Army Ammunition Plant (SCAAP) in Scranton, PA for the projectile body, the second with Savit Corporation in Rockaway, NJ to procure multiple small components and conduct the Load, Assemble, and Pack (LAP) with American Ordnance (AO) at Iowa Army Ammunition Plant (IAAP), the third with Northrop Grumman in Plymouth, MN for fuze compatibility efforts, and the fourth with Nammo Talley in Mesa, AZ for the rocket grains. The parts will support test activities in Yuma, Arizona. In FY 2019, the U.S. Government is evaluating a single DOTC OTA to cover the XM1113 system to support the accelerated timeline and Urgent Materiel Release (UMR) of 2,000 projectiles in 3Q FY 2021, as well as the maturation XM1113 to meet Milestone C requirements in FY 2022. The Program will transition to a Federal Acquisition Regulation (FAR) based production contract after Milestone C for Low Rate Initial Production (LRIP) and Full Rate Production (FRP).											
E. Performance Metrics N/A											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) EU6 / 155mm HE Rocket Assist Project Extended Range			
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
XM1113 Program Management	Various	Office of the Project Manager (PM) Combat Ammunition Systems (CAS) : Picatinny Arsenal, NJ	-	-		0.190	Oct 2018	0.150	Oct 2019	-		0.150	0.000	0.340	-
Subtotal				-		0.190		0.150		-		0.150	0.000	0.340	N/A
Remarks Program Management support includes XM1113 travel and milestone documentation support.															
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
XM1113 HE-RAP Prototyping	MIPR	DoD Ordnance Technology Consortium (DOTC) : Various	-	-		1.874	Nov 2018	5.688	Nov 2019	-		5.688	17.000	24.562	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.253		-		-		-	0.000	0.253	-
Subtotal				-		2.127		5.688		-		5.688	17.000	24.815	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
XM1113 Engineering Support	MIPR	Armament Research, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	-	-		4.000	Oct 2018	1.750	Oct 2019	-		1.750	11.400	17.150	-
Subtotal				-		4.000		1.750		-		1.750	11.400	17.150	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EU6 / 155mm HE Rocket Assist Project Extended Range					
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
XM1113 Testing	MIPR	Army Research Lab (ARL) : Adelphi, MD	-	-		0.600	Mar 2020	-		-		-	0.000	0.600	-
XM1113 Testing	MIPR	Army Test and Evaluation Command (ATEC) Yuma Proving Ground (YPG) : Yuma, AZ	-	-		-		1.355	Mar 2020	-		1.355	9.500	10.855	-
Subtotal			-	-		0.600		1.355		-		1.355	9.500	11.455	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-		6.917		8.943		-		8.943	37.900	53.760	N/A
Remarks															
In FY 2018, PE 604802A, Project EU7 Enhanced Lethality Cannon Munitions received \$5.100M as part of the FY 2018 OMNIBUS in support of the acceleration of XM1113 High Explosive Rocket Assisted Projectile (HE-RAP) fuze compatibility and prototyping efforts to support the Army's modernization priorities in support of the National Defense Strategy.															
FY 2019 funding in the amount of \$26.300M from Project 613, MORTAR SYSTEMS, was realigned to Project EU6, 155mm HE Rocket Assist project Extended Range. Both Projects are within the 0604802A Program Element. This funding will be utilized to complete XM1113 lethality testing, firing tables software updates, development of fuze integration efforts, and development of prototype hardware for qualification in support of the Urgent Material Release of 2,000 projectiles in FY 2021 to support the Army's modernization priorities in support of the National Defense Strategy.															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev		Project (Number/Name) EU6 / 155mm HE Rocket Assist Project Extended Range	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
XM1113 Engineering Manufacturing and Development (EMD)																												
XM1113 Lethality Testing																												
XM1113 Urgent Materiel Release (UMR) Qualification Testing																												
XM1113 UMR																												
XM1113 Milestone C Qualification Testing																												
XM1113 Milestone C																												
XM1113 Full Materiel Release (FMR)																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) EU6 / <i>155mm HE Rocket Assist Project Extended Range</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
XM1113 Engineering Manufacturing and Development (EMD)	3	2019	4	2022
XM1113 Lethality Testing	1	2019	1	2020
XM1113 Urgent Materiel Release (UMR) Qualification Testing	3	2019	2	2020
XM1113 UMR	3	2021	3	2021
XM1113 Milestone C Qualification Testing	1	2021	3	2022
XM1113 Milestone C	4	2022	4	2022
XM1113 Full Materiel Release (FMR)	4	2023	4	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EU7 / Enhanced Lethality Cannon Munitions			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EU7: Enhanced Lethality Cannon Munitions	-	25.600	7.905	7.908	-	7.908	0.000	0.000	0.000	0.000	0.000	41.413
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2018, Program Element 0604802A, Project EU7 Enhanced Lethality Cannon Munitions received \$5.100 million as part of the FY 2018 OMNIBUS Prior Approval Above Threshold Reprogramming (FY 18-17 PA) in support of the acceleration of XM1113 High Explosive Rocket Assisted Projectile (HE-RAP) fuze compatibility and prototyping efforts to support the Army's modernization priorities in support of the National Defense Strategy.

A. Mission Description and Budget Item Justification

The Enhanced Lethality Cannon Munitions (ELCM) Project will evaluate, develop, and qualify new lethality technologies for 155mm cannon artillery munitions and evaluate their effectiveness in mitigating evolving and derived capability gaps, and support transition to production. The ELCM Project supports testing and assessment of the Israeli Military Industries (IMI) Systems M999 advanced anti-personnel munition and also accelerates the qualification of the 155mm XM1128 High Explosive Projectile including the evaluation of Lithographic Fragmentation Technology (LFT); both of these initiatives support the Army Directed Requirement for a Rapid Bridging Solution for the replacement of the 155mm Dual Purpose Improved Conventional Munition (DPICM). FY 2020 funds will support fuze performance evaluation and confirmation with XM1128, as well as continued Insensitive Munitions (IM) testing, Sequential Environmental Test - Safety (SET-S), and Military Standard Environmental Engineering Considerations and Laboratory Tests (MIL-STD-810). Engineering efforts will support the evaluation of the XM1128 test data to determine that the Program is safe, suitable and operationally effective, as well as the gathering of all statutory and regulatory requirements in support of a Milestone C in FY 2021.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: 155mm XM1128 High Explosive Projectile	18.027	7.615	7.908	-	7.908
Description: Evaluate, Develop, and Qualify Enhanced Lethality Technologies.					
FY 2019 Plans: FY 2019 supports the completion of the Product Qualification Testing (PQT) test series for the XM1128 and the finalization of the Capability Production Document (CPD) by 4Q FY 2019.					
FY 2020 Base Plans: FY 2020 funds will support fuze performance evaluation and confirmation with XM1128, as well as continued Insensitive Munitions (IM) testing, Sequential Environmental Test - Safety (SET-S), and Military Standard environmental testing (MIL-STD-810). Engineering efforts will support the evaluation of the XM1128 test data to					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army									Date: March 2019			
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EU7 / Enhanced Lethality Cannon Munitions				
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
determine that the Program is safe, suitable and operationally effective, as well as the gathering of all statutory and regulatory requirements in support of a Milestone C in FY 2021.												
FY 2019 to FY 2020 Increase/Decrease Statement: N/A												
Title: 155mm M999 IMI Projectile with M99 Submunitions								2.473	-	-	-	-
Description: M999 testing assessment of performance, safety, and unexploded ordnance (UXO) rates.												
Title: 155mm XM1113 High Explosive Rocket Assisted Projectile								5.100	-	-	-	-
Description: Evaluate, Develop, and Qualify Enhanced Lethality Technologies.												
Title: FY 2019 SBIR / STTR Transfer								-	0.290	-	-	-
FY 2019 Plans: FY 2019 SBIR / STTR Transfer												
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer												
Accomplishments/Planned Programs Subtotals								25.600	7.905	7.908	-	7.908
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost	
• E67802: PROJ, 155mm ARTY HE-BB, XM1128	-	-	0.000	14.994	14.994	34.503	50.240	119.781	128.366	0.000	347.884	
Remarks Procurement of Ammunition, Army (PAA) Funding												
D. Acquisition Strategy												
The XM1128 High Explosive munition has been accelerated for qualification, per the Army Directed Requirement for a Rapid Bridging Solution for the 155mm Dual Purpose Improved Conventional Munition (DPICM) as of 22 December 2016, as an inherent part of the Rapid Bridging solution for 155mm DPICM. Prototyping was awarded in 1Q FY 2018 through DoD Ordnance Technology Consortium (DOTC) Other Transaction Agreement (OTA) initiatives to multiple vendors (subcontractors to U.S. Government system integrator) through Engineering & Manufacturing Development (EMD). The U.S. Government will lead EMD efforts to complete development												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) EU7 / <i>Enhanced Lethality Cannon Munitions</i>
<p>by end 4Q FY 2020. Milestone C approval is in 2Q FY 2021. Following Milestone C, the XM1128 will be competed via Federal Acquisition Regulation (FAR) based contracts for Load, Assemble, and Pack (LAP) and metal parts in support of Low Rate Initial Production (LRIP) and follow-on production activities. Full Material Release (FMR) is planned for 1Q FY 2022.</p> <p><u>E. Performance Metrics</u> N/A</p>		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) EU7 / Enhanced Lethality Cannon Munitions			
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
ELCM Program Management	Various	Office of the Project Manager (PM) Combat Ammunition Systems (CAS) : Picatinny Arsenal, NJ	-	0.347	Oct 2017	0.140	Oct 2018	0.150	Oct 2019	-		0.150	0.000	0.637	-
Subtotal			-	0.347		0.140		0.150		-		0.150	0.000	0.637	N/A
Remarks Program Management support includes XM1128 and M999 travel and milestone documentation support.															
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
XM1128 PQT Hardware	MIPR	DoD Ordnance Technology Consortium (DOTC) : Various	-	10.074	Nov 2017	3.054	Feb 2019	1.875	Oct 2019	-		1.875	0.140	15.143	-
XM1113 Prototype Hardware	MIPR	DoD Ordnance Technology Consortium (DOTC) : Various	-	4.494	Oct 2018	-		-		-		-	0.000	4.494	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.290		-		-		-	0.000	0.290	-
Subtotal			-	14.568		3.344		1.875		-		1.875	0.140	19.927	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
XM1128 Engineering Support	MIPR	Armament Reasech Development and Engineering Center	-	5.294	Nov 2017	1.032	Mar 2019	4.283	Oct 2019	-		4.283	1.377	11.986	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army Date: March 2019

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev	Project (Number/Name) EU7 / Enhanced Lethality Cannon Munitions
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Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
		(ARDEC) : Picatinny Arsenal, NJ													
XM1128 Firing Table Software Updates	MIPR	Armament Research Development and Engineering Center (ARDEC) : Adelphi, MD	-	2.123	Feb 2019	-		-		-		-	0.000	2.123	-
M999 Engineering Support	MIPR	Armament Research, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	-	0.750	Jun 2018	-		-		-		-	0.000	0.750	-
XM1113 Engineering Support	MIPR	Armament Research, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	-	0.606	Oct 2018	-		-		-		-	0.000	0.606	-
Subtotal			-	8.773		1.032		4.283		-		4.283	1.377	15.465	N/A

Remarks

FY 2020: Additional XM1128 Engineering Support in FY 2020 required to facilitate individual Production Qualification Testing (PQT) events, reviews, and Milestone C preparation

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
XM1128 Testing	MIPR	Army Test and Evaluation Command (ATEC) Yuma Proving Ground (YPG) : Yuma, AZ	-	-		1.891	Mar 2019	1.250	Mar 2020	-		1.250	0.000	3.141	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EU7 / Enhanced Lethality Cannon Munitions					
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
XM1128 Testing	MIPR	Naval Surface Warfare Center (NSWC) ? Dahlgren : Dahlgren, VA	-	-		0.898	Nov 2018	-		-		-	0.000	0.898	-
XM1128 Testing	MIPR	National Technical Systems (NTS) : Camden, AR	-	0.067	May 2018	0.600	Jan 2019	0.350	Mar 2020	-		0.350	0.000	1.017	-
M999 Testing	MIPR	Combating Terrorism Technical Support Office (CTTSO) : Alexandria, VA	-	1.770	Sep 2018	-		-		-		-	0.000	1.770	-
XM1128 Testing	MIPR	Army Research Lab (ARL) : Adelphi, MD	-	0.075	May 2018	-		-		-		-	0.000	0.075	-
Subtotal			-	1.912		3.389		1.600		-		1.600	0.000	6.901	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	25.600		7.905		7.908		-		7.908	1.517	42.930	N/A
Remarks															
FY 2018: \$5.100M received as part of the FY 2018 OMNIBUS in support of the acceleration of XM1113 High Explosive Rocket Assisted Projectile (HE-RAP) fuze compatibility and prototyping efforts to support the Army's modernization priorities in support of the National Defense Strategy.															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev		Project (Number/Name) EU7 / Enhanced Lethality Cannon Munitions	

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
XM1128																												
XM1128 Prototyping																												
XM1128 Milestone B																												
XM1128 Lethality Testing and Assessment																												
XM1128 Critical Design Review (CDR)																												
XM1128 Performance Qualification Testing (PQT)																												
XM1128 Baseline Prototyping																												
XM1128 Milestone C																												
XM1128 Full Materiel Release (FMR)																												
M999																												
M999 Testing																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev	Project (Number/Name) EU7 / Enhanced Lethality Cannon Munitions	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
XM1128	3	2017	1	2021
XM1128 Prototyping	3	2017	4	2019
XM1128 Milestone B	1	2018	1	2018
XM1128 Lethality Testing and Assessment	4	2017	4	2019
XM1128 Critical Design Review (CDR)	2	2019	2	2019
XM1128 Performance Qualification Testing (PQT)	2	2019	3	2020
XM1128 Baseline Prototyping	4	2019	3	2020
XM1128 Milestone C	2	2021	2	2021
XM1128 Full Materiel Release (FMR)	1	2023	1	2023
M999	4	2018	4	2019
M999 Testing	4	2018	4	2019

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EU8 / Improved Multi-Option Fuze			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EU8: Improved Multi-Option Fuze	-	9.730	7.905	10.000	-	10.000	0.000	0.000	0.000	0.000	0.000	27.635
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

FY 2020 funding increase supports the Army's modernization priorities in support of the National Defense Strategy.

A. Mission Description and Budget Item Justification

The Improved Multi-Option Fuze Project (MOFA II/iMOFM) is a technology refresh and modernization effort that provides an incremental capability with technology advancements and performance improvements on the current non-precision artillery and mortar ammunition proximity multi-option fuzes that will increase robustness to electronic countermeasures (ECM), eliminates the susceptibility of reverse engineering (RE), incorporates power source advancements, improves delay mode reliability, and integrates safe & arm improvements. This will develop and qualify safe, affordable, reliable Proximity Height of Burst (HoB) fuzing solutions with robust Defense Exportability Features (DEF) for non-precision conventional Cannon artillery and Mortar munitions that are resistant to adversary exploitation via electronic countermeasures and reverse engineering threats. FY 2020 will support the preparation and incrementing of Engineering and Manufacturing Development (EMD) contracts, the fabrication of MOFA II and iMOFM hardware to conduct developmental verification tests and Product Qualification Tests (PQT), the iMOFM Critical Design Review (CDR), and the preparations for transition into production.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Improved Multi-Option Fuze Development	9.730	7.615	10.000	-	10.000
Description: Develop and qualify improved multi-option fuze technologies.					
FY 2019 Plans: FY 2019 is supporting the preparation and award of EMD contract utilizing the DoD Ordnance Technology Consortium (DOTC) Other Transaction Agreement (OTA) for preliminary iMOFM design and detailed MOFA II design, the fabrication of hardware and conducting of development verification tests, the preparations for and execution of an iMOFM Preliminary Design Review (PDR) and MOFA II Critical Design Review (CDR), and the completion of MOFA II Product Qualification (PQT) plans and the fabrication of test hardware.					
FY 2020 Base Plans: FY 2020 funding will support the EMD contract increments utilizing the DOTC OTA for MOFA II detailed designs, the fabrication of hardware and the execution of MOFA II Product Qualification Tests (PQT), ballistic engineering					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army								Date: March 2019				
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EU8 / Improved Multi-Option Fuze				
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
and qualification testing, iMOFM developmental verification tests, iMOFM Critical Design Review, the execution of iMOFM PQT and the preparations for transition into production.												
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increase supports the test assets required for both execution of Production Qualification Testing (PQT) and Development Verification Testing (DVT).												
Title: FY 2019 SBIR / STTR Transfer								-	0.290	-	-	-
FY 2019 Plans: FY 2019 SBIR / STTR Transfer												
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer												
Accomplishments/Planned Programs Subtotals								9.730	7.905	10.000	-	10.000
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost	
• E99909: Multi-Option Fuze, Artillery M782	-	-	0.000	2.700	2.700	16.250	32.500	-	-	0.000	51.450	
Remarks Budget Activity (BA) 4, Program Element (PE) 0603639A Project EU2: Improved Multi-Option Fuze (MOFA II/iMOFM) - FY 2017 \$7.588 million Project was transitioned in FY 2018 to BA5 PE 0604802A Project EU8: Improved Multi-Option Fuze (MOFA II/iMOFM).												
D. Acquisition Strategy The Improved Multi-Option Fuze Project will utilize the DoD Ordnance Technology Consortium (DOTC) Other Transaction Agreement (OTA) with incrementally funded Engineering and Manufacturing Development (EMD) contracts for improved and modernized MOFA II detailed designs and the fabrication of hardware. Improved Multi-Option Fuze programs of record via subsequent Engineering and Manufacturing Program for Type Classification (TC) into existing multi-option fuzes for Cannon Artillery and Mortar Munitions with supporting detailed government-owned Technical Data Packages (TDPs) to enable "build to print" by Industry to facilitate competitive Federal Acquisition Regulation (FAR) based contracting for procurement. Qualified MOFA II will be a Technology Readiness Level 8 (TRL-8) TC design with a mature technical design packages for production. Parallel iMOFM effort will be a qualified TRL-8 design and replace current MOFMs in appropriate ongoing production mortar cartridges.												
E. Performance Metrics N/A												

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) EU8 / Improved Multi-Option Fuze			
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	Various	Office of the Project Manager (PM) Combat Ammunition Systems (CAS) : Picatinny Arsenal, NJ	-	0.898	May 2018	0.200	Nov 2018	0.300	Nov 2019	-		0.300	0.000	1.398	-
Subtotal				-	0.898		0.200		0.300		-	0.300	0.000	1.398	N/A
Remarks Program management supports travel and Milestone C documentation.															
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Improved Multi-Option Fuze Development and Component Prototypes	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD : Various	-	6.278	Oct 2017	-		-		-		-	0.000	6.278	-
Improved Multi-Option Fuze Test Hardware & PQT Support	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD : Various	-	-		5.200	Apr 2019	3.000	Mar 2020	-		3.000	0.000	8.200	-
MOFA II Fuze Test Hardware & PQT Support	MIPR	DoD Ordnance Technology Consortium (DOTC) - TBD : Various	-	-		0.300	Jun 2019	3.800	Jun 2020	-		3.800	0.000	4.100	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.290		-		-		-	0.000	0.290	-
Subtotal				-	6.278		5.790		6.800		-	6.800	0.000	18.868	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) EU8 / Improved Multi-Option Fuze			
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support	MIPR	Armament Research, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	-	1.551	Oct 2017	0.869	Nov 2018	1.025	Nov 2019	-		1.025	0.000	3.445	-
Subtotal			-	1.551		0.869		1.025		-		1.025	0.000	3.445	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Improved Multi-Option Fuze Test and Evaluations	MIPR	Armament Research, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	-	0.666	Oct 2017	0.300	Nov 2018	0.500	Nov 2019	-		0.500	0.000	1.466	-
Improved Multi-Option Fuze Test and Evaluations	MIPR	Army Test and Evaluation Command (ATEC) Yuma Proving Ground (YPG) : Yuma, AZ	-	0.187	May 2018	0.596	Jun 2019	1.300	Jun 2020	-		1.300	0.000	2.083	-
Improved Multi-Option Fuze Test and Evaluations	MIPR	U.S. Army Research Lab (ARL) : Adelphi, MD	-	0.150	Oct 2017	0.150	Nov 2018	0.075	Nov 2019	-		0.075	0.000	0.375	-
Subtotal			-	1.003		1.046		1.875		-		1.875	0.000	3.924	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	9.730		7.905		10.000		-		10.000	0.000	27.635	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army																Date: March 2019																					
Appropriation/Budget Activity 2040 / 5										R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev										Project (Number/Name) EU8 / Improved Multi-Option Fuze																	
Event Name										FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
										1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Fabricate Prototypes																																					
Conduct Evaluations and Design Reviews																																					
Fabricate System Level Qualification Hardware																																					
Safety, Reliability, Environmental, EMD and Qualification Testing																																					

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) EU8 / <i>Improved Multi-Option Fuze</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Fabricate Prototypes	3	2018	3	2019
Conduct Evaluations and Design Reviews	2	2019	4	2019
Fabricate System Level Qualification Hardware	3	2019	3	2020
Safety, Reliability, Environmental, EMD and Qualification Testing	2	2020	4	2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EW1 / 40mm Low Velocity Ammunition			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
EW1: 40mm Low Velocity Ammunition	-	13.469	13.253	14.032	-	14.032	17.402	5.963	2.000	0.000	0.000	66.119
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The 40mm Low Velocity High Explosive Air Burst (HEAB) is a new capability identified as a Warfighter requirement in the Capability Development Document (CDD), 40mm Low Velocity (LV) Family of Ammunition Annex. The 40mm Low Velocity HEAB tactical cartridge allows the warfighter to engage targets at increased effective ranges using the 40mm M320 Grenade Launcher. The HEAB cartridge provides the grenadier with a higher probability of achieving a first shot kill against enemy personnel, coupled with the ability to defeat personnel targets in defilade positions. When deployed against point and area targets, the cartridge inflicts incapacitating effects against personnel beyond those offered by the current M433 High Explosive Dual Purpose (HEDP) cartridge. The cartridge provides lethal effects against targets with improved accuracy and greater standoff ranges increasing Soldier Survivability. FY 2020 will support Design Engineering Test (DET) 2 and DET 3 build, Soldier Touch Point (Limited User Evaluation), Test Readiness Reviews (TRRs) and DET 2 Testing.

The 40mm Low Velocity (LV) Door Breach (DB), XM1167, cartridge allows the grenadier to conduct a ballistic breach of an existing door to create an entry point into a building or other structure. This capability is critical during Urban Operations, while having stand-off ability to conduct ballistic breach at ranges up to 50 meters away, with a single-shot, and without pause between actual breach and entry of initial force. The 40mm Door Breach cartridge will provide the small unit with the capability to conduct efficient breaching operations; allowing the Warfighter to create an entry point into a structure for an assault element to enter and begin clearing operations, one of the most difficult types of operations that Soldiers may face in an urban environment. The 40mm Door Breach cartridge will reduce collateral damage and friendly casualties associated with breaching operations. The deployment of 40mm Dor Breach cartridges will enable the small unit to gain and maintain a tactical advantage through efficiency of combat power and momentum. No funding requested in FY 2020.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: 40mm Low Velocity High Explosive Air Burst (HEAB), XM1166	9.291	12.767	14.032	-	14.032
Description: Engineering Manufacturing Development (EMD) of the 40mm Low Velocity, High Explosive Airburst (HEAB) munition.					
FY 2019 Plans: FY 2019 activities include awarding two development contracts for competing prototyping, a Low Velocity-High Explosive Air Burst (LV-HEAB) Preliminary Design Review (PDR), a Test Readiness Review (TRR), Design Engineering Test (DET 1) build and DET 1 Testing.					
FY 2020 Base Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019	
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev		Project (Number/Name) EW1 / 40mm Low Velocity Ammunition	

B. Accomplishments/Planned Programs (\$ in Millions) FY 2020 Engineering and Manufacturing Development (EMD) activities will include Test Readiness Reviews (TRRs), Design Engineering Test (DET) hardware build, DET 2 testing, a Limited User Evaluation (LUE), and DET 3 hardware build. FY 2019 to FY 2020 Increase/Decrease Statement: Increase due to continued 40mm Low Velocity High Explosive Air Burst (HEAB) development. Title: 40mm Low Velocity Door Breach (DB), XM1167 Description: Conduct limited qualification testing to mature technology and manufacturing readiness. Title: FY 2019 SBIR / STTR Transfer FY 2019 Plans: FY 2019 SBIR / STTR Transfer FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	
	4.178	-	-	-	-	
	-	0.486	-	-	-	
	Accomplishments/Planned Programs Subtotals		13.469	13.253	14.032	-

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• E71005: CTG, 40mm LV, IRAP	-	-	0.000	-	0.000	-	11.601	13.594	14.500	0.000	39.695
Remarks											
D. Acquisition Strategy											
The HEAB cartridge will be developed through a competitive Engineering and Manufacturing Development (EMD) program. Evaluate potential designs as part of the pre-EMD activities using a Cooperative Research and Development Agreement (CRADA) with contractors to completed testing. For EMD, the Government anticipates awarding two contracts utilizing an Other Transaction Agreement (OTA) through Department of Defense (DoD) Ordnance Technology Consortium (DOTC). The EMD phase will consist of a series of Design Engineering Tests (DETs) to assess the Contractors' design progress and ability of achieving the program objectives. Any shortcomings and deficiencies will be addressed prior to final Developmental Test & Evaluation (DT&E). After DT&E and a successful Milestone C, the government will down-select to a single contractor for Low Rate Initial Production (LRIP) and four production year options utilizing a follow-on Federal Acquisition Regulation (FAR) based contract.											

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) EW1 / <i>40mm Low Velocity Ammunition</i>
<p>The Door Breach cartridge development will consist of characterization testing of multiple designs provided by industry which will be used to further inform a potential future requirement.</p> <p><u>E. Performance Metrics</u> N/A</p>		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EW1 / 40mm Low Velocity Ammunition					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
LV HEAB XM1166 Project Manager Maneuver Ammunition Systems (PM MAS)	Various	Picatinny Arsenal : NJ	-	0.241	Nov 2017	-		-		-		-	0.000	0.241	-
LV HEAB XM1166 Contractor 1	C/CPFF	Day & Zimmerman, Inc (DZI) : Middletown, IA	-	3.900	Sep 2018	5.243	Jan 2019	5.716	Oct 2019	-		5.716	Continuing	Continuing	Continuing
LV HEAB XM1166 Contractor 2	C/CPFF	Chemring Ordnance, Inc : Perry, FL	-	3.900	Sep 2018	5.243	Jan 2019	5.716	Oct 2019	-		5.716	Continuing	Continuing	Continuing
LV Door Breach XM1167 Testing Contractor 1	C/CPFF	ATI : Arlington, VA	-	0.842	Nov 2018	-		-		-		-	0.000	0.842	-
LV Door Breach XM1167 Testing Contractor 2	C/CPFF	ATI : Arlington, VA	-	0.842	Nov 2018	-		-		-		-	0.000	0.842	-
LV Door Breach XM1167 Testing Contractor 3	C/CPFF	ATI : Arlington, VA	-	0.842	Nov 2018	-		-		-		-	0.000	0.842	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.486		-		-		-	0.000	0.486	-
Subtotal			-	10.567		10.972		11.432		-		11.432	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
LV HEAB XM1166 Armament Research Development Engineering Center (ARDEC)	MIPR	Picatinny Arsenal : NJ	-	1.250	Nov 2017	1.300	Nov 2018	1.350	Oct 2019	-		1.350	Continuing	Continuing	Continuing
LV Door Breach XM1167 Armament Research Development Engineering Center (ARDEC)	MIPR	Picatinny Arsenal : NJ	-	0.902	Jan 2018	-		-		-		-	0.000	0.902	-
Subtotal			-	2.152		1.300		1.350		-		1.350	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) EW1 / 40mm Low Velocity Ammunition					
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
LV HEAB XM1166 Design Engineering Test (DET) 1	MIPR	Aberdeen Test Center (ATC) : Aberdeen, MD	-	-		0.981	May 2019	-		-		-	0.000	0.981	-
LV HEAB XM1166 Design Engineering Test (DET) 2	MIPR	Aberdeen Test Center (ATC) : Aberdeen, MD	-	-		-		1.250	Feb 2020	-		1.250	0.000	1.250	-
LV Door Breach XM1167 Testing and Materials	MIPR	Aberdeen Test Center (ATC) : Aberdeen, MD	-	0.750	May 2018	-		-		-		-	0.000	0.750	-
Subtotal			-	0.750		0.981		1.250		-		1.250	0.000	2.981	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	13.469		13.253		14.032		-		14.032	Continuing	Continuing	N/A
Remarks															

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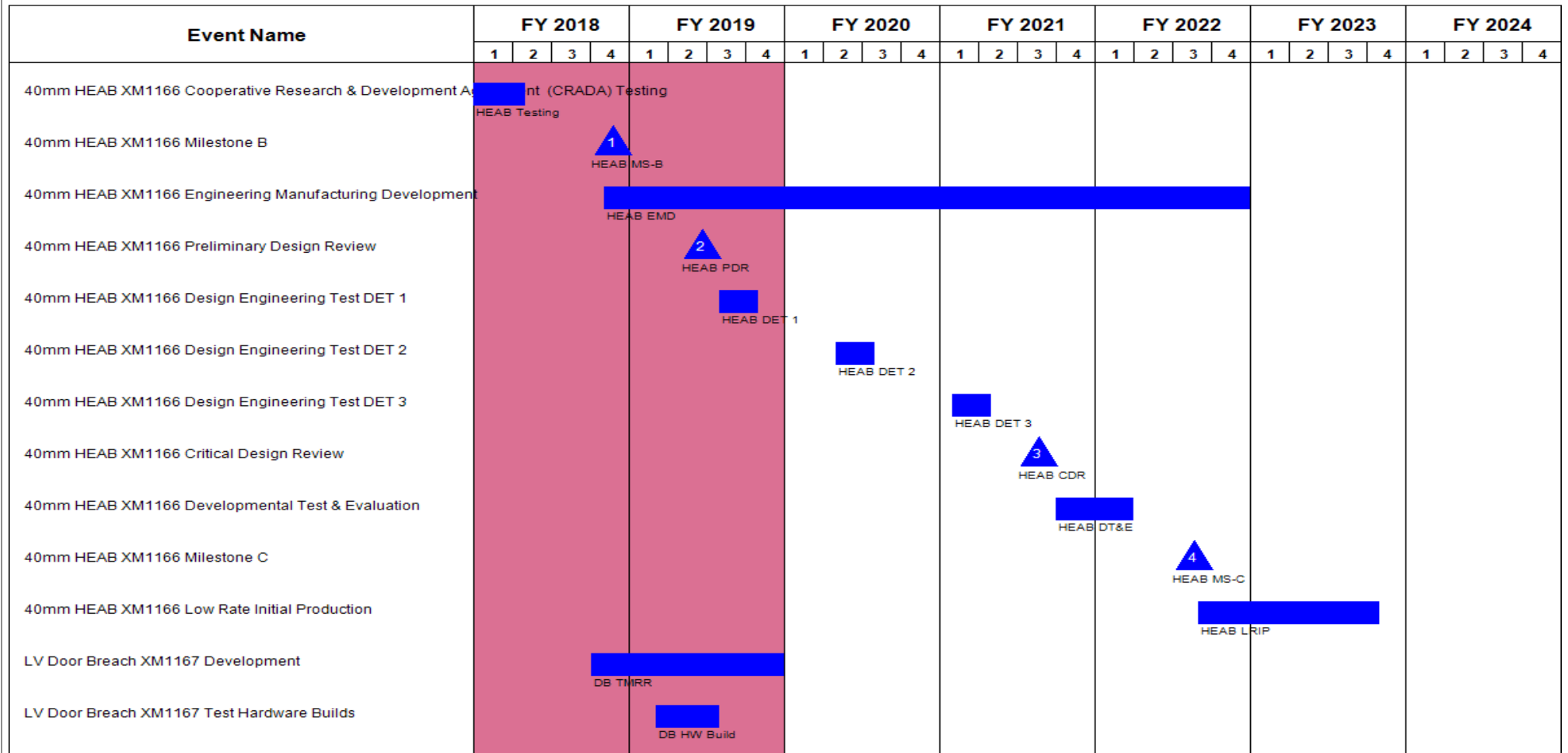
Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army

Date: March 2019

Appropriation/Budget Activity
2040 / 5

R-1 Program Element (Number/Name)
PE 0604802A / Weapons and Munitions -
Eng Dev

Project (Number/Name)
EW1 / 40mm Low Velocity Ammunition



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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army																Date: March 2019												
Appropriation/Budget Activity 2040 / 5								R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev								Project (Number/Name) EW1 / 40mm Low Velocity Ammunition												
Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
LV Door Breach XM1167 Testing																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev	Project (Number/Name) EW1 / 40mm Low Velocity Ammunition	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
40mm HEAB XM1166 Cooperative Research & Development Agreement (CRADA) Testing	3	2017	1	2018
40mm HEAB XM1166 Milestone B	4	2018	4	2018
40mm HEAB XM1166 Engineering Manufacturing Development	4	2018	4	2022
40mm HEAB XM1166 Preliminary Design Review	2	2019	2	2019
40mm HEAB XM1166 Design Engineering Test DET 1	3	2019	4	2019
40mm HEAB XM1166 Design Engineering Test DET 2	2	2020	3	2020
40mm HEAB XM1166 Design Engineering Test DET 3	1	2021	2	2021
40mm HEAB XM1166 Critical Design Review	3	2021	3	2021
40mm HEAB XM1166 Developmental Test & Evaluation	4	2021	1	2022
40mm HEAB XM1166 Milestone C	3	2022	3	2022
40mm HEAB XM1166 Low Rate Initial Production	3	2022	4	2023
LV Door Breach XM1167 Development	4	2018	4	2019
LV Door Breach XM1167 Test Hardware Builds	1	2019	3	2019
LV Door Breach XM1167 Testing	4	2019	4	2019

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) FA6 / 30mm Lethality			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FA6: 30mm Lethality	-	13.344	13.834	22.897	-	22.897	15.860	9.797	8.000	3.000	0.000	86.732
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
The 30mm Lethality project funds the development of a suite of 30x173mm caliber cartridges, which includes anti-personnel tactical and training cartridges and anti-materiel tactical and training cartridges, as well as Airburst Munition cartridges for Urgent Materiel Release (UMR) and Full Materiel Release (FMR). The objective is to enhance the operational effectiveness and lethality of the Stryker Infantry Carrier Vehicle (ICV), Next Generation Combat Vehicle (NGCV), and any Army Fighting Vehicles that are equipped with a 30x173mm weapon system. The tactical cartridges will provide an organic direct fire capability to support infantry at a greater range and will improve lethality when engaging dismounted infantry and light armored vehicles. The training cartridges will be ballistically matched to the tactical cartridges, allowing the Warfighter to train in a cost effective manner. The Airburst munitions will provide the Warfighter with increased lethality against troops in the open, counter defilade and anti-tank guided missiles (ATGM). This project will leverage earlier efforts in support of the Stryker Operational Needs Statement (ONS) for Increased Lethality for the 2nd Calvary Regiment (2CR), United States Army Europe (USAREUR) (HQDA ONS 15-20590). FY 2020 funding will support three Design Engineering Tests (DET) and a Design Verification Test (DVT) for the non-airburst 30x173mm suite of ammunition. FY 2020 will also support Milestone B and Engineering and Manufacturing Development (EMD) contract award for the 30x173mm Airburst munition.												
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: 30X173mm Non-Airburst Suite of Ammunition								5.808	3.380	17.360	-	17.360
Description: Qualify and field a suite of 30x173mm anti-materiel and anti-personnel tactical and training cartridges for use on Stryker Infantry Combat Vehicles (ICV) or other Army Future Fighting Vehicles.												
FY 2019 Plans: FY 2019 primary activities include completing the hardware build to support Design Engineering Testing (DET) of the suite of 30x173mm ammunition and support the hardware build required for one of the Design Verification Tests (DVT).												
FY 2020 Base Plans: FY 2020 primary activities include three Design Engineering Tests (DET) and a Design Verification Test (DVT) for the non-airburst 30x173mm suite of ammunition. FY 2020 will also support the hardware build required for the remaining three DVTs scheduled for FY 2021.												
FY 2019 to FY 2020 Increase/Decrease Statement:												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019			
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev	Project (Number/Name) FA6 / 30mm Lethality				
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Increase due to the ramp up of Design Engineering Testing (DET) and the hardware required to support Design Verification Testing (DVT).						
Title: 30x173mm High Explosive Airburst - Tracer (HEAB-T) Description: Develop, qualify, and field a 30x173mm Airburst capable cartridge for use on Stryker Infantry Combat Vehicles (ICV), Next Generation Combat Vehicles (NGCV), or other Army Future Fighting Vehicles. FY 2019 Plans: FY 2019 primary activities include the continued development of the 30x173mm Airburst technology and the completion of software, fire control, and integration testing. FY 2020 Base Plans: FY 2020 primary activities include a Milestone B decision and awards up to two contractors to support Engineering, Manufacturing, and Development (EMD). FY 2019 to FY 2020 Increase/Decrease Statement: Decrease to do a decrease in technology development to be followed by an increase for EMD.		6.525	9.830	5.537	-	5.537
Title: 30x173mm Programmable Airburst Munitions (PABM) Urgent Materiel Release (UMR) Description: Qualify and field the 30x173mm MK310 Programmable Air Burst munition with Tracer (PABM-T) ammunition to support the increased lethality for the 2nd Calvary Stryker Regiment directed requirement. FY 2019 Plans: FY 2019 primary activities include the completion of the UMR of the Programmable Air Burst with Tracer (PABM-T) ammunition. FY 2019 to FY 2020 Increase/Decrease Statement: Decrease due to successful completion of urgent materiel release (UMR).		1.011	0.118	-	-	-
Title: FY 2019 SBIR / STTR Transfer FY 2019 Plans: FY 2019 SBIR / STTR Transfer FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer		-	0.506	-	-	-
Accomplishments/Planned Programs Subtotals		13.344	13.834	22.897	-	22.897

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev	Project (Number/Name) FA6 / 30mm Lethality	

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• E07610: CTG, 30MM, Progrmabl Air Burst Mun, Mk310, Linked	-	1.765	0.000	14.546	14.546	14.565	15.509	15.497	15.000	0.000	76.882
• E07306: CTG, 30mm TP-T, MK239, Single	14.550	3.000	0.000	10.870	10.870	3.000	11.188	3.000	4.206	0.000	49.814
• E07406: CTG, 30mm Hi Expl Incendry-T(HEI-T), Mk238 Series	14.450	12.674	0.000	10.976	10.976	6.000	10.000	10.000	10.100	0.000	74.200
• E09191: CTG, 30mm TPDS- T, MK317 (SABOT Trng), Single	15.000	15.123	0.000	4.000	4.000	15.619	-	11.621	7.713	0.000	69.076
• E09292: CTG, 30mm APFSDS-T, MK258, Single	25.500	25.447	0.000	25.232	25.232	18.952	11.900	11.900	12.020	0.000	130.951

Remarks

D. Acquisition Strategy

A Request for Proposal (RFP) will be sent to industry soliciting responses to the requirements of Army Performance Specifications for the following items: 30x173mm anti-materiel tactical cartridge (XM1170), 30x173mm anti-materiel training cartridge (XM1172), 30x173mm anti-personnel tactical cartridge (XM1171), and 30x173mm anti-personnel training cartridge (XM1173). Contracts will be awarded to viable contractors for the development and qualification of each family of cartridges (anti-personnel family and anti-materiel family). Contractor designs will be subjected to Design Engineering Tests (DETs) and Design Verification Tests (DVTs). Based on technical performance, technical maturity, and cost, production contracts may be awarded for each family of cartridges. The objective is to qualify two production sources for each cartridge.

In support of the 30x173mm High Explosive Airburst - Tracer (HEAB-T) cartridge (XM1182), the Government anticipates awarding two contracts utilizing an Other Transaction Agreement (OTA) through Department of Defense (DoD) Ordnance Technology Consortium (DOTC) to support development and design engineering tests. The Government will down-select and award a single contract to complete Developmental Test and Evaluation (DT&E) in support of Milestone C.

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) FA6 / 30mm Lethality					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Manager Maneuver Ammunition Systems (PM MAS)	Various	Picatinny Arsenal : NJ	-	0.320	Jan 2018	-		-		-		-	0.000	0.320	-
High Explosive Airburst (HEAB-T) Development Contract 1	C/CPFF	General Dynamics - Ordnance and Tactical Systems (GD-OTS) : Marion, IL	-	2.201	Feb 2018	3.449	Jan 2019	-		-		-	0.000	5.650	-
High Explosive Airburst (HEAB-T) Development Contract 2	C/CPFF	Northrop Grumman Information Systems (NGIS) : Plymouth, MN	-	2.201	Feb 2018	3.449	Jan 2019	-		-		-	0.000	5.650	-
High Explosive Airburst (HEAB-T) EMD Contract 1	TBD	TBD : TBD	-	-		-		2.250	May 2020	-		2.250	Continuing	Continuing	Continuing
High Explosive Airburst (HEAB-T) EMD Contract 2	TBD	TBD : TBD	-	-		-		2.250	May 2020	-		2.250	Continuing	Continuing	Continuing
Non-Airburst DET Hardware Contractor 1	C/CPFF	TBD : TBD	-	2.060	Jul 2018	0.675	Feb 2019	-		-		-	0.000	2.735	-
Non-Airburst DET Hardware Contractor 2	C/CPFF	TBD : TBD	-	2.060	Aug 2018	0.675	Feb 2019	-		-		-	0.000	2.735	-
Non-Airburst DVT Hardware Contractor 1	TBD	TBD : TBD	-	-		0.540	Jun 2019	7.200	Jan 2020	-		7.200	0.000	7.740	-
Non-Airburst DVT Hardware Contractor 2	TBD	TBD : TBD	-	-		0.540	Jun 2019	7.200	Jan 2020	-		7.200	0.000	7.740	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.506		-		-		-	0.000	0.506	-
Subtotal			-	8.842		9.834		18.900		-		18.900	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) FA6 / 30mm Lethality			
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Armament Research, Development, and Engineering Center (ARDEC)	MIPR	Picatinny Arsenal : NJ	-	2.509	Nov 2017	2.550	Nov 2019	2.600	Oct 2019	-		2.600	Continuing	Continuing	Continuing
Subtotal			-	2.509		2.550		2.600		-		2.600	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Programmable Air Burst Munitions (PABM) Urgent Material Release (UMR) Qualification Testing	MIPR	Aberdeen Test Center (ATC) : Aberdeen, MD	-	0.511	Jun 2018	-		-		-		-	0.000	0.511	-
Non-Airburst Design Engineering Tests (DET)	MIPR	Aberdeen Test Center (ATC) : Aberdeen Proving Ground, MD	-	-		-		1.050	Oct 2019	-		1.050	0.000	1.050	-
Non-Airburst Design Verification Tests (DVT)	MIPR	Aberdeen Test Center (ATC) : Aberdeen Proving Ground, MD	-	-		-		0.347	Jul 2020	-		0.347	Continuing	Continuing	Continuing
High Explosive Airburst (HEAB-T) Test Preparations	C/CPFF	Various : Various	-	1.482	Nov 2017	-		-		-		-	0.000	1.482	-
High Explosive Airburst (HEAB-T) Integration and Setter Testing	MIPR	Aberdeen Test Center (ATC) : Aberdeen, MD	-	-		1.450	Jan 2019	-		-		-	0.000	1.450	-
Subtotal			-	1.993		1.450		1.397		-		1.397	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	13.344		13.834		22.897		-		22.897	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army							Date: March 2019			
Appropriation/Budget Activity 2040 / 5			R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev			Project (Number/Name) FA6 / 30mm Lethality				
	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract	
Remarks										

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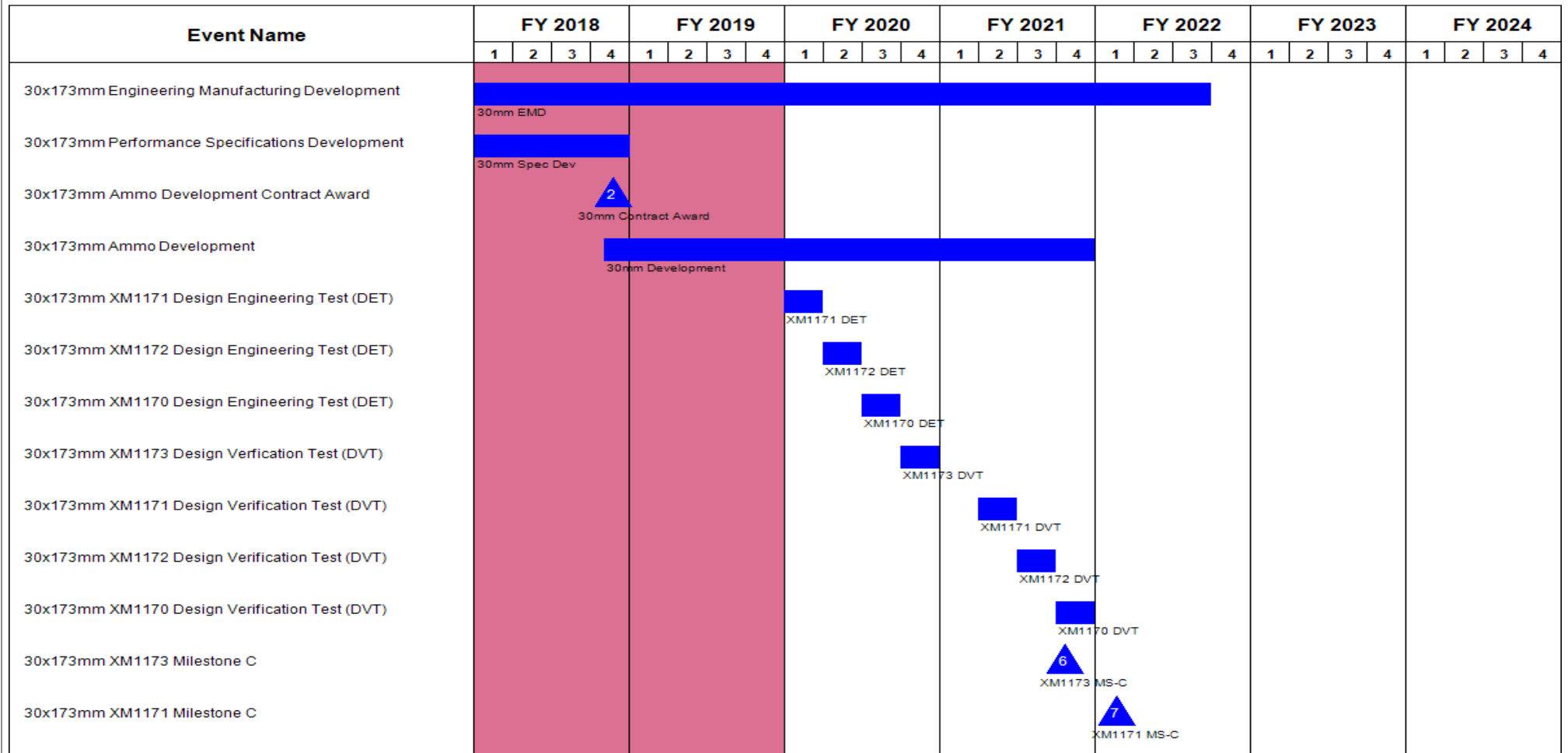
Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army

Date: March 2019

Appropriation/Budget Activity
2040 / 5

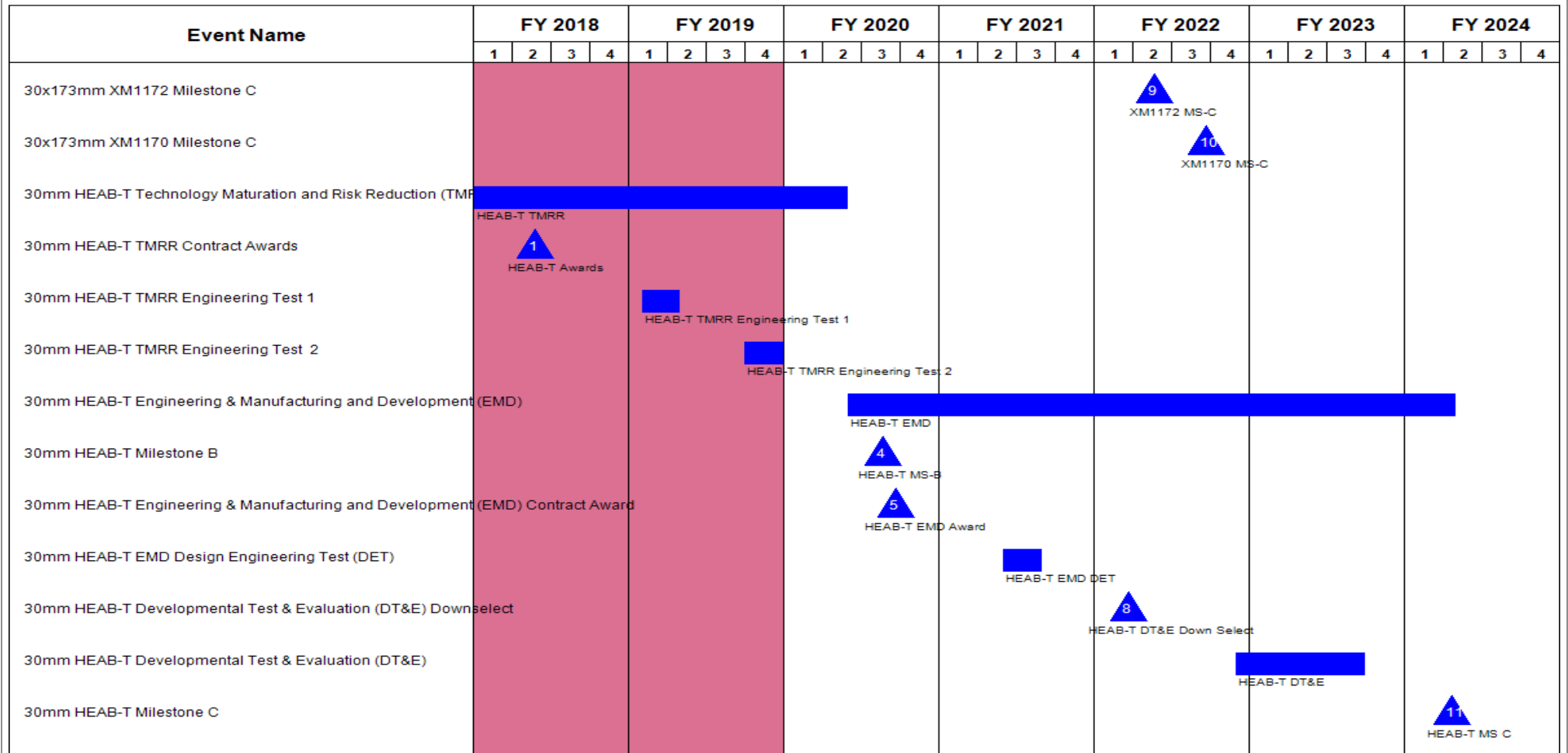
R-1 Program Element (Number/Name)
PE 0604802A / Weapons and Munitions -
Eng Dev

Project (Number/Name)
FA6 / 30mm Lethality



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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev		Project (Number/Name) FA6 / 30mm Lethality	



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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army																Date: March 2019																				
Appropriation/Budget Activity 2040 / 5										R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev								Project (Number/Name) FA6 / 30mm Lethality																		
Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024											
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4								
30mm HEAB-T Live Fire Test and Evaluation (LFT&E)																																	HEAB-T			
30mm HEAB-T Initial Operational Test and Evaluation (IOT&E)																																	HEAB-T			
Programmable Air Burst Munition UMR Safety Qualification Build																																				
Programmable Air Burst Munition UMR Safety Qualification Test																																				
Programmable Air Burst Munition Urgent Materiel Release (UMR)																																				

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) FA6 / 30mm Lethality	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
30x173mm Engineering Manufacturing Development	1	2018	3	2022
30x173mm Performance Specifications Development	1	2018	4	2018
30x173mm Ammo Development Contract Award	4	2018	4	2018
30x173mm Ammo Development	4	2018	4	2021
30x173mm XM1171 Design Engineering Test (DET)	1	2020	1	2020
30x173mm XM1172 Design Engineering Test (DET)	2	2020	2	2020
30x173mm XM1170 Design Engineering Test (DET)	3	2020	3	2020
30x173mm XM1173 Design Verification Test (DVT)	4	2020	4	2020
30x173mm XM1171 Design Verification Test (DVT)	2	2021	2	2021
30x173mm XM1172 Design Verification Test (DVT)	3	2021	3	2021
30x173mm XM1170 Design Verification Test (DVT)	4	2021	4	2021
30x173mm XM1173 Milestone C	4	2021	4	2021
30x173mm XM1171 Milestone C	1	2022	1	2022
30x173mm XM1172 Milestone C	2	2022	2	2022
30x173mm XM1170 Milestone C	3	2022	3	2022
30mm HEAB-T Technology Maturation and Risk Reduction (TMRR)	1	2018	2	2020
30mm HEAB-T TMRR Contract Awards	2	2018	2	2018
30mm HEAB-T TMRR Engineering Test 1	1	2019	2	2019
30mm HEAB-T TMRR Engineering Test 2	4	2019	4	2019
30mm HEAB-T Engineering & Manufacturing and Development (EMD)	2	2020	2	2024
30mm HEAB-T Milestone B	3	2020	3	2020
30mm HEAB-T Engineering & Manufacturing and Development (EMD) Contract Award	3	2020	3	2020

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019	
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev		Project (Number/Name) FA6 / 30mm Lethality	
	Start		End	
Events	Quarter	Year	Quarter	Year
30mm HEAB-T EMD Design Engineering Test (DET)	2	2021	3	2021
30mm HEAB-T Developmental Test & Evaluation (DT&E) Downselect	1	2022	1	2022
30mm HEAB-T Developmental Test & Evaluation (DT&E)	4	2022	3	2023
30mm HEAB-T Milestone C	2	2024	2	2024
30mm HEAB-T Live Fire Test and Evaluation (LFT&E)	3	2024	4	2024
30mm HEAB-T Initial Operational Test and Evaluation (IOT&E)	3	2024	4	2024
Programmable Air Burst Munition UMR Safety Qualification Build	4	2017	3	2018
Programmable Air Burst Munition UMR Safety Qualification Test	4	2018	1	2019
Programmable Air Burst Munition Urgent Materiel Release (UMR)	2	2019	2	2019

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) FL4 / Small Caliber Ammo for Next Gen Squad Weapons			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
FL4: Small Caliber Ammo for Next Gen Squad Weapons	-	0.000	0.000	22.880	-	22.880	30.630	28.750	25.000	11.750	0.000	119.010
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2021, PE 0604802A, Project FL4, Small Caliber Ammo for Next Gen Squad Weapons will be re-aligned to PE 0604601 Project EV9 prior to the PB 2021 submission. The effort is not a new start.

A. Mission Description and Budget Item Justification

The Small Caliber Ammo for Next Gen Squad Weapons project is a critical technology development in response to the Soldier Lethality Cross Functional Team (SL CFT) Initial Capability Document (ICD) for the ammunition required to support the rapid prototyping, development, and fielding of the Next Generation Squad Weapons (NGSW) under Section 804 Authority. The objective is to develop and Full Materiel Release (FMR) the new ammunition. The NGSW ammunition is split into two initial variants, the General Purpose (GP) and the Special Purpose (SP). FY 2020 funding supports continuing rapid prototyping/development of the GP projectile, building prototypes and maturing prototypes to provide to the weapon system contractors for performance evaluation, conducting a Critical Design Review (CDR), and conducting prototype testing. FY 2020 also supports continuing rapid prototyping for the SP projectile, conducting a Preliminary Design Review (PDR), conducting an Initial Product Review (IPR), and performing activities to increase prototype capacity to support planned weapon system testing. Follow-on NGSW ammunition types include: tracer ammunition, blank ammunition, reduced range ammunition, and Close Combat Mission Capability Kit (CCMCK) ammunition. Development efforts on the follow-on NGSW ammunition variants are scheduled to begin in FY 2022. FY 2020 supports initial activities to evaluate potential solutions/prototypes and concepts to satisfy follow-on NGSW ammunition requirements.

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

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Rapid Prototyping General Purpose (GP)	-	-	9.152	-	9.152
Description: Develop, demonstrate, and qualify new ammunition for the Next Generation Squad Weapon (NGSW) systems.					
FY 2020 Base Plans: FY 2020 efforts are focused on continuing rapid prototyping/development of the GP projectile, building prototypes and maturing prototypes to provide to the weapon system contractors for performance evaluation, conducting a Critical Design Review (CDR), and conducting prototype testing.					
FY 2019 to FY 2020 Increase/Decrease Statement:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army							Date: March 2019				
Appropriation/Budget Activity 2040 / 5			R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev			Project (Number/Name) FL4 / Small Caliber Ammo for Next Gen Squad Weapons					
B. Accomplishments/Planned Programs (\$ in Millions)						FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	
The Project transitioned from Program Element (PE) 0604802A, Project EP5, Adv Armor-Piercing (ADVAP). Planned contract awards.											
Title: Rapid Prototyping Special Purpose (SP) Description: Develop, demonstrate, and qualify new ammunition to defeat hard targets for the Next Generation Squad Weapon (NGSW) systems. FY 2020 Base Plans: FY 2020 efforts are focused on continuing Rapid Prototyping for the Special Purpose projectile, conducting a Preliminary Design Review (PDR), conducting an Initial Product Review, and performing activities to increase prototype capacity to support planned weapon system. FY 2019 to FY 2020 Increase/Decrease Statement: The Project transitioned from Program Element (PE) 0604802A, Project EP5, Adv Armor-Piercing (ADVAP). Planned contract awards.						-	-	13.528	-	13.528	
Title: Concept Evaluation of other Next Generation of Squad Weapons (NGSW) Ammunition Variants Description: Concept development/evaluation of follow-on variants/ammunition for the Next Generation of Squad Weapons (NGSW). FY 2020 Base Plans: Explore/evaluate ammunition prototypes and concepts of follow-on ammunition for the NGSW. Follow-on NGSW ammunition types include: tracer ammunition, blank ammunition, reduced range ammunition, and Close Combat Mission Capability Kit (CCMCK) ammunition. FY 2019 to FY 2020 Increase/Decrease Statement: Begin exploring ammunition concepts/solutions to meet follow-on NGSW ammunition requirements.						-	-	0.200	-	0.200	
Accomplishments/Planned Programs Subtotals						-	-	22.880	-	22.880	
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• EC2: Adv Armor-Piercing (ADVAP) for Small Cal Ammo	-	3.755	6.821	-	6.821	-	-	-	-	0.000	10.576

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019	
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) FL4 / Small Caliber Ammo for Next Gen Squad Weapons			
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• EP5: Adv Armor-Piercing (ADVAP) for Small Caliber Ammo	13.318	16.748	0.000	-	0.000	-	-	-	-	0.000	30.066
Remarks											
Budget Activity 4 PE 0603639A, Project EC2-RDTE/Adv Armor-Piercing (ADVAP) for Small Cal Ammo: This funding line starts the rapid development/rapid prototyping work on the Special Purpose (SP) ammunition for the Next Generation Squad Weapon (NGSW) systems.											
Budget Activity 5 PE 0604802A, Project EP5-RDTE/Adv Armor-Piercing (ADVAP) for Small Caliber Ammo: This funding line starts the rapid prototyping/development work on the General Purpose (GP) ammunition for the Next Generation Squad Weapon (NGSW) systems.											
D. Acquisition Strategy											
The Next Generation Squad Weapon (NGSW) ammunition program will utilize rapid prototyping acquisition strategy under Section 804 Authority to develop ammunition concepts/designs for the General Purpose (GP) variant and the Special Purpose (SP) variant. 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; with a planned Urgent Materiel Release (UMR) in FY 2022 and Full Materiel Release (FMR) in FY 2024. Follow-on development efforts for additional NGSW ammunition variants including tracer ammunition, blank ammunition, reduced range ammunition, and Close Combat Mission Capability Kit (CCMCK) ammunition will start in FY 2022.											
E. Performance Metrics											
N/A											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) FL4 / Small Caliber Ammo for Next Gen Squad Weapons			
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Follow-on Ammo Prototypes/Concepts	MIPR	Armament Research Development and Engineering Center (ARDEC) : New Jersey	-	-		-		0.200	Oct 2019	-		0.200	Continuing	Continuing	Continuing
Projectile Development Contract	TBD	To Be Determined : To Be Determined	-	-		-		9.080	Jan 2020	-		9.080	Continuing	Continuing	Continuing
Subtotal			-	-		-		9.280		-		9.280	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Development and Prototyping	MIPR	Armament Research Development and Engineering Center (ARDEC) : New Jersey	-	-		-		6.460	Oct 2019	-		6.460	Continuing	Continuing	Continuing
Projectile Development and Support	MIPR	Army Research Lab : Aberdeen, Maryland	-	-		-		3.140	Oct 2019	-		3.140	Continuing	Continuing	Continuing
Subtotal			-	-		-		9.600		-		9.600	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Prototype Testing ARDEC	MIPR	Armament Research Development and Engineering Center (ARDEC) : New Jersey	-	-		-		0.900	Oct 2019	-		0.900	Continuing	Continuing	Continuing
Army Research Lab (ARL)	MIPR	Aberdeen Proving Ground : Maryland	-	-		-		2.200	Oct 2019	-		2.200	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019		
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) FL4 / Small Caliber Ammo for Next Gen Squad Weapons				

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
U.S. Army Aberdeen Test Center (ATC)	MIPR	Aberdeen Proving Ground : Maryland	-	-		-		0.900	Oct 2019	-		0.900	Continuing	Continuing	Continuing
Subtotal			-	-		-		4.000		-		4.000	Continuing	Continuing	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-	0.000	22.880	-	22.880	Continuing	Continuing	N/A

Remarks

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

Date: March 2019

Appropriation/Budget Activity

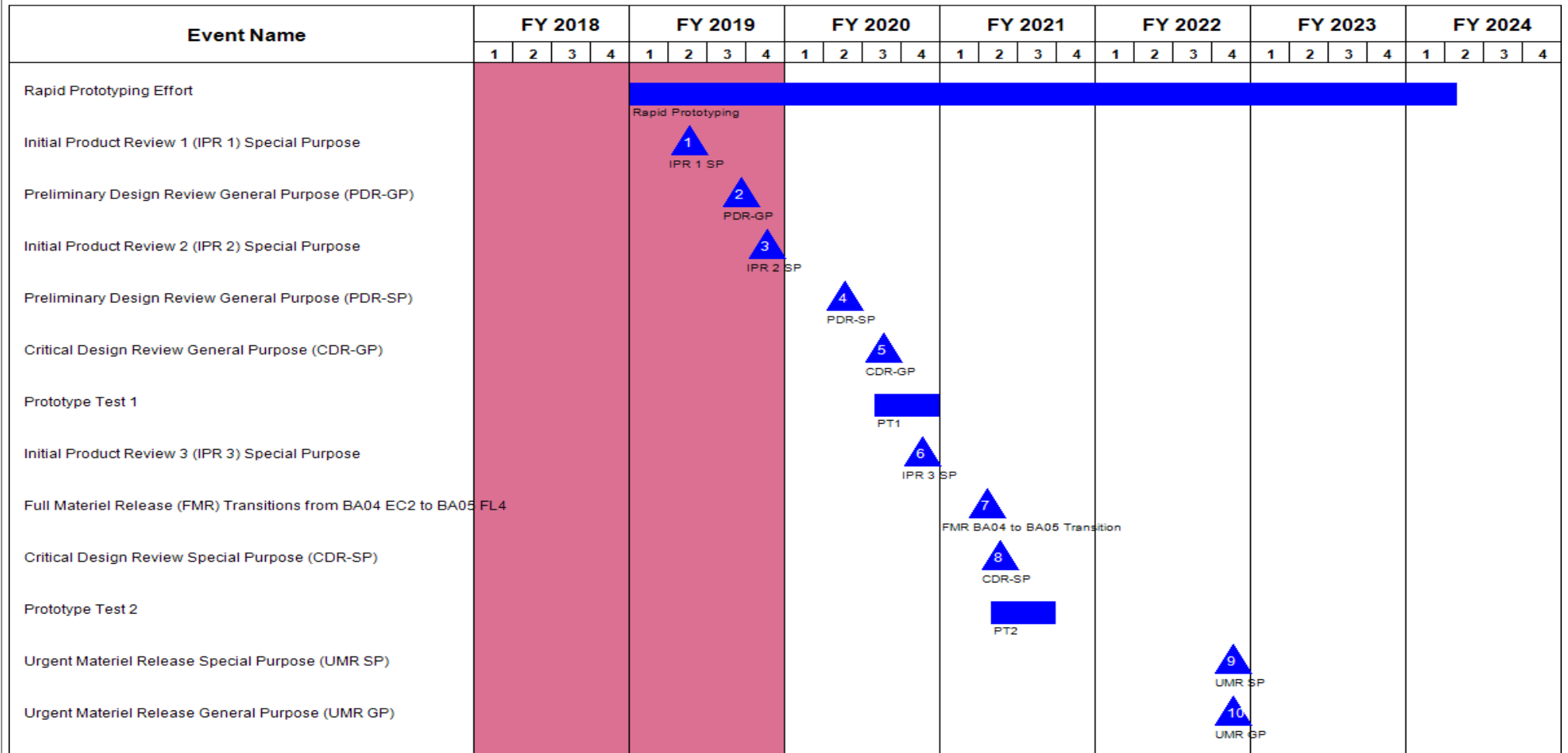
2040 / 5

R-1 Program Element (Number/Name)

PE 0604802A / Weapons and Munitions - Eng Dev

Project (Number/Name)

FL4 / Small Caliber Ammo for Next Gen Squad Weapons



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

Date: March 2019

Appropriation/Budget Activity
2040 / 5

R-1 Program Element (Number/Name)
PE 0604802A / Weapons and Munitions - Eng Dev

Project (Number/Name)
FL4 / Small Caliber Ammo for Next Gen Squad Weapons

Event Name	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Rapid Fielding																					<div></div> <div>Rapid Fielding</div> <div></div>				<div></div> <div></div> <div>11 FMR</div>			
Production Qualification Test Special Purpose (PQT SP)																												
Full Materiel Release (FMR)																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev	Project (Number/Name) FL4 / Small Caliber Ammo for Next Gen Squad Weapons	

Schedule Details

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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) S36 / Precision Guidance Kit			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
S36: Precision Guidance Kit	-	14.218	28.188	30.500	-	30.500	3.691	3.174	3.753	3.531	0.000	87.055
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
The Precision Guidance Kit (PGK) is a course correcting fuze that provides precision accuracy and efficiency for current and future 155mm High Explosive (HE) projectiles by eliminating a portion of the inherent errors associated with ballistic firing solutions which effectively reduces the number of projectiles required to execute fire missions. PGK utilizes a Global Positioning System (GPS) receiver and internal Guidance and Navigation Computer to accomplish its mission with point detonating and height of burst fuzing functions. The PGK M1156E1 effort will incorporate and qualify state of the art technologies to increase the functionality of PGK in GPS degraded environments as well as compatibility with the Army's new long range cannon (Extended Range Cannon Artillery (ERCA)) and projectiles which will be fielded during the PGK Life Cycle. PGK Anti-Jam (PGK-AJ) supports the National Defense Strategy, the Army Long Range Precision Fires (LRPF) Cross Functional Team (CFT), future 155mm projectiles and M777 Long Range Cannon (LRC) initiatives. FY 2020 funding supports the award of the Engineering and Manufacturing Development (EMD) contract initiating system design and prototype development for PGK-AJ.												
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Contractor Engineering and Manufacturing Development (EMD)								10.656	23.871	26.685	-	26.685
Description: Contractor Engineering and Manufacturing Development (EMD)												
FY 2019 Plans: Will continue to support Technology Maturation Risk Reduction activities via Department of Defense Ordnance Technology Consortium (DOTC) contracts with system and receiver developers leading to a Preliminary Design Review (PDR). This includes various support system test activities.												
FY 2020 Base Plans: Will support Engineering and Manufacturing Development (EMD) activities including prototype development, build and test activities as well as tactical guided flight testing in the threat environment.												
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding increase due to continued transition into Engineering and Manufacturing Development (EMD).												
Title: Government and Engineering Support								3.006	2.534	2.815	-	2.815
Description: Engineering Support												
FY 2019 Plans:												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019	
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev		Project (Number/Name) S36 / Precision Guidance Kit	
B. Accomplishments/Planned Programs (\$ in Millions)					
	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Support of Technology Maturation and Risk Reduction (TMRR) development and test activities. Provide engineering and analysis for the system and GPS receiver TMRR development and test activities. FY 2020 Base Plans: Engineering support of development, build and test activities which will include prototype and tactical guided flight testing. FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding increase supports engineering and testing initiatives.					
Title: Continue Development/Operational Testing Description: Development/Operational Test. FY 2019 Plans: Execute Precision Guided Kit (PGK) Anti-Jam (AJ) concept and subsystem maturation. Perform Preliminary Design Review. FY 2020 Base Plans: Engineering support of development, build and test activities which will include prototype and tactical guided flight testing. FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding increase required as an entry point to Prototype development and testing.	0.556	0.750	1.000	-	1.000
Title: FY 2019 SBIR / STTR Transfer FY 2019 Plans: FY 2019 SBIR / STTR Transfer FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer	-	1.033	-	-	-
Accomplishments/Planned Programs Subtotals	14.218	28.188	30.500	-	30.500

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army									Date: March 2019			
Appropriation/Budget Activity 2040 / 5				R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) S36 / Precision Guidance Kit				
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost	
• E99250: FUZE, 155mm ARTY Precision Guidance Kit (PGK)	144.410	217.933	0.000	164.176	164.176	186.350	79.114	72.595	76.105	Continuing	Continuing	
Remarks Procurement of Ammunition, Army (PAA) Funding												
D. Acquisition Strategy The Precision Guidance Kit (PGK) is a Global Positioning System (GPS) guidance kit with fuzing functions for 155mm High Explosive (HE) artillery projectiles. PGK provides near precision accuracy and effectiveness for 155mm HE projectiles. The PGK corrects the inherent errors associated with ballistic firing solutions and reduces the number of artillery projectiles required to execute the mission. The current PGK Increment has been qualified for the M795 and M549A1 HE projectiles. This increment of PGK entered Low Rate Initial Production (LRIP) at Milestone C in March 2013. Initial Operational Test and Evaluation (IOT&E) was completed 3Q FY 2015, Full Material Release (FMR) was approved 1Q FY 2016, Full Rate Production (FRP) decision and Initial Operational Capability (IOC) occurred 2Q FY 2016. On going PGK Anti-Jam (PGK-AJ) efforts are focused on addressing performance in a GPS degraded environment as well as compatibility with the Army's new long range 155mm cannon and projectile which are scheduled to be fielded in the same timeframe as the next increment of PGK. The strategy includes competitive DoD Ordnance Technology Consortium (DOTC) Other Transaction Agreement (OTA) concept development efforts with multiple contractors in FY 2017, followed by a DOTC Risk Reduction concept maturation phase in FY 2019. This will be followed by a competitive Federal Acquisition Regulation (FAR) based contractual Engineering & Manufacturing Development (EMD) effort beginning in FY 2020.												
E. Performance Metrics N/A												

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) S36 / Precision Guidance Kit			
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Office	Various	Office of the Project Manager (PM) Combat Ammunition Systems (CAS) : Picatinny Arsenal, NJ	13.664	0.283	Oct 2017	0.060	Oct 2018	0.060	Oct 2019	-		0.060	0.000	14.067	14.067
Subtotal			13.664	0.283		0.060		0.060		-		0.060	0.000	14.067	N/A
Remarks Program Management support includes PGK-AJ travel and documentation support.															
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
PGK Anti-Jam EMD Development Contract	C/CPAF	TBD : TBD	-	-		6.361	Nov 2019	26.685	Mar 2020	-		26.685	0.000	33.046	33.046
DOTC - PGK GPS Anti-Jam Development - GD-OTS	MIPR	DoD Ordnance Technology (DOTC) - General Dynamics Ordnance & Tactical Systems : Bothell, WA	2.017	5.399	Feb 2018	5.150	Jan 2019	-		-		-	0.000	12.566	7.167
DOTC - PGK GPS Anti-Jam Development - BAE	MIPR	DoD Ordnance Technology (DOTC) - BAE Systems / Rokar : Minneapolis, MN	2.017	5.257	Feb 2018	5.150	Jan 2019	-		-		-	0.000	12.424	7.167
DOTC - PGK GPS Anti-Jam Development - L3 IEC	MIPR	DOD Ordnance Consortium (DOTC) - L3 - IEC : Various	3.341	-		7.210	Apr 2019	-		-		-	0.000	10.551	10.551
PGK TD Contract	C/CPAF	Alliant Techsystems (ATK) : Plymouth, MN	5.279	-		-		-		-		-	0.000	5.279	5.279

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) S36 / Precision Guidance Kit			
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
PGK TD Contract	C/CPAF	BAE Systems : Minneapolis, MN	3.103	-		-		-		-		-	0.000	3.103	3.103
Soft Recovery Modules	MIPR	SubSystems Technology : Rosslyn, VA	0.116	-		-		-		-		-	0.000	0.116	0.116
PGK EMD & Phase 1-2 (Reliability Failure/Root Cause Analysis)	C/CPAF	Orbital-Alliant Techsystems (O-ATK) : Plymouth, MN	59.953	-		-		-		-		-	0.000	59.953	59.953
PGK EMD - Phase 3a to 5	C/FFP	Orbital-Alliant Techsystems (O-ATK) : Plymouth, MN	32.443	-		-		-		-		-	0.000	32.443	32.443
High Angle Software Configuration	C/CPFF	Raytheon : Ft Wayne, IN	0.105	-		-		-		-		-	0.000	0.105	0.105
Engineering & Technology Assessment. Low Cost Roll Control Solutions	C/CPFF	DoD Ordnance Technology Consortium (DOTC) - General Dynamics Ordnance & Tactical Systems : Bothell, WA	4.774	-		-		-		-		-	0.000	4.774	4.774
Engineering & Technology Assessment. Low Cost Course Correction solutions.	C/CPFF	BAE Systems/ Rokar : Minneapolis, MN	1.778	-		-		-		-		-	0.000	1.778	1.778
DOTC - PGK GPS Anti-Jam Development - Raytheon	MIPR	DoD Ordnance Technology Consortium (DOTC) - Raytheon : Ft Wayne, IN	3.296	-		-		-		-		-	0.000	3.296	3.296
DOTC - PGK GPS Anti-Jam Development - O-ATK	MIPR	DoD Ordnance Technology Consortium (DOTC) - Orbital-Alliant Techsystems (O-ATK) : Plymouth, MN	8.217	-		-		-		-		-	0.000	8.217	8.217

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev				Project (Number/Name) S36 / Precision Guidance Kit					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
DOTC - PGK GPS Anti-Jam Development - Rockwell Collins	MIPR	DoD Ordnance Technology Consortium (DOTC) - Rockwell Collins : Cedar Rapids, IA	1.561	-		-		-		-		-	0.000	1.561	1.561
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		1.033		-		-		-	0.000	1.033	-
Subtotal			128.000	10.656		24.904		26.685		-		26.685	0.000	190.245	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Engineering Support	MIPR	Armament Research, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	33.460	2.723	Oct 2017	2.474	Oct 2018	2.755	Oct 2019	-		2.755	0.000	41.412	41.412
Management Support	MIPR	Camber : Mt Arlington, NJ	2.041	-		-		-		-		-	0.000	2.041	2.041
Miscellaneous Support Contract	MIPR	MITRE Corporation : Fort Monmouth, NJ	0.600	-		-		-		-		-	0.000	0.600	0.600
Jammer Support	MIPR	Electronic Proving Ground (EPG) : Ft Huachuca, AZ	0.316	-		-		-		-		-	0.000	0.316	0.316
PGK Parallel Studies and Analysis Support	MIPR	Command and Control Directorate : Ft Monmouth, NJ	0.300	-		-		-		-		-	0.000	0.300	0.300
LNO Support - Ft. Sill	MIPR	US ARMY Field Artillery Center : Ft. Sill, OK	0.201	-		-		-		-		-	0.000	0.201	0.201
ATEC Support	MIPR	Army Test and Evaluation	0.041	-		-		-		-		-	0.000	0.041	0.041

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) S36 / Precision Guidance Kit			
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
		Command (ATEC) : Aberdeen, MD													
Subtotal			36.959	2.723		2.474		2.755		-		2.755	0.000	44.911	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Testing for GPS Anti-Jam	MIPR	Army Test and Evaluation Command (ATEC) Yuma Proving Ground (YPG) : Yuma, AZ	0.590	0.556	Dec 2018	0.750	Feb 2019	1.000	Aug 2020	-		1.000	0.000	2.896	2.896
System Development Testing Increment 1	MIPR	Army Test and Evaluation Command (ATEC) Yuma Proving Ground (YPG) : Yuma, AZ	10.442	-		-		-		-		-	0.000	10.442	10.442
Other Development Testing	MIPR	Various : Various	1.769	-		-		-		-		-	0.000	1.769	1.769
Limited User Test	MIPR	Army Test and Evaluation Command (ATEC) Yuma Proving Ground (YPG) : Yuma, AZ	1.631	-		-		-		-		-	0.000	1.631	1.631
Initial Operational Test & Evaluation - Increment 1	MIPR	Army Test and Evaluation Command (ATEC) Yuma Proving Ground (YPG) : Yuma, AZ	1.000	-		-		-		-		-	0.000	1.000	1.000

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604802A / Weapons and Munitions - Eng Dev						Project (Number/Name) S36 / Precision Guidance Kit			

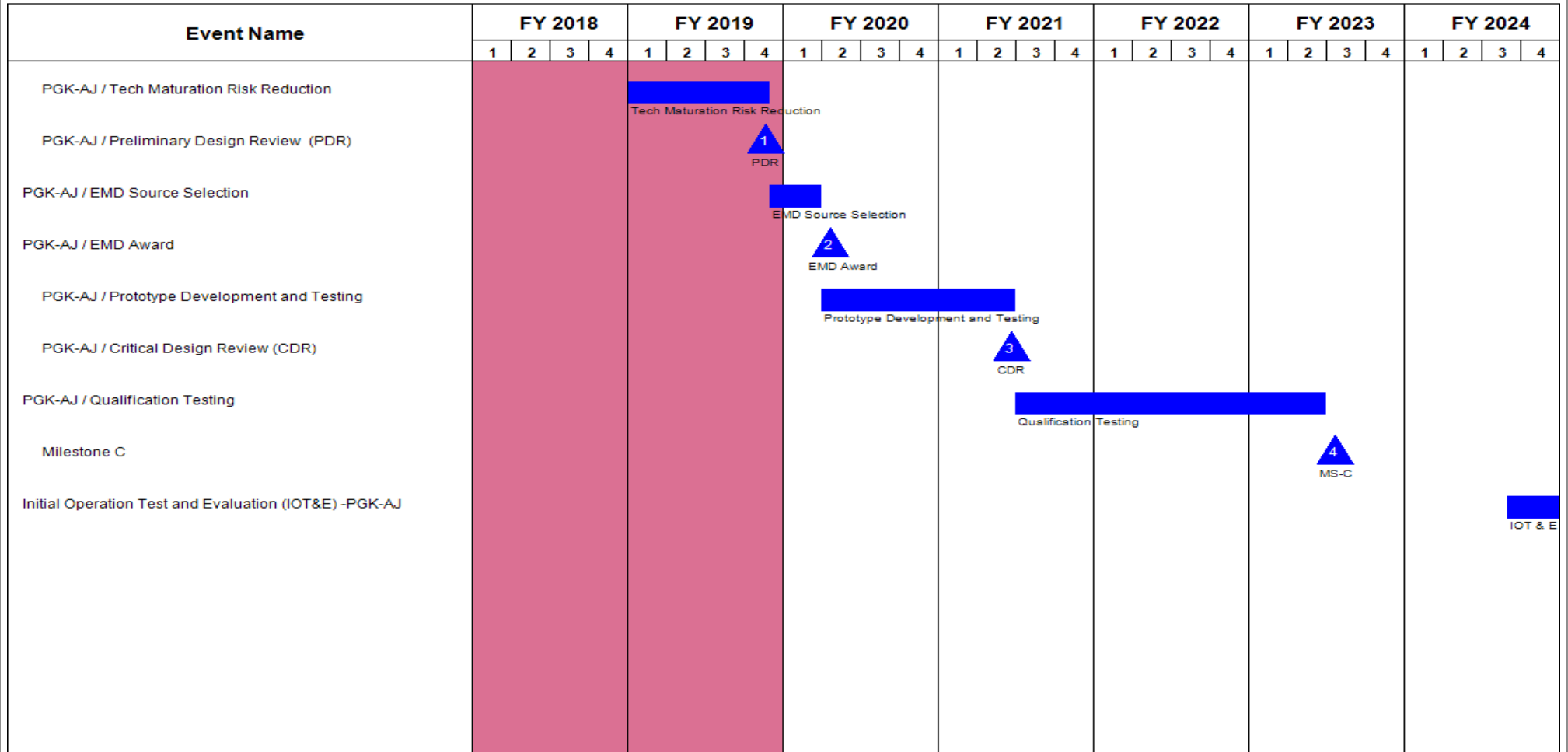
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Initial Operational Test & Evaluation - Troop Support	MIPR	Lab Test Center : Ft. Sill, OK	0.731	-		-		-		-		-	0.000	0.731	0.731
Component Air Gun/ Railgun Testing	MIPR	Armament Research, Development and Engineering Center (ARDEC) : Picatinny Arsenal, NJ	0.337	-		-		-		-		-	0.000	0.337	0.337
Cold Region Testing	MIPR	Cold Region Test Center : Yuma, AZ	0.300	-		-		-		-		-	0.000	0.300	0.300
Airdrop Testing	MIPR	Army Test and Evaluation Command (ATEC) Yuma Proving Ground (YPG) : Yuma, AZ	0.200	-		-		-		-		-	0.000	0.200	0.200
Subtotal			17.000	0.556		0.750		1.000		-		1.000	0.000	19.306	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	195.623	14.218	28.188	30.500	-	30.500	0.000	268.529	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army			Date: March 2019		
Appropriation/Budget Activity 2040 / 5		R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>		Project (Number/Name) S36 / <i>Precision Guidance Kit</i>	



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604802A / <i>Weapons and Munitions - Eng Dev</i>	Project (Number/Name) S36 / <i>Precision Guidance Kit</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
PGK-AJ / Tech Maturation Risk Reduction	1	2019	4	2019
PGK-AJ / Preliminary Design Review (PDR)	4	2019	4	2019
PGK-AJ / EMD Source Selection	4	2019	1	2020
PGK-AJ / EMD Award	2	2020	2	2020
PGK-AJ / Prototype Development and Testing	2	2020	2	2021
PGK-AJ / Critical Design Review (CDR)	2	2021	2	2021
PGK-AJ / Qualification Testing	3	2021	2	2023
Milestone C	3	2023	3	2023
Initial Operation Test and Evaluation (IOT&E) -PGK-AJ	3	2024	4	2024