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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603004A / <i>Weapons and Munitions Advanced Technology</i>
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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
Total Program Element	-	195.345	241.581	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	436.926
232: <i>Advanced Lethality & Survivability Demo</i>	-	99.265	70.340	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	169.605
43A: <i>ADV WEAPONRY TECH DEMO (CA)</i>	-	68.000	139.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	207.000
L96: <i>High Energy Laser Technology Demo</i>	-	23.274	26.225	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	49.499
L97: <i>Smoke And Obscurants Advanced Technology</i>	-	4.806	6.016	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	10.822

Note

In Fiscal Year (FY) 2020 this Program Element (PE) is being eliminated, with continuity of effort realigned to the following PEs:

- ? 0603118A Soldier Lethality Advanced Technology
- ? 0603119A Ground Advanced Technology
- ? 0603462A Next Generation Combat Vehicle Advanced Technology
- ? 0603464A Long Range Precision Fires Advanced Technology
- ? 0603465A Future Vertical Lift Advanced Technology
- ? 0603466A High Energy Laser Tactical Vehicle Demonstrator Advanced Technology

A. Mission Description and Budget Item Justification

This PE matures weapons and munitions components/subsystems and demonstrates lethal weapons systems with potential to increase force application and force protection capabilities across the spectrum of operations. Project 232 focuses on affordable delivery of scalable effects for kinetic weapons and munitions including: artillery, mortars, medium caliber, tank fired, Soldier weapons and shoulder fired weapons. Project L96 matures and integrates critical high energy laser subsystems into mobile demonstrators to explore and validate system performance in relevant environments. Project L97 demonstrates performance of advanced obscurants and delivery of mechanisms and conducts forensic analysis of explosives and hazardous materials to enable detection.

In FY 2018/FY 2019 work in this PE is related to, and fully coordinated with, PE 0602120A (Sensors and Electronic Survivability), PE 0602307A (Advanced Weapons Technology), PE 0602618A (Ballistics Technology), PE 0602622A (Chemical, Smoke, and Equipment Defeating Technology), PE 0602624A (Weapons and Munitions Technology), PE 0602772A (Advanced Tactical Computer Science and Sensor Technology), PE 0602782A (Command, Control, Communications Technology), PE 0603005A (Combat Vehicle and Automotive Advanced Technology), PE 0603008A (Electronic Warfare Advanced Technology), and PE 0603313A (Missile and Rocket Advanced Technology).

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Beginning in FY 2020, work in this PE is related to and fully coordinated with PE 0603118 (Soldier Lethality Advanced Technology), 0603462A (Next Generation Combat Vehicle Advanced Technology), 0603464A (Long Range Precision Fires Advanced Technology), 0603465A (Future Vertical Lift Advanced Technology), PE 0603466A (High Energy Laser Tactical Vehicle Demonstrator Advanced Technology), and PE 0603119A (Ground Advanced Technology).

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

The work in this PE is performed by the U.S. Army Futures Command (AFC) and the United States Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT).

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	84.079	102.686	112.213	-	112.213
Current President's Budget	195.345	241.581	0.000	-	0.000
Total Adjustments	111.266	138.895	-112.213	-	-112.213
• Congressional General Reductions	-0.056	-0.105			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	68.000	139.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	46.000	-			
• SBIR/STTR Transfer	-2.678	-			
• Adjustments to Budget Years	-	-	-112.213	-	-112.213

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 43A: *ADV WEAPONRY TECH DEMO (CA)*

Congressional Add: *Program Increase*

Congressional Add: *Gun-launched unmanned aerial system*

Congressional Add: *High energy laser research*

Congressional Add: *High energy rotorcraft integration*

Congressional Add: *Program Increase FY19 Appropriations Act*

Congressional Add: *Program increase - advanced development of asset protection technologies*

Congressional Add: *Program increase - accelerate ERCA gun*

Congressional Add: *Program increase - high energy laser*

	FY 2018	FY 2019
	42.000	-
	3.000	-
	15.000	-
	8.000	-
	-	42.000
	-	5.000
	-	12.000
	-	20.000

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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603004A / <i>Weapons and Munitions Advanced Technology</i>
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Congressional Add Details (\$ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Congressional Add: <i>Program increase - long range precision fires</i>	-	35.000
Congressional Add: <i>hypersonic capability - transfer from line 71</i>	-	25.000
Congressional Add Subtotals for Project: 43A	68.000	139.000
Congressional Add Totals for all Projects	68.000	139.000

Change Summary Explanation

FY18 congressional adds for Program increase (\$42.000 million), Gun-launched unmanned aerial system (\$3.000 million), High energy laser research (\$15.000 million), and High energy laser rotorcraft integration (\$8.000 million).
 FY19 congressional adds for Program increase (\$42.000 million), advanced development of asset protection technologies (\$5.000 million), accelerate ERCA gun (\$12.000 million), high energy laser (\$20.000 million), long range precision fires (\$35.000 million), and hypersonic capability (\$25.000 million).
 This Program Element (PE) is eliminated in FY20 as part of the Science and Technology (S&T) financial restructure initiative; however, continuity of effort is preserved through transition to new Program Elements (PE) / Projects.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603004A / Weapons and Munitions Advanced Technology				Project (Number/Name) 232 / Advanced Lethality & Survivability Demo			
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
232: Advanced Lethality & Survivability Demo	-	99.265	70.340	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	169.605

Note

In Fiscal Year (FY) 2020 this Project is being realigned to:
 PE 0603118A Soldier Lethality Advanced Technology, Projects:
 * AY7 Small Arms Fire Control Advanced Technology
 PE 0603462A Next Generation Combat Vehicle Advanced Technology, Projects:
 * BF5 Adv Lethality & Accuracy Sys for Med Cal Adv Tech
 * BG5 Extended Line of Sight (ELOS) Advanced Technology
 * BI1 Protection for Autonomous Systems Adv Tech
 * BK4 Next Gen Intelligent Fire Control(NG-IFC) Adv Tech
 * BK6 Adv Direct InDirect Armament Sys (ADIDAS) Adv Tech
 PE 0603464A Long Range Precision Fires Advanced Technology, Projects:
 * AE6 Strategic Long Range Cannon Advanced Technology
 * AG3 Extended Range Cannon Artillery (ERCA) Adv Tech
 * AG5 Extended Range Artillery Munition Suite Adv Tech
 * AG7 Energetic Materials and Adv Processing Adv Tech
 * BS3 Strategic Missile Advanced Technology
 PE 0603465A Future Vertical Lift Advanced Technology, Projects:
 * AK7 Adv Rotorcraft Armaments Protection Sys Adv Tech

A. Mission Description and Budget Item Justification

This Project matures and demonstrates technologies for affordable precision munitions including advanced energetic materials and munitions, novel fuze designs, penetrators, and scalable effects.

Efforts in this Project support the Lethality and Ground Maneuver portfolios.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. FY20 realignments are due to financial restructuring in support of Army Modernization Priorities.

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

Title: Cluster Munitions Replacement Acceleration	FY 2018	FY 2019	FY 2020
	7.657	7.748	-

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Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603004A / <i>Weapons and Munitions Advanced Technology</i>	Project (Number/Name) 232 / <i>Advanced Lethality & Survivability Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Description: This effort matures and demonstrates ultra-high reliability fuzing, advanced kill mechanisms, and alternative dispensing technologies for 155mm artillery to provide increased battlefield lethality with reduced unexploded ordnance (UXO) compliant with the Department of Defense (DoD) cluster munitions policy.</p> <p>FY 2019 Plans: Continue to conduct ballistic testing with the objective of a TRL6 demonstration at the end of FY 2019 to validate performance of critical components such as fuzing and warheads; will optimize tests to capture as much pertinent data as possible to inform requirements generation; will mature and demonstrate the performance of integrated components through ballistic testing to show improvements over legacy systems and serve as a down-select to a tactical design; will generate documentation capturing the cluster munition effort relevant data to facilitate transition to PEO/PM in support of the Cannon-Delivered Area Effects Munitions (C-DAEM) Program of Record.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Effort ends in FY19.</p>				
<p>Title: Medium Caliber Weapon Systems</p> <p>Description: Beginning in FY 2020, this effort realigns to PE 0603462A/Project BF5 (Next Generation Combat Vehicle Advanced Technology) as part of the financial restructure and the Army Modernization Strategy.</p> <p>This effort matures and demonstrates advanced medium caliber ammunition, weapon, fire control, and Ammunition Handling Systems (AHS) optimized for remote operation. This effort demonstrates cannon-super high elevation engagement, high performance stabilization, remote ammunition loading, weapon safety and reliability, improved lethality, accuracy, ability to fire a suite of ammunition from non-lethal to lethal, and escalation of force capability in one system.</p> <p>FY 2019 Plans: Will mature fire control software to support 50mm weapon system integration; will integrate complete weapon system into a test bed turret to mature and demonstrate test bed turret control systems and fire control ballistic solutions for optimized lethal performance; will validate simulated system analysis data against various target sets and provide feedback into fire control solutions for integrated system optimization; will complete an integrated (TRL 6) 50mm demonstration to validate the integrated system accuracy and lethal performance.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>		18.000	9.700	-

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Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603004A / <i>Weapons and Munitions Advanced Technology</i>	Project (Number/Name) 232 / <i>Advanced Lethality & Survivability Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Beginning in FY 2020, this effort realigns to PE 0603462A/Project BF5 as part of the financial restructure and the Army Modernization Strategy.				
<p>Title: Scale-up of Energetic Materials</p> <p>Description: Beginning in FY 2020, this effort realigns to PE 0603464A/Project AG7 (Long Range Precision Fires Advanced Technology) as part of the financial restructure and the Army Modernization Strategy.</p> <p>This effort matures and demonstrates the performance and insensitivity of energetic materials ranging from 25mm medium caliber (direct fire) through 155mm large caliber (indirect fire) weapons.</p> <p>FY 2019 Plans: Continue to qualify energetic materials for complete material characterization; will demonstrate high-energy, reduced sensitivity melt-pour formulations for enhanced fragmentation representative munitions.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Beginning in FY 2020, this effort realigns to PE 0603464A/Project AG7 as part of the financial restructure and the Army Modernization Strategy.</p>		1.400	1.937	-
<p>Title: Active Protection Armament Technologies</p> <p>Description: This effort supports the Army's Active Protection System (APS) program to mature and demonstrate APS technologies to reduce vehicle weight while reducing reliance on armor through the use of other means such as sensing, warning, hostile fire detection, and active countermeasures to achieve increased protection against current and emerging threats. This effort is done in coordination with efforts in Program Element (PE) 0602601A, PE 0602618A, PE 0603004A, PE 0603005A, PE 0603270A, and PE 0603313A.</p> <p>FY 2019 Plans: Conduct demonstrations of mature Modular APS Framework (MAF)-compliant HKCM subsystems to validate modularity and performance optimization; provide mature technologies for integration in a MAF-compliant HKCM subsystem for a layered demonstration of combined Soft Kill and Hard Kill component technologies.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Effort ends in FY 2019</p>		6.811	4.358	-
<p>Title: Long Range Gun Technology</p> <p>Description: Beginning in FY 2020, this effort realigns to PE 0603464A/Project AG3 (Long Range Precision Fires Advanced Technology) as part of the financial restructure and the Army Modernization Strategy.</p>		1.700	4.628	-

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Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603004A / <i>Weapons and Munitions Advanced Technology</i>	Project (Number/Name) 232 / <i>Advanced Lethality & Survivability Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>This effort matures and demonstrates extended range artillery weapon system and projectile technologies that increase the range by 25% without an increase in platform weight.</p> <p>FY 2019 Plans: Optimize the design of secondary weapon subsystems such as scavenge systems, elevation, equilibration, automated breech operation, and thermal warning technologies; will demonstrate compact automatic ammunition handling and loading systems with armaments using emerging charge and projectile technologies for improved range and rate of fire performance.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Beginning in FY 2020, this effort realigns to PE 0603464A/Project AG3 as part of the financial restructure and the Army Modernization Strategy.</p>				
<p>Title: Affordable Precision Technologies</p> <p>Description: This effort integrates complementing navigation sensors, actuators and subsystems in order to demonstrate precision delivery capability on an indirect fire munition system in a global positioning system (GPS) denied environment.</p>		3.000	-	-
<p>Title: Counter-Unmanned Aviation System (C-UAS) Technology</p> <p>Description: This effort matures and demonstrates C-UAS technologies designed to encompass the entire kill chain including detection, tracking, classification, and kinetic defeat of UAS for point defense and mobile applications.</p> <p>FY 2019 Plans: Demonstrate integrated small (0.50) caliber counter UAS technologies at a live fire event; will demonstrate the ability to track outgoing rounds and incorporate data into fire control solution; will mature and demonstrate guided medium caliber armament system initially created through DARPA effort to search, identify, track and intercept maneuvering threats; will improve fire control and guidance algorithms for C-UAS/Air Defense scenarios; will optimize kinetic armament system components design for integration on a ground vehicle platform.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Effort completes in FY 2019</p>		1.700	3.622	-
<p>Title: Accelerated Extended Range Munition Suite</p> <p>Description: Beginning in FY 2020, this effort realigns to PE 0603464A/Project AG5 (Long Range Precision Fires Advanced Technology) as part of the financial restructure and the Army Modernization Strategy.</p>		3.000	22.152	-

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Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603004A / <i>Weapons and Munitions Advanced Technology</i>	Project (Number/Name) 232 / <i>Advanced Lethality & Survivability Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>This effort matures and demonstrates extended range artillery technologies including rocket and base bleed propulsion, hybrid lifting surfaces and guidance technologies which increase range and accuracy.</p> <p>FY 2019 Plans: Mature and evaluate long range unitary artillery projectile components in the areas of precision, counter-measure, and payload technologies; will conduct system modeling and simulation to assess improved projectile performance by these technologies when fired from Extended Range Cannon Artillery (ERCA) cannon tube; will develop and test integration concepts and algorithms and refine guidance and navigation system design concepts at extended ranges in GPS-denied environments; will mature component development for cargo and effects munition compatible with legacy and ERCA in the following areas: 1) dispensing techniques and sensor for area effects to service precisely located targets ; 2) optimal formulations and characteristics for smoke and illumination payloads that maximize effectiveness ; and 3) survivability of cannon-launched terrain shaping munition for maximum area denial effects; will conduct critical design review of component technologies; will perform test and evaluation of key enabling component technologies; refine concepts for system integration; and will mature modeling and simulation concepts for subsequent validation.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Beginning in FY 2020, this effort realigns to PE 0603464A/Project AG5 as part of the financial restructure and the Army Modernization Strategy.</p>				
<p>Title: Fuze and Power Technology for Munitions</p> <p>Description: This effort matures and demonstrates innovative fuze and power technologies for enhanced environment and target sensing/classification, warhead initiation schemes, and advanced fuze setting. These technologies will provide enhanced lethality combined effects on targets and advanced initiation schemes for the next generation munitions.</p> <p>FY 2019 Plans: Conduct live fire (Mann Barrel) demonstration of several 30x173mm or Light Weight 50mm airburst rounds that demonstrate an increase in range accuracy when rounds are corrected; will conduct live fire demonstration of a 40mm round using a pre-timed airburst function and low cost Electronic Safe and Arming (ESAD); will conduct demo of the Precision Guided Kit in a 155mm projectile using the Next Gen Large Cal Setter; and will conduct demo of the extended run time thermal battery.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Efforts completes in FY 2019.</p>		2.860	2.360	-
<p>Title: Enhanced Tactical Multi-Purpose (ETMP) Hand Grenade</p>		1.000	-	-

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Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603004A / <i>Weapons and Munitions Advanced Technology</i>	Project (Number/Name) 232 / <i>Advanced Lethality & Survivability Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Description: This effort develops a multi-purpose selectable lethal hand grenade that produces either fragmentation or blast overpressure effects.				
Title: Extended Range Armament and Fire Control Integration		3.000	3.447	-
<p>Description: Beginning in FY 2020, this effort realigns to PE 0603464A/Project AG3 (Long Range Precision Fires Advanced Technology) as part of the financial restructure and the Army Modernization Strategy.</p> <p>This effort matures and demonstrates extended range Armament technologies including light weight Cannon and Mount structures, high efficiency recoil cylinders, common lower power fire control hardware, improved fire control software, and improved sensor to shooter communications which will increase range and accuracy.</p> <p>FY 2019 Plans: Optimize enhanced light weight structures for cannon and mount components, will integrated controls and ammunition handling system; will exploit projectile tracking and guidance technologies to provide accuracy at extended ranges in global positioning system (GPS)-denied environments; will continue to mature and demonstrate advanced and common fire control hardware and software to increase accuracy and reduce logistic burden.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Beginning in FY 2020, this effort realigns to PE 0603464A/Project AG3 as part of the financial restructure and the Army Modernization Strategy.</p>				
Title: Aviation Armament System Technologies		1.237	2.433	-
<p>Description: This effort matures and demonstrates armament solutions adaptable to current aviation and future vertical lift applications in small caliber, medium caliber, counter measure technologies with a focus on light lethal aerodynamic systems.</p> <p>FY 2019 Plans: Will mature and demonstrate a Technology Readiness Level (TRL) 6 airburst munition with a selectable proximity airburst - point detonation fuze for the Apache AH-64E; will optimize critical ammunition technologies in areas of power generation, proximity sensor, and smart multi-mode fuzing to support the Apache AH-64E.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Effort completes in FY 2019.</p>				
Title: Leader-Soldier Effects Tool Suite		0.700	-	-

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Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603004A / <i>Weapons and Munitions Advanced Technology</i>	Project (Number/Name) 232 / <i>Advanced Lethality & Survivability Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Description: This effort matures and demonstrates fires and effects planning, coordination and execution tool suite for sensor to shooter and tactical application. Provides enhanced collaborative engagement capability of fielded and emerging battle command systems supporting PM Soldier Warrior and PM Mission Command Program of Record (POR) architectures.				
Title: Advanced Small Arms Fire Control		1.200	-	-
Description: This effort will mature and demonstrate advanced small arms ballistic calculations from advanced sensor input and optimized architecture for the precision-optical wind system.				
Title: Extended Line of Site Munition (ELOS)		-	5.811	-
Description: Beginning in FY 2020, this effort realigns to PE 0603462A/Project BG5 (Next Generation Combat Vehicle Advanced Technology) as part of the financial restructure and the Army Modernization Strategy. This effort demonstrates a 120mm Tank fired ELOS Munition that counters the growing Anti-Tank Guided Missile (ATGM) threat at extended line of sight ranges beyond current capability.				
FY 2019 Plans: Will optimize an ELOS Munition Air Frame (projectile) design to include fin stabilization element, Seeker Unit, Guidance Electronics Unit (GEU), Canard Actuation System (CAS), Warhead, GNC (Guidance, Navigation, and Control) Software, Target Acquisition and Tracking Software, and Propulsion system; will integrate these components to validate their performance through a preprogram maneuver cannon fired experiment.				
FY 2019 to FY 2020 Increase/Decrease Statement: Beginning in FY 2020, this effort realigns to PE 0603462A/Project BG5 (Next Generation Combat Vehicle Advanced Technology) as part of the financial restructure and the Army Modernization Strategy.				
Title: Strategic Long Range Cannon (SLRC)		46.000	-	-
Title: FY 2019 SBIR / STTR Transfer		-	2.144	-
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		99.265	70.340	-

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C. Other Program Funding Summary (\$ in Millions) N/A		
Remarks		
D. Acquisition Strategy N/A		
E. Performance Metrics N/A		

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Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603004A / Weapons and Munitions Advanced Technology				Project (Number/Name) 43A / ADV WEAPONRY TECH DEMO (CA)			
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
43A: ADV WEAPONRY TECH DEMO (CA)	-	68.000	139.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	207.000

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Advanced Weaponry Technology development.

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

	FY 2018	FY 2019
Congressional Add: Program Increase	42.000	-
FY 2018 Accomplishments: Program Increase		
Congressional Add: Gun-launched unmanned aerial system	3.000	-
FY 2018 Accomplishments: Gun-launched unmanned aerial system		
Congressional Add: High energy laser research	15.000	-
FY 2018 Accomplishments: High energy laser research		
Congressional Add: High energy rotorcraft integration	8.000	-
FY 2018 Accomplishments: High energy rotorcraft integration		
Congressional Add: Program Increase FY19 Appropriations Act	-	42.000
FY 2019 Plans: Program Increase FY19 Appropriations Act		
Congressional Add: Program increase - advanced development of asset protection technologies	-	5.000
FY 2019 Plans: Program increase - advanced development of asset protection technologies		
Congressional Add: Program increase - accelerate ERCA gun	-	12.000
FY 2019 Plans: Program increase - accelerate ERCA gun		
Congressional Add: Program increase - high energy laser	-	20.000
FY 2019 Plans: Program increase - high energy laser		
Congressional Add: Program increase - long range precision fires	-	35.000
FY 2019 Plans: Program increase - long range precision fires		
Congressional Add: hypersonic capability - transfer from line 71	-	25.000

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019
<i>FY 2019 Plans:</i> hypersonic capability - transfer from line 71		
Congressional Adds Subtotals	68.000	139.000

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603004A / <i>Weapons and Munitions Advanced Technology</i>				Project (Number/Name) L96 / <i>High Energy Laser Technology Demo</i>			
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
L96: <i>High Energy Laser Technology Demo</i>	-	23.274	26.225	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	49.499

Note

In Fiscal Year (FY) 2020 this Project is being realigned to:
 Program Element (PE) 0603466A Air and Missile Defense Advanced Technology, Projects:
 * AD1 High Energy Laser Tactical Vehicle Demonstrator Advanced Technology

A. Mission Description and Budget Item Justification

This Project matures and demonstrates advanced technologies for future High Energy Laser (HEL) weapons technology. The major effort under this Project is the phased approach for mobile high power solid state laser (SSL) technology demonstrations that are traceable to the form, fit, and function requirements for a HEL weapon. SSL technology has demonstrated the potential to engage and defeat rockets, artillery and mortars (RAM), UAVs, cruise missiles, sensors, and optics at tactically relevant ranges. HELs are expected to complement conventional offensive and defensive weapons at a lower cost-per-shot than current systems and without the need to strategically, operationally, or tactically stockpile ordnance. This effort utilizes a modular building block approach with open systems architecture to ensure growth, interoperability, and opportunity for technology insertions for maturation of laser, beam control, sensor/radar, integration of power and thermal management subsystems, as well as Battle Management Command, Control, and Computers (BMC3).

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. FY20 realignments are due to financial restructuring in support of Army Modernization Priorities.

Work is performed by the United States Army Space and Missile Defense Command/Army Forces Strategic Command (SMDC/ARSTRAT).

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

Title: Laser System Ruggedization	FY 2018	FY 2019	FY 2020
Description: This effort ruggedizes laser systems for integration on Army platforms. Ruggedization includes modifications of the laser system to withstand vibration, temperature, and contamination environments expected on various Army platforms, while ensuring platform volume, weight, and interface specifications are met. The laser system consists of laser devices, such as the laboratory laser devices developed under Program Element (PE) 0602307A, Project 042, and the prime power (PE 0603005A, Project 441), command and control and thermal management subsystems required for the laser device operation.	12.550	18.494	-
FY 2019 Plans: Complete Critical Design Review (CDR) for the High Energy Laser Tactical Vehicle Demonstrator (HEL TVD). This review will complete the design of the system and includes details of the laser subsystems interfaces with the platform, a Family of Medium			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603004A / <i>Weapons and Munitions Advanced Technology</i>	Project (Number/Name) L96 / <i>High Energy Laser Technology Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Tactical Vehicles (FMTV). Will begin ruggedizing and assembling thermal management, electrical power, and battle management subsystems for the HEL TVD based on designs of the laser and beam control system designs developed under PE 0602307A, Project 042.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: In FY20, this work is being realigned to PE 0603466A/Project AD1 as part of the financial restructure and the Army Modernization Strategy.</p> <p>Title: High Energy Laser Systems Integration and Mobile Demonstrations</p> <p>Description: This effort integrates a 50 kW-class laser from Project 042 into the existing mobile laser demonstrator platform that includes the ruggedized Beam Control System (BCS) built under the HEL Technical Demonstration effort and other required subsystems to demonstrate weapon system performance. The goal is to demonstrate and evaluate performance of a complete mobile high energy laser system in a relevant environment.</p> <p>FY 2019 Plans: Complete analysis of the FY18 HELMTT 50 kW-class system risk reduction demonstration; consolidate lessons learned from HELMTT demonstration to apply to High Energy Laser Tactical Vehicle Demonstrator (HEL TVD); begin preliminary planning for HEL TVD demonstration and define target requirements for FY22 demonstration; initiate system demonstration performance prediction analysis based on HEL TVD predicted performance parameters.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: In FY20, this work is being realigned to PE 0603466A/Project AD1 as part of the financial restructure and the Army Modernization Strategy.</p>		10.724	6.876	-
<p>Title: FY 2019 SBIR / STTR Transfer</p> <p>FY 2019 Plans: FY 2019 SBIR / STTR Transfer</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 SBIR / STTR Transfer</p>		-	0.855	-
Accomplishments/Planned Programs Subtotals		23.274	26.225	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603004A / <i>Weapons and Munitions Advanced Technology</i>	Project (Number/Name) L96 / <i>High Energy Laser Technology Demo</i>

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army **Date:** March 2019

Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603004A / Weapons and Munitions Advanced Technology	Project (Number/Name) L97 / Smoke And Obscurants Advanced Technology
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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
L97: Smoke And Obscurants Advanced Technology	-	4.806	6.016	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	10.822

Note

In Fiscal Year (FY) 2020 this Project is being realigned to:
 Program Element (PE) 0603119A Ground Advanced Technology, Projects:
 * BL3 Explosives Forensics Advanced Technology
 PE 0603462A Next Generation Combat Vehicle Advanced Technology, Projects:
 * BG7 Ground Systems Active Defense (GSAD) Advanced Tech
 * BG9 Obscuration Advanced Technology

A. Mission Description and Budget Item Justification

The Project matures and demonstrates obscurant technologies with potential to enhance personnel/platform survivability by degrading threat force surveillance sensors and defeating the enemy's target acquisition devices, missile guidance, and directed energy weapons. Dissemination systems for new and improved obscurants are developed with the goal of providing efficient and safe screening of deployed forces. This Project also matures and demonstrates improved detection of explosives and hazardous materials by Soldiers and Small Units.

Work in this Project is related to, and fully coordinated with, PE 0602622A (Chemical, Smoke and Equipment Defeating Technology) and PE 0603606A, Project 608 (Countermines & Barrier Development).

This Project sustains Army Science and Technology efforts supporting the Ground Maneuver portfolio.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. FY20 realignments are due to financial restructuring in support of Army Modernization Priorities.

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

	FY 2018	FY 2019	FY 2020
Title: Obscurant Enabling Technologies	0.866	1.802	-
Description: This effort demonstrates the dissemination of new and advanced obscurants. This effort will support Modular Active Protection System (MAPS) in 0603005/221.			
FY 2019 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603004A / <i>Weapons and Munitions Advanced Technology</i>	Project (Number/Name) L97 / <i>Smoke And Obscurants Advanced Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Assess existing and emerging obscurants and their dissemination in vehicle protection grenades; initiate design efforts to integrate with MAPS system. FY 2019 to FY 2020 Increase/Decrease Statement: In FY20 funding is realigned to PE 0603462A/Projects BG7 and BG9 as part of the financial restructure and the Army Modernization Strategy.				
Title: Forensic Analysis of Explosives Description: This effort demonstrates improved point and stand-off detection of explosives and homemade explosive (HME) precursors. FY 2019 Plans: Revise and develop 2nd Generation Chemical Fingerprint Imaging System (CFIS) prototype showing optimized detection performance including improved detection of trace explosive residues and other molecules on curved surfaces and detection algorithm for discrimination of target materials on complex backgrounds. FY 2019 to FY 2020 Increase/Decrease Statement: In FY20, funding is realigned to PE63270A/Project BG9 (Obscuration Advanced Technology) as part of the financial restructure and the Army Modernization Strategy.		2.034	2.071	-
Title: Detection Mechanisms for Contaminants Description: This effort demonstrates improved point and standoff detection of a wide range of hazardous materials. FY 2019 Plans: Investigate UV laser alternatives and spectrometer for trace explosives standoff detection system; conduct technology assessment of trace explosives sensors through a field trial to evaluate sensor sensitivity and technical performance analysis. FY 2019 to FY 2020 Increase/Decrease Statement: In FY20, funding is realigned to PE 0603119A/Project BL3 as part of the financial restructure and the Army Modernization Strategy.		1.906	1.923	-
Title: FY 2019 SBIR / STTR Transfer FY 2019 Plans: FY 2019 SBIR / STTR Transfer FY 2019 to FY 2020 Increase/Decrease Statement:		-	0.220	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603004A / <i>Weapons and Munitions Advanced Technology</i>	Project (Number/Name) L97 / <i>Smoke And Obscurants Advanced Technology</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
FY 2019 SBIR / STTR Transfer			
Accomplishments/Planned Programs Subtotals	4.806	6.016	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A