Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army												Date: March 2019
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603466A *I Air and Missile Defense Advanced Technology*							
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	-	0.000	0.000	60.613	-	60.613	60.980	61.628	64.445	54.616	0.000	302.282
AC8: *Low Cost Extended Range Air Defense Adv Tech*	-	0.000	0.000	21.050	-	21.050	20.150	0.000	0.000	0.000	0.000	41.200
AD1: *High Energy Laser Tactical Vehicle Demo Adv Tech*	-	0.000	0.000	29.914	-	29.914	27.268	27.706	0.000	0.000	0.000	84.888
AD4: *Maneuver Air Defense Advanced Technology**	-	0.000	0.000	0.000	-	0.000	0.000	20.000	22.692	12.392	0.000	55.084
AD6: *Next Generation Fires Radar Advanced Technology*	-	0.000	0.000	7.729	-	7.729	7.884	8.042	8.203	8.294	0.000	40.152
AE1: *Close Combat High Energy Laser Advanced Technology**	-	0.000	0.000	0.000	-	0.000	2.500	2.700	31.350	31.700	0.000	68.250
AE3: *Unconventional Countermeasures-Survivability ATech*	-	0.000	0.000	1.920	-	1.920	3.178	3.180	2.200	2.230	0.000	12.708

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

Note

In Fiscal Year (FY) 2020 this Program Element (PE) continues efforts previously funded in the following PEs:
* PE 0603004A Weapons and Munitions Advanced Technology
* PE 0603313A Missile and Rocket Advanced Technology
* PE 0603734A Military Engineering Advanced Technology
* PE 0603772A Advanced Tactical Computer Science and Sensor Technology

A. Mission Description and Budget Item Justification

Work in this Program Element (PE) matures demonstrates technology in support of Army Modernization Priority Air and Missile Defense by maturating, demonstrating and conducting system level experimentation for the development of advanced air defense technologies that reduce the cost curve of missile defense, restore overmatch, survive volley-fire attacks, and operate within sophisticated Anti-Access/Area Denial (A2/AD) and contested domains.

Work in this PE complements PE 0602147A (Air and Missile Defense Technology).

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603466A *I Air and Missile Defense 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.

Work is performed by the U.S. Army Futures Command (AFC), the United States Army Space and Missile Defense Command/Army Forces Strategic Command (SMDC/ARSTRAT), and the Engineer Research and Development Center (ERDC).

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	60.613	-	60.613
Total Adjustments	0.000	0.000	60.613	-	60.613
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	60.613	-	60.613

Change Summary Explanation

FY20 increase represents a realignment of efforts previously funded in other PEs.

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 0603466A / *Air and Missile Defense Advanced Technology*	Project (Number/Name) AC8 / *Low Cost Extended Range Air Defense Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AC8: *Low Cost Extended Range Air Defense Adv Tech*	-	0.000	0.000	21.050	-	21.050	20.150	0.000	0.000	0.000	0.000	41.200

Note

In Fiscal Year (FY) 2020 this Project is realigned from:
Program Element (PE) 0603313A Missile and Rocket Advanced Technology, Project:
* 704 Advanced Missile Demo

A. Mission Description and Budget Item Justification

This Project directly supports Army Modernization Priority Air and Missile Defense capabilities. Matures and demonstrates key missile technologies for a lower-cost interceptor system to address advanced air defense threats such as medium to large unmanned aerial systems (UAS) and sub-sonic cruise missile systems.

Work in this Project complements PE 0602150A (Air and Missile Defense 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.

Work in this Project is performed by the U.S. Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Low Cost Extended Range Air Defense (LowER AD) Advanced Technology	-	-	21.050
Description: Mature and demonstrate key missile technologies for a lower-cost interceptor system to address advanced air defense threats such as medium to large unmanned aerial systems (UAS) and sub-sonic cruise missile systems			
FY 2020 Plans: Will integrate motor, airframe, mission computer, power supply, telemetry, and data link as an interceptor for demonstrating initial capability in two Ballistic Test Vehicle (BTV) flight tests. These tests will provide verification of component operation and aerodynamic parameters in a relevant environment. The control actuation system (CAS) and inertial measurement unit (IMU) will be integrated with the interceptor to demonstrate control authority and aerodynamic characterization in a Control Test Vehicle (CTV). Will continue maturation of guidance and fuzing algorithms, and verify Guidance Electronic Unit (GEU) performance from pre-flight predictions for CTV and guided test vehicle (GTV) in the Hardware-in the-Loop (HWIL).			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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 0603466A / *Air and Missile Defense Advanced Technology*	**Project (Number/Name)** AC8 / *Low Cost Extended Range Air Defense Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Ongoing work transferred from other PEs due to S&T Financial Restructuring.			
Accomplishments/Planned Programs Subtotals	-	-	21.050

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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 0603466A / *Air and Missile Defense Advanced Technology*	Project (Number/Name) AD1 / *High Energy Laser Tactical Vehicle Demo Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AD1: *High Energy Laser Tactical Vehicle Demo Adv Tech*	-	0.000	0.000	29.914	-	29.914	27.268	27.706	0.000	0.000	0.000	84.888

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603004A Weapons and Munitions Advanced Technology, Project:
* L96 High Energy Laser Technology Demo

A. Mission Description and Budget Item Justification

This Project matures and demonstrates a 100 kW-class mobile HEL weapon system on a tactical platform to protect fixed and semi-fixed sites from rocket, artillery, mortar (RAM) and unmanned aerial system (UAS) threats. 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. This effort utilizes 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 as well as supports the Army's future capability opportunities for leap-ahead technology for directed energy.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

Work is performed by the U.S. Army Space and Missile Defense Command/Amy Forces Strategic Command (USASMDC/ARSTRAT).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: High Energy Laser Tactical Vehicle Demonstrator (HEL TVD) Advanced Technology	-	-	29.914
Description: This effort integrates and demonstrates HEL technologies on an Army tactical platform for transition to the future Indirect Fire Protection Capability Increment 2-Intercept Program of Record. Effort includes integrating technologies developed under PE 0602307A/AC9 into HEL TVD and demonstrating the system against an array of RAM and UAS targets in FY 2022. Technology and knowledge gained from demonstration will be transitioned to Program Executive Office Missiles and Space for material development.			
FY 2020 Plans: Will begin integration and laboratory checkout of the HEL TVD subsystems. Will integrate the electrical and thermal management subsystems into the HEL TVD platform, a family of medium tactical vehicles (FMTV). Will begin integration of system software			

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 0603466A / *Air and Missile Defense Advanced Technology*	**Project (Number/Name)** AD1 / *High Energy Laser Tactical Vehicle Demo Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
to control all subsystems that will validate software functionality. Will begin test range coordination for HEL TVD FY 2022 demonstration to include range and non-range truth data sensors and purchase first RAM and UAS targets for system demonstrations and knowledge points. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Ongoing work transferred from other PEs due to S&T Financial Restructuring.			
Accomplishments/Planned Programs Subtotals	-	-	29.914

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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 0603466A / *Air and Missile Defense Advanced Technology*	Project (Number/Name) AD6 / *Next Generation Fires Radar Advanced Technology*	

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
AD6: *Next Generation Fires Radar Advanced Technology*	-	0.000	0.000	7.729	-	7.729	7.884	8.042	8.203	8.294	0.000	40.152

Note

In Fiscal Year (FY) 2020 this Project is realigned from:
Program Element (PE) 0603772A Advanced Tactical Computer Science and Sensor Technology, Project:
* 243 Sensors and Signals Processing

A. Mission Description and Budget Item Justification

This Project directly supports Army Modernization Priority Air and Missile Defense capabilities by demonstrating scalable radar open systems architecture software allowing the insertion of modular software components.

Work in this Project complements PE 0602150A (Air and Missile Defense 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.

Work in this Project is performed by the U.S. Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Next Generation Fires Radar Advanced Technology	-	-	7.729
Description: This effort matures and demonstrates the architectures, processing and components necessary to deliver next generation capability, flexibility and supportability to the fires family of radar systems. Efforts focus on development of a modular and scalable open architecture that is extensible to multiple radar systems technologies in support of air defense and area/base camp protection.			
FY 2020 Plans: Will demonstrate Fires Radar Open System Technology architecture and back- end processing on the first version of Digital Array Radar Technology as well as other front end antenna configurations, as available, to verify scalability and modularity; Leverage the mode development efforts in FY 2019 (multi-mission, target identification, and multi-static) to complete a Mode Development Kit (MDK) that will be used to mature the interfaces of the open architecture backend; Continue development of the modes from FY 2019 to improve performance and optimize the multi-mission capability for future Fires radars; and Demonstrate additional			

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 0603466A / *Air and Missile Defense Advanced Technology*	**Project (Number/Name)** AD6 / *Next Generation Fires Radar Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Fires radar technology on different class (medium and light-weight) systems to provide multi-mode and multi-mission capabilities relevant to current and future radar systems. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Work transferred from other PEs due to S&T Financial Restructuring.			
Accomplishments/Planned Programs Subtotals	-	-	7.729

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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 0603466A / *Air and Missile Defense Advanced Technology*	Project (Number/Name) AE3 / *Unconventional Countermeasures-Survivability ATech*	

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
AE3: *Unconventional Countermeasures-Survivability ATech*	-	0.000	0.000	1.920	-	1.920	3.178	3.180	2.200	2.230	0.000	12.708

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0603734A Military Engineering Advanced Technology, Project:
* T08 Combat Eng Systems

A. Mission Description and Budget Item Justification

This Project matures and demonstrates technologies to increase survivability of personnel and critical assets using integrated unconventional countermeasures. These countermeasures include tonedown concepts for signature management using novel materials, rapidly deployable, low-cost, multisprectral survivability enhancers as well as intuitive decision support technologies to select and assess non-kinetic protective measures.

Work in this Project supports the Army Science and Technology AMD Portfolio.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Work in this Project conducted at Engineer Research and Development Center (ERDC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Development of Unconventional Countermeasures for Enhanced Survivability (DeUCES) Demonstrations	-	-	1.920
Description: This effort matures and demonstrates countermeasures to detect and defeat near-peer advanced weapons through computational simulations and physical countermeasures and enhanced tonedown measures. This effort is coordinated with PE 0602150A Air and Missile Defense Technology.			
FY 2020 Plans: Will demonstrate novel tonedown techniques for critical fixed and semi-fixed assets to include novel application of commercial off the shelf materials.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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 0603466A / *Air and Missile Defense Advanced Technology*	**Project (Number/Name)** AE3 / *Unconventional Countermeasures-Survivability ATech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
In FY 2020, work in this PE transferred from other PEs due to S&T Financial Restructuring.			
Accomplishments/Planned Programs Subtotals	-	-	1.920

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A