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Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 2: Applied Research	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	107.584	93.549	27.016	-	27.016	29.409	30.907	36.632	40.364	0.000	365.461
AC9: High Energy Laser Tactical Vehicle Demonstrator Te	-	9.008	-	-	-	-	-	-	-	-	0.000	9.008
AD2: High Energy Laser (HEL) Enabling and Support Techn	-	9.744	5.991	-	-	-	-	-	-	-	0.000	15.735
AD3: Maneuver Air Defense Technology	-	12.744	7.893	-	-	-	-	-	-	-	0.000	20.637
AD5: Next Generation Fires Radar Technology	-	5.336	1.488	-	-	-	-	-	-	-	0.000	6.824
AD9: Close Combat High Energy Laser Technology	-	8.467	-	-	-	-	-	-	-	-	0.000	8.467
AE2: Unconventional Countermeasures-Survivability Tech	-	6.347	3.927	3.947	-	3.947	3.369	2.751	3.745	3.744	0.000	27.830
AE4: Collaborative ISR Sensors Technology	-	2.938	-	-	-	-	-	-	-	-	0.000	2.938
BN6: Advanced Weapons Components (CA)	-	53.000	74.250	-	-	-	-	-	-	-	0.000	127.250
CV7: High Energy Laser Direct Diode Apl Tech	-	-	-	2.902	-	2.902	6.034	5.716	7.278	12.472	0.000	34.402
CV8: Vulnerability Modules for Multi-Domain Operations	-	-	-	8.083	-	8.083	8.947	7.691	7.901	8.627	0.000	41.249
DA9: Radar Survivability through Dis Sensing Tech	-	-	-	5.803	-	5.803	4.682	4.053	3.743	2.287	0.000	20.568
DC1: Next Generation DE Concept Development & Analysis	-	-	-	6.281	-	6.281	6.377	10.696	13.965	13.234	0.000	50.553

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Note
In Fiscal Year 2023 (FY23), the following Projects are New Starts: Project CV7 (High Energy Laser Direct Diode Apl Tech); Project CV8 (Vulnerability Modules for Multi-Domain Operations); and Project DA9 (Radar Survivability through Dis Sensing Tech).

A. Mission Description and Budget Item Justification

This Program Element (PE) line is directly aligned with the Air & Missile Defense (AMD) Army Modernization Priority. Work in this PE investigates and develops AMD technologies to enable defense of ground forces and selected geopolitical assets from aerial attack, missile attack, and surveillance. Major focus areas for AMD Science and Technology include: Missiles, Directed Energy, Gun-Based Air Defense Technologies, and Battlefield Sensors and Supporting AMD Technologies. Missiles Applied Research investigates and develops a broad range of Missile technologies to enhance Army integrated AMD capabilities at extended range. Directed Energy Applied Research investigates and develops critical High Energy Laser (HEL) technologies to explore performance against Air Defense threats and for other Directed Energy applications across Army Modernization Priorities. Gun-Based Air Defense Technologies Applied Research investigates and develops Combined Arms for Air Defense (CAFAD) technologies and components in a laboratory environment. Sensors and Supporting AMD Technologies Applied Research investigates and develops Battlefield Sensor and radar technologies required for detection, acquisition and tracking of air defense targets as well as supporting technologies that enhance AMD.

Work in this PE complements PE 0603466A (Air and Missile Defense Advanced Technology).

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

Research is performed by the United States Army Futures Command (AFC), the United States Army Space and Missile Defense Command/Army Strategic Forces Command (SMDC/ARSTRAT), and the United States Army Rapid Capabilities and Critical Technologies Office (RCCTO).

<u>B. Program Change Summary (\$ in Millions)</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023 Base</u>	<u>FY 2023 OCO</u>	<u>FY 2023 Total</u>
Previous President's Budget	107.584	19.316	0.000	-	0.000
Current President's Budget	107.584	93.549	27.016	-	27.016
Total Adjustments	0.000	74.233	27.016	-	27.016
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	74.250			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	27.016	-	27.016
• FFRDC Transfer	-	-0.017	-	-	-

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Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 2: Applied Research	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology
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Congressional Add Details (\$ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Project: BN6: <i>Advanced Weapons Components (CA)</i>		
Congressional Add: <i>Program Increase - Beam Control Systems and Industry Grade Optical Fiber Fabrication for Energy Laser</i>	12.000	12.000
Congressional Add: <i>Program Increase - High Energy Laser Enabling and Support Technology</i>	7.000	-
Congressional Add: <i>Program Increase - Army missile supply chain risk management</i>	15.000	-
Congressional Add: <i>Program Increase - Close Combat High Energy Laser Technology</i>	8.500	-
Congressional Add: <i>Program Increase - Fires Center of Excellence</i>	1.500	-
Congressional Add: <i>Program Increase - Cyber Resiliency in Weapon Systems</i>	1.500	-
Congressional Add: <i>Program Increase - Countermeasures Based on Artificial Intelligence Enabled Material Analysis and Design</i>	6.000	-
Congressional Add: <i>Program Increase - Counter-UAS Center of Excellence</i>	1.500	5.000
Congressional Add: <i>Program Increase: High Energy Laser Testing and Expansion</i>	-	10.000
Congressional Add: <i>Program Increase: High Energy Laser Optical Technology</i>	-	6.000
Congressional Add: <i>Program Increase: High Energy Laser Technology Integration</i>	-	10.000
Congressional Add: <i>Army Missile Risk-Based Mission Assurance</i>	-	15.000
Congressional Add: <i>Kill Chain Automation</i>	-	8.000
Congressional Add: <i>Machine Learning Optimized Power Electronics</i>	-	3.000
Congressional Add: <i>Precision Long Range Integrated Strike</i>	-	5.250
Congressional Add Subtotals for Project: BN6	53.000	74.250
Congressional Add Totals for all Projects	53.000	74.250

Change Summary Explanation

FY23 funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

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Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) AC9 / High Energy Laser Tactical Vehicle Demonstrator Te
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AC9: High Energy Laser Tactical Vehicle Demonstrator Te	-	9.008	-	-	-	-	-	-	-	-	0.000	9.008

A. Mission Description and Budget Item Justification

This Project investigates component technologies for mobile high energy laser (HEL) weapon systems in solid state lasers (SSL) for use in protecting fixed and semi-fixed sites from Rocket, Artillery, and Mortars (RAM), Unmanned Aerial Systems (UAS) and advanced Air Defense threats. The Project researches advanced technologies for HEL weapon systems to enable more efficient laser systems with significantly greater power output for future HEL weapons to augment current kinetic Air Defense Artillery (ADA) systems and address additional missions with a low cost-per-kill exchange ratio. This includes technologies to support development of alternate laser sources, precision optical pointing and tracking components and adaptive optics to overcome laser degradation due to atmospheric effects to gain great lethality permitting expansion of threats set. Additionally development of compact and lighter weight energy generation and storage devices, and more efficient thermal management systems to remove excess heat will permit integrating laser weapons on additional combat platforms.

Work in this Project complements Program Element (PE) 0603466A (Air and Missile Defense Advanced Technology) / Project AD1 (High Energy Laser Tactical Vehicle Demo Adv Tech).

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy and supports the Army's future capability opportunities for leap-ahead technology for directed energy.

Research is performed by the United States (US) Army Rapid Capabilities and Critical Technologies Office (RCCTO).

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

	FY 2021	FY 2022	FY 2023
Title: High Energy Laser Tactical Vehicle Demonstrator Technology	9.008	-	-
Description: This effort develops technologies for robust beam control and SSL subsystems in the HEL Tactical Vehicle Demonstrator (TVD). Technologies developed under this effort will enable lighter, more agile beam control systems for tactical Army platform development and SSL technologies that enhance effectiveness against emerging air defense threats and increase efficiencies, enabling reductions in size, weight and power (SWaP) and improving the ability to integrate SSL systems into multiple Army weapon platforms.			
Accomplishments/Planned Programs Subtotals	9.008	-	-

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

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / <i>Air and Missile Defense Technology</i>	Project (Number/Name) AC9 / <i>High Energy Laser Tactical Vehicle Demonstrator Te</i>

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

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army										Date: April 2022		
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology				Project (Number/Name) AD2 / High Energy Laser (HEL) Enabling and Support Techn			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AD2: High Energy Laser (HEL) Enabling and Support Techn	-	9.744	5.991	-	-	-	-	-	-	-	0.000	15.735

Note

In Fiscal Year 2023 (FY23), this Project is realigned to Program Element (PE) 0602150A (Air and Missile Defense Technology) / Project DC1 (Next Generation DE Concept Development & Analysis).

A. Mission Description and Budget Item Justification

This Project conducts static and dynamic High Energy Laser (HEL) vulnerability and lethality analyses and investigates advanced component technologies to enhance performance of future HEL weapons systems against advanced threats. In addition, this Project includes laboratory efforts for HEL applied research as well as concepts analysis for Army core competencies in Directed Energy (DE). This Project investigates low cost, advanced laser technologies based on unconventional solid-state laser concepts, architectures, beam control and advanced beam control schemes for the development of improved size, weight, and power (SWaP) Army DE weapons and tactical laser developers.

Work in this effort compliments other Army DE efforts conducted under PE 0602150A (Air and Missile Defense Technology) and PE 0603466A (Air and Missile Defense Advanced Technology).

The cited research is consistent with the Army's 31+4 programs, the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy, and supports the Army's future capability opportunities for leap-ahead technology for Directed Energy.

Research is performed by the United States Army Space and Missile Defense Command - Technical Center (USASMDC-TC) with the Rapid Capabilities and Critical Technologies Office (RCCTO) oversight.

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

	FY 2021	FY 2022	FY 2023
Title: High Energy Laser Enabling and Support Technology	7.739	5.866	-
Description: This effort provides the underlying data for future High Energy Laser weapons to effectively engage an array of threats. The data includes prioritized aim points on each threat as well as time to defeat the threats for each aim point. This activity includes the full spectrum of target lethality investigations and engagement of flying targets in relevant scenarios. This part of the activity is primarily executed at the Solid State Laser Testbed facility at White Sands Missile Range, New Mexico.			
This effort also focuses on developing core Army expertise through laser and beam control technology assessments, applied research, and other technical core competencies. This effort focuses on developing in-house expertise in Adaptive Optics, Beam Control, laser diodes, target illuminators lasers and beacon illuminator lasers, laser diagnostics, and new tracking algorithms.			

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) AD2 / High Energy Laser (HEL) Enabling and Support Techn		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>These technologies can be integrated into future laser systems to locate, identify, and engage critical targets. Results of this research will improve the size, weight and power requirements, and the efficacy of laser weapons systems on Army platforms in the future.</p> <p>FY 2022 Plans: Will conduct lethality studies and analysis of new/evolving threats and sustain core competency in HEL Lethality. Will advance Advanced Optics (AO) studies and analysis to compensate for deep turbulence atmospheric conditions. Will fund research to show proof of concept of a tapered amplifier phased array laser system concept that compensates for atmospheric turbulence.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Decreased funding in FY 2023 is due to an administrative realignment to PE 0602150A (Air and Missile Defense Technology) / Project DC1 (Next Generation DE Concept Development & Analysis).</p>				
<p>Title: High Energy Laser Enabling Technologies for Tactical Directed Energy Weapons</p> <p>Description: Research novel solid-state laser concepts, architectures, and components in support of the Army's HEL weapons strategy; exploit breakthroughs in laser technology, develop and employ innovative laser gain material, and utilize photonics to meet the stringent weight/volume requirements for Army platforms, especially to enhance and improve the generation, transmission, and reception of lasers.</p>		2.005	-	-
<p>Title: SBIR/STTR Tax</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>		-	0.125	-
Accomplishments/Planned Programs Subtotals		9.744	5.991	-
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

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Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) AD3 / Maneuver Air Defense Technology
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AD3: <i>Maneuver Air Defense Technology</i>	-	12.744	7.893	-	-	-	-	-	-	-	0.000	20.637

Note

In Fiscal Year 2023 (FY23), this Project is Eliminated and funding is realigned to Program Element (PE) 0603466A (Air and Missile Defense Advanced Technology) / Project AD4 (Maneuver Air Defense Advanced Technology).

A. Mission Description and Budget Item Justification

This Project directly supports Army Modernization Priority Air and Missile Defense capabilities by investigating and developing critical missile technologies and components necessary for an affordable short range air defense interceptor capability to defeat Cruise Missile (CM), Rotary Wing (RW), Tactical / Lethal Unmanned Aerial System (UAS), and Fixed Wing (FW) threats. This Project also designs and develops technologies to provide reduced size weight and power and cost for Maneuver Short Range Air Defense (MSHORAD), Short Range Air Defense (SHORAD), and Lower Tier essential to maintain overmatch against mid-/far-term threats.

Work in this Project complements Program Element (PE) 0603466A (Air and Missile Defense Advanced Technology) / Project AD4 (Maneuver Air Defense Advanced Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

Title: Maneuver Air Defense Technology	FY 2021	FY 2022	FY 2023
<p>Description: Investigates and develops critical missile technologies and components necessary for an affordable short range air defense interceptor capability to defeat RW, Tactical / Lethal UAS, and FW threats.</p> <p>FY 2022 Plans: Will continue component maturation and software integration of seeker, guidance electronics, and control subsystems, then will integrate and validate performance of those subsystems in a dynamic HWIL environment; will conduct warhead lethality experiments to validate ability achieve an immediately observable kill against emulated threats.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement:</p>	10.586	7.604	-

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) AD3 / Maneuver Air Defense Technology

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Efforts continue in PE 0603466A (Air and Missile Defense Advanced Technology) / Project AD4 (Maneuver Air Defense Advanced Technology) through maturation and demonstration of technologies and components.			
Title: Future Air Defense Missile Enabling Technology Description: Designs and develops reduced cost advanced Air Defense missile critical components essential to maintain overmatch against Mid/Far term Maneuver-Short Range Air Defense threats.	2.158	-	-
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638	-	0.289	-
Accomplishments/Planned Programs Subtotals	12.744	7.893	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) AD5 / Next Generation Fires Radar Technology
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AD5: Next Generation Fires Radar Technology	-	5.336	1.488	-	-	-	-	-	-	-	0.000	6.824

Note

In Fiscal Year 2023 (FY23), this Project is Eliminated and funding is realigned to Program Element (PE) 0602141A (Lethality Technology) / Project CG4 (Advanced Radar Concepts and Technologies).

A. Mission Description and Budget Item Justification

This Project directly supports Army Modernization Priority Air and Missile Defense capabilities by investigating and developing advanced radar technologies for insertion into Multi-Mission Army Radar systems. This Project addresses challenges facing simultaneously achieving high linearity and efficiency at high frequencies, accuracy in the underlying high frequency device and circuit models, integration of new material into Silicon complementary metal-oxide-semiconductor (CMOS) processing flows, and electronics reliability that appear as new semiconductor materials are developed and feature sizes shrink.

Work in this Project complements Program Element (PE) 0603466A (Air and Missile Defense Advanced Technology) / Project AD6 (Next Generation Fires Radar Advanced Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

Title: Multi-Mode Air Defense Radar	FY 2021	FY 2022	FY 2023
Description: This research supports the technical challenges associated with air defense radar technology. In particular, this effort will analyze current and emerging radio frequency (RF) spoofing, RF jamming, and RF signature management technologies to determine their impact on the performance of air defense radars. Electromagnetic modeling, RF measurements, and experiments will be used to identify mitigation techniques for spoofing and jamming, and to identify useful signature management technologies. This will also include research in electronic devices, sub-assembly design, and laboratory experiments to advance the state-of-the-art of air defense radars operating in contested electronic environments.	1.522	1.433	-
FY 2022 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) AD5 / Next Generation Fires Radar Technology		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Will leverage digital radar algorithms and modeling to evolve enhanced concepts for distributed and passive RF Sensing; validate and apply algorithms to distributed sub-array architectures and model system-level requirements for expanding battlefield sensing through distributed architectures. FY 2022 to FY 2023 Increase/Decrease Statement: Funding realigned to PE 0602141A (Lethality Technology) / Project CG4 (Advanced Radar Concepts and Technologies) in FY 2023.				
Title: Antennas and RF Device Components for Advanced Electronic Systems Description: This effort designs, characterizes, and validates high performance antennas, microwave components, and software for multifunction radar, RF sensing, and communication and position/timing systems. Research areas include scanning techniques, broadbanding, beamforming, polarization, platform integration, and affordability. For microwave components, research areas include software defined radios, analog-to-digital conversion rates, bandwidth resolution, bit accuracy, circuit design and affordability.		3.814	-	-
Title: FY2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	0.055	-
Accomplishments/Planned Programs Subtotals		5.336	1.488	-
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

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Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) AD9 / Close Combat High Energy Laser Technology
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AD9: Close Combat High Energy Laser Technology	-	8.467	-	-	-	-	-	-	-	-	0.000	8.467

A. Mission Description and Budget Item Justification

This Project investigates and develops technologies for compact, highly efficient lasers, and compact beam control for close-combat platforms. This Project investigates and develops advanced technologies for High Energy Laser (HEL) weapon systems to enable more efficient laser systems with greater power output, which in-turn enables laser weapons on smaller vehicles for additional missions. This includes technologies to support development of alternate laser sources, precision optical pointing and tracking components, adaptive optics to overcome laser degradation due to atmospheric effects, more compact and lighter weight energy generation and storage devices, and more efficient thermal management systems to remove excess heat.

Work in this Project complements Program Element (PE) 0603466A (Air and Missile Defense Advanced Technology) / Project AE1 (Close Combat High Energy Laser Advanced Technology).

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, and the Army Modernization Strategy, and supports the Army's future capability opportunities for leap-ahead technology for directed energy.

Research is performed by the United States (US) Army Rapid Capabilities and Critical Technologies Office (RCCTO).

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

	FY 2021	FY 2022	FY 2023
Title: Close Combat High Energy Laser Technology	8.467	-	-
Description: This effort develops laser and beam control technologies with extremely low size, weight, and power (SWaP) requirements enabling high energy lasers in small, agile close combat platforms. Extremely low SWaP laser systems will expand the laser weapons mission set. Reduction in SWaP also provides for higher power systems on the large tactical vehicles that enable countering the current threat set at longer ranges as well as laser-hardened threats.			
Accomplishments/Planned Programs Subtotals	8.467	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) AE2 / Unconventional Countermeasures-Survivability Tech
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>AE2: Unconventional Countermeasures-Survivability Tech</i>	-	6.347	3.927	3.947	-	3.947	3.369	2.751	3.745	3.744	0.000	27.830

A. Mission Description and Budget Item Justification

This Project designs and develops technologies to deter tactical surveillance and targeting by adversarial area denial systems and munitions. The Project investigates methods to increase survivability of critical assets against precision-guided near-peer advanced weapons threats, investigates and develops tonedown methods for signature management, and computationally develops novel countermeasures. This Project also develops a suite of high-fidelity, physics-based modeling and simulation tools for the design and development of unconventional countermeasures and survivability enhancers applicable to a wide range of operating environments.

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

Research in this Project is conducted by the United States (U.S.) Army Engineer Research and Development Center and coordinated with U.S. Army Futures Command.

Research in this Project complements Program Element (PE) 0603466A (Air and Missile Defense Advanced Technology) / Project AE3 (Unconventional Countermeasures-Survivability ATech).

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

	FY 2021	FY 2022	FY 2023
Title: Development of Unconventional Countermeasures for Enhanced Survivability (DeUCES)	4.075	-	-
Description: This effort designs and develops countermeasures to defeat near-peer advanced weapons through computational modeling and enhanced tonedown measures.			
Title: Model-Based Assessment of Sensors and Countermeasures	2.272	2.400	1.903
Description: This effort develops a suite of high-fidelity, physics-based modeling and simulation tools for the design and development of unconventional countermeasures for a wide range of operating environments; develops tools for the evaluation of threat detection and object identification.			
FY 2022 Plans: Integrate Electro-Optic / Infrared (EO/IR) sensor models and generated synthetic, physics based imagery into a computational testbed for the evaluation of unconventional countermeasure designs.			
FY 2023 Plans:			

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Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) AE2 / Unconventional Countermeasures-Survivability Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
Will integrate and blend small high-fidelity models within larger low resolution domains to enable end-to-end modeling of environmental and unconventional countermeasure effects on terminal sensing modalities. FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort ending in Fiscal Year 2023 (FY23).				
Title: Advanced Integrated Unconventional Countermeasures Applications Description: This effort develops methods and materials to defeat peer advanced reconnaissance, surveillance, targeting methods through advancements in material science and computational prototyping to reduce targetable signatures and confuse targeting systems. FY 2022 Plans: Conduct experiments to develop materials and techniques for hyperspectral camouflage and thermal tonedown utilizing novel waste heat rejection and recovery methods integrated into critical assets. FY 2023 Plans: Will develop concepts for systems incorporating organic materials for targeting hyperspectral and multispectral sensor bands, and develop advanced thermal generation technologies for lightweight structural panels for integration into survivability enhancement systems. FY 2022 to FY 2023 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort reflecting an emphasis in research focus to integrated applications.		-	1.383	2.044
Title: FY 2022 SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC ?638 FY 2022 Plans: Funding transferred in accordance with Title 15 USC ?638 FY 2022 to FY 2023 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638		-	0.144	-
Accomplishments/Planned Programs Subtotals		6.347	3.927	3.947
C. Other Program Funding Summary (\$ in Millions) N/A				

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / <i>Air and Missile Defense Technology</i>	Project (Number/Name) AE2 / <i>Unconventional Countermeasures-Survivability Tech</i>

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

Remarks

N/A

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology				Project (Number/Name) AE4 / Collaborative ISR Sensors Technology			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AE4: Collaborative ISR Sensors Technology	-	2.938	-	-	-	-	-	-	-	-	0.000	2.938

A. Mission Description and Budget Item Justification

This Project directly supports Army Modernization Priority Air and Missile Defense capabilities by designing and developing Intelligence, Surveillance, Reconnaissance (ISR) sensors with extended range threat detection and enhanced survivability by cooperative sensing while on-the-move.

Research in this Project complements Program Element (PE) 0603466A (Air and Missile Defense Advanced Technology) / Project AD6 (Next Generation Fires Radar Advanced Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2021	FY 2022	FY 2023
Title: Collaborative ISR Sensors Technology	2.938	-	-
Description: Design and develop ISR sensors with extended range threat detection and enhanced survivability by cooperative sensing while on-the-move.			
Accomplishments/Planned Programs Subtotals	2.938	-	-

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) BN6 / Advanced Weapons Components (CA)
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BN6: <i>Advanced Weapons Components (CA)</i>	-	53.000	74.250	-	-	-	-	-	-	-	0.000	127.250

Note

Congressional Interest Item funding provided for Advanced Weapons Components.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Advanced Weapon Components.

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

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

	FY 2021	FY 2022
<p>Congressional Add: Program Increase - Beam Control Systems and Industry Grade Optical Fiber Fabrication for Energy Laser</p> <p>FY 2021 Accomplishments: Program increase supporting applied research in beam control systems and industry grade optical fiber fabrication for energy laser.</p> <p>This effort has developed Army capability to characterize and optimize a diverse set of fiber laser systems, optics, and photonics to support technology development and maturation for high energy laser weapon systems.</p> <p>Started development of a Fiber Amplifier Laser Characterization and Optimization lab for evaluating kW class laser modules; the lab will be an open architecture design that facilitates the capability to provide independent Army evaluation and verification of high energy laser source components.</p> <p>Conducted laboratory and field experiments to validate performance of the technologies.</p> <p>Work performed in Huntsville, Alabama by the United States Army Space and Missile Defense Command (USASMDC), with the Rapid Capabilities and Critical Technologies Office (RCCTO) oversight.</p> <p>FY 2022 Plans: Work in FY 2022 is a continuation of and furthers efforts executed under FY 2021.</p>	12.000	12.000

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022	
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) BN6 / Advanced Weapons Components (CA)	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022
<p>The effort will characterize and optimize a diverse set of fiber laser systems, optics, and photonics to support development, maturation, and suitability assessments for technology insertion for High Energy Laser weapon systems.</p> <p>Additionally, this effort will develop and mature next generation direct diode laser systems. Finally, this effort will research crystalline fiber lasers and techniques for high energy pulsed power applications for next generation High Energy Laser systems.</p> <p>Work performed in Huntsville, Alabama by the United States Army Space and Missile Defense Command (USASMDC), with the Rapid Capabilities and Critical Technologies Office (RCCTO) oversight.</p>			
<p>Congressional Add: Program Increase - High Energy Laser Enabling and Support Technology</p> <p>FY 2021 Accomplishments: Program increase supporting applied research in high energy laser enabling and support technology.</p> <p>This effort supported the design and development of agile and lightweight beam control system technology including gimbals and telescopes for High Energy Lasers (HEL). Researching innovative design solutions to revolutionize technology for improved size, weight, and power (SWaP), and cost in next generation HEL weapon systems. Researching and developing HEL platform Enhanced Tracking (ET) capabilities to improve current acquisition tracking and clutter, and fine tracking in deep turbulence in adverse weather conditions. Researching and developing improved HEL beam propagation techniques to achieve a higher laser power on target and improve the effectiveness of a HEL weapon system.</p> <p>Work performed in Huntsville, Alabama by the United States Army Space and Missile Defense Command (USASMDC), with the Rapid Capabilities and Critical Technologies Office (RCCTO) oversight.</p>		7.000	-
<p>Congressional Add: Program Increase - Army missile supply chain risk management</p> <p>FY 2021 Accomplishments: Conduct applied research in Army Missile Supply Chain Risk Management.</p> <p>Work executed by Army Futures Command.</p>		15.000	-
<p>Congressional Add: Program Increase - Close Combat High Energy Laser Technology</p> <p>FY 2021 Accomplishments: Program increase supporting applied research in close combat high energy laser technology.</p>		8.500	-

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022	
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) BN6 / Advanced Weapons Components (CA)	
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	
This effort has focused on integrating a 300 kW-class laser into a U.S. Army combat vehicle. This High Energy Laser platform will be capable of performing a wide variety of missions including air and missile defense as well as lethal engagement of enemy ground targets such as armored vehicles, artillery and rocket systems, logistics, and communications systems.			
Work performed by the Rapid Capabilities and Critical Technologies Office (RCCTO), in Huntsville, Alabama.			
Congressional Add: Program Increase - Fires Center of Excellence FY 2021 Accomplishments: Conduct applied research in Fires Center of Excellence.	1.500	-	
Work executed by Army Futures Command.			
Congressional Add: Program Increase - Cyber Resiliency in Weapon Systems FY 2021 Accomplishments: Conduct applied research in Cyber Resiliency in Weapon Systems.	1.500	-	
Work executed by Army Futures Command.			
Congressional Add: Program Increase - Countermeasures Based on Artificial Intelligence Enabled Material Analysis and Design FY 2021 Accomplishments: Conduct applied research in Countermeasures Based on Artificial Intelligence Enabled Material Analysis and Design.	6.000	-	
Work executed by Army Futures Command.			
Congressional Add: Program Increase - Counter-UAS Center of Excellence FY 2021 Accomplishments: Program increase supporting applied research in Counter-Unmanned Aerial Systems (C-UAS) Center of Excellence.	1.500	5.000	
This effort supports the development of enhancements for High Energy Laser modeling and simulation capabilities to improve current force-on-force models for Counter-small Unmanned Aerial Systems (C-sUAS). Enables C-sUAS force planning, experimentation, and Tactics, Techniques, and Procedures development.			

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022	
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) BN6 / Advanced Weapons Components (CA)	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022
Work executed by the Rapid Capabilities and Critical Technologies Office under the direction of Army Futures Command.			
FY 2022 Plans: Congressional Interest Item funding provided for Counter UAS Center for Excellence			
Congressional Add: Program Increase: High Energy Laser Testing and Expansion		-	10.000
FY 2022 Plans: Program increase supporting applied research in high energy laser lethality testing and expansion.			
This effort will develop and refine High Energy Laser (HEL) Lethality Testing using the Solid-State Laser Testbed (SSLT) at White Sands Missile Range (WSMR). Effort ensures upgrades to maintain relevancy and responsiveness to today's programs (cruise missiles, larger UAVs). Additionally, this effort will conduct HEL testing to support development of HEL atmospheric propagation codes to account for ground battlefield conditions, while providing traceability to current and future Army HEL systems. Defines lethality requirements for future and current Army HEL programs and acquisition Program of Records.			
Work performed in Huntsville, Alabama by the United States Army Space and Missile Defense Command (USASMDC), with the Rapid Capabilities and Critical Technologies Office (RCCTO) oversight.			
Congressional Add: Program Increase: High Energy Laser Optical Technology		-	6.000
FY 2022 Plans: Program increase supporting applied research in high energy laser optical technology.			
This effort will develop and mature power scalable laser subsystem optical technologies. Conduct laboratory and field experiments to validate performance of the technologies. Develop beam control technologies, e.g. adaptive optics for atmospheric compensation and advanced tracking sensors, to increase effectiveness of Army HEL weapon systems against stressing threats. Finally, this effort will enable beam director subsystem refinement, development, and systematic maturation, while enhancing the industrial base critical materials and technologies.			
Work performed in Huntsville, Alabama by the United States Army Space and Missile Defense Command (USASMDC), with the Rapid Capabilities and Critical Technologies Office (RCCTO) oversight.			
Congressional Add: Program Increase: High Energy Laser Technology Integration		-	10.000
FY 2022 Plans: Program increase supporting applied research in high energy laser technology integration.			

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) BN6 / Advanced Weapons Components (CA)

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
This effort supports increased Science and Technology (S&T) investment to improve High Energy Laser (HEL) capability for operational analysis and system development. Leverages increased model and simulation capability to support technical analysis, operational assessments and systems engineering in areas such as Direct Diode approaches for HEL. Finally, this effort will research and develop automated detection, tracking, identification and engagement algorithms to enable integration with higher echelon battle management systems. Work performed in Huntsville, Alabama by the United States Army Space and Missile Defense Command (USASMDC), with the Rapid Capabilities and Critical Technologies Office (RCCTO) oversight.		
Congressional Add: Army Missile Risk-Based Mission Assurance FY 2022 Plans: Congressional Interest Item funding provided for Army Missile Risk-Based Mission Assurance	-	15.000
Congressional Add: Kill Chain Automation FY 2022 Plans: Congressional Interest Item funding provided for Kill Chain Automation	-	8.000
Congressional Add: Machine Learning Optimized Power Electronics FY 2022 Plans: Congressional Interest Item funding provided for Machine Learning Optimized Power Electronics	-	3.000
Congressional Add: Precision Long Range Integrated Strike FY 2022 Plans: Congressional Interest Item funding provided for Precision Long Range Integrated Strike	-	5.250
Congressional Adds Subtotals	53.000	74.250

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

Remarks

D. Acquisition Strategy
N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) CV7 / High Energy Laser Direct Diode Apl Tech
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
<i>CV7: High Energy Laser Direct Diode Apl Tech</i>	-	-	-	2.902	-	2.902	6.034	5.716	7.278	12.472	0.000	34.402

Note

This is a new start in FY 2023.

This Project is a new Start in Fiscal Year 2023 (FY23)

A. Mission Description and Budget Item Justification

This Project designs and develops single mode diode emitters to increase output power to 100 Watts with >60% electrical-to-optical efficiency and packaging for an array of emitters. This Project will also develop and validate a 100 kW-class laser subsystem with 58% electrical-to-optical efficiency and 80% fractional power in bucket (PIB) in a lab setting. This Project will leverage industry and National Labs research to overcome gain limitations through implementing innovative techniques to control the current across the contact in the semi-conductor gain region. This Project also funds research to achieve higher power, 10s of watts, single mode emitters are necessary to make significant improvements to the size, weight, and power (SWaP) of laser subsystems.

Research in this Project compliments other Army Directed Energy efforts conducted under Program Element (PE) 0602150A (Air and Missile Defense Technology) and PE 0603466A (Air and Missile Defense Advanced Technology).

The cited research is consistent with the Army's 31+4 programs, the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy, and supports the Army's future capability opportunities for leap-ahead technology for Directed Energy.

Research is performed by the United States Army Space and Missile Defense Command - Technical Center (USASMDC-TC).

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

Title: High Energy Laser Direct Diode Applied Technology	FY 2021	FY 2022	FY 2023
Description: This effort designs and develops single mode diode emitters to increase output power to 100 Watts with >60% electrical-to-optical efficiency and develop packaging for an array of emitters. This effort will also design and develop a 100 kW-class laser subsystem with 58% E-O efficiency and 80% fractional PIB; validate in a lab setting. This effort will leverage industry and National Labs research to overcome gain limitations through implementing innovative techniques to control the current across the contact in the semi-conductor gain region. Higher power 10s of watts single mode emitters are necessary to make significant improvements to the SWaP of laser subsystems.	-	-	2.902
FY 2023 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) CV7 / High Energy Laser Direct Diode Appl Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Will design and develop the Tapered Amplifier Array in order to fit into spectral locking assembly for laser system to improve Size, Weight and Power for High Energy Laser weapon systems. Will design and develop a 100 Watt, 60% Electrical to Optical Efficient Single Mode Tapered Amplifier in order to improve power and efficiency out of single mode tapered amplifiers to improve Size, Weight and Power for a High Energy Laser weapon system.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: This is a new Start Project in FY23.</p>				
Accomplishments/Planned Programs Subtotals		-	-	2.902
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) CV8 / Vulnerability Modules for Multi-Domain Operations
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CV8: Vulnerability Modules for Multi-Domain Operations	-	-	-	8.083	-	8.083	8.947	7.691	7.901	8.627	0.000	41.249

Note

This is a new start in FY 2023.

This is a New Start Project in Fiscal Year 2023 (FY23).

A. Mission Description and Budget Item Justification

This Project will design and develop High Energy Laser (HEL) Vulnerability Modules (VM), engagement tactics data and kill signatures for targeting Unmanned Aerial Systems, Cruise Missiles, and Rotary Wing threats for future HEL weapon systems. Developed smart VM's will enable real time threat feature detection and targeting, increasing the lethality of the HEL weapon systems through optimizing aimpoint selection. Developed smart Vulnerability Modules will enable optimized targeting across a large range of current and future threat targets due to detection capabilities applied against threat features and not specific threats.

Research in this Project compliments other Army Directed Energy efforts conducted under Program element (PE) 0602150A (Air and Missile Defense Technology) and PE 0603466A (Air and Missile Defense Advanced Technology).

The cited research is consistent with the Army's 31+4 programs, the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy, and supports the Army's future capability opportunities for leap-ahead technology for Directed Energy.

Research is performed by the United States Army Space and Missile Defense Command - Technical Center (USASMDC-TC).

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

Title: Vulnerability Modules for Multi Domain Operations	FY 2021	FY 2022	FY 2023
Description: This effort will design and develop Vulnerability Modules for Multi Domain Operations against current and emerging high priority threats. Investigates and conducts experiments on High Energy Laser Lethality against Unmanned Aerial Systems, Cruise Missiles and Rotary Wing aircraft. The effort will fund research and conduct experiments to optimize aimpoints for rapid and effective High Energy Laser weapon systems.	-	-	8.083
FY 2023 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) CV8 / Vulnerability Modules for Multi-Domain Operations		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>This effort will develop Vulnerability Modules on Group 2&3 Unmanned Aerial System (UAS), sub-sonic Cruise Missiles and Rotary Wing Aircraft by conducting vulnerability analysis and experiment activities. Will research Failure Mode Effects Analysis (FMEA), selecting aim points, developing models, and analyze data from intel sources and subject matter experts.</p> <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> This is a New Start Project in FY23.</p>				
Accomplishments/Planned Programs Subtotals		-	-	8.083
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology				Project (Number/Name) DA9 / Radar Survivability through Dis Sensing Tech			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
DA9: Radar Survivability through Dis Sensing Tech	-	-	-	5.803	-	5.803	4.682	4.053	3.743	2.287	0.000	20.568

Note

This is a new start in FY 2023.

This Project is a new Start in Fiscal Year 2023 (FY23)

A. Mission Description and Budget Item Justification

This project investigates and develops critical radar capability enhancements to defeat advanced Air and Missile threats and protect Army maneuver forces and critical assets. Radar enhancements are required for advanced Electronic Protection (EP) techniques against advanced jammers, electronic Combat Identification (CID), and resource optimization across the threat spectrum while retaining 360° coverage capability. Technology development includes providing capabilities for: dispersed multi-static operation, classifying/tracking emerging threats and high volume threats; adaptive digital beam forming to enable resource efficiency, performance in a dynamic clutter environment and enhanced survivability in a contested battlespace; and multi-modal tracking and additional discrimination models to support diverse and emerging threats, such as swarms and guided munitions. Enhanced development for the state-of-the-art scalable, digital array radar testbed to include advanced algorithms, transmitted power, antenna gain, detection range and angle accuracy/resolution upgrades to the existing/new radar front/back ends will allow greater performance characterization for Multi-mission Army Radar systems supporting the Multi-domain Operations (MDO).

This research is coordinated with Army Program Element (PE) 0602141A (Lethality Technology) / Project CG4 (Advanced Radar Concepts); PE 0602148A (Future Vertical Lift Technology / Project CC3 (FVL Radar Technology); PE 0602150A (Air and Missile Defense Tech)/Project AD5 (Next Generation Fires Radar Tech); and PE 0601102A (Defense Research Sciences)/ Project AA8 (Foundational Distributed Radar); Additionally this project leverages and works closely with Navy, Air Force, DARPA, and MDA radar research and development efforts.

This research complements Program Element (PE) 0602141A (Lethality Technology)//Project CJ7 (Future Air Defense Missile Enabling Technology) and PE 0603466A (Air and Missile Defense Advanced Technology)/ Project DB3 (Radar Survivability through Dis Sensing Adv Tech)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 is performed by the United States Army Futures Command (AFC).

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

Title: Radar Survivability through Dis Sensing (RSDS) Tech	FY 2021	FY 2022	FY 2023
	-	-	5.803

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022		
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) DA9 / Radar Survivability through Dis Sensing Tech		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Description: Investigates and develops critical radar capability enhancements to defeat advanced Air and Missile threats and protect Army maneuver forces and critical assets</p> <p>FY 2023 Plans: Will design and develop RSDS software for radar survivability and explore concepts of operations for resource optimization architectures for dispersed multi-static operations implemented in current and future Army Air Defense radars. Will develop a tailored high-fidelity simulation environment to model and evaluate the optimum method of linking multiple radars. Will leverage the new scalable, all-digital front-end antenna aperture Digital Array Radar Testbed (DART) to design and develop next generation capability, flexibility, and supportability to Army radars by increasing the number of digital elements and developing advanced algorithms and architectures to allow greater performance characterization.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: This Project is a new Start in Fiscal Year 2023 (FY23)</p>				
Accomplishments/Planned Programs Subtotals		-	-	5.803
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army **Date:** April 2022

Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / Air and Missile Defense Technology	Project (Number/Name) DC1 / Next Generation DE Concept Development & Analysis
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
DC1: Next Generation DE Concept Development & Analysis	-	-	-	6.281	-	6.281	6.377	10.696	13.965	13.234	0.000	50.553

Note

In Fiscal Year 2023 (FY23), this Project is an Administrative Realignment from Program Element (PE) 0602150A (Air and Missile Defense Technology) / Project AD2 (High Energy Laser (HEL) Enabling and Support Techn).

A. Mission Description and Budget Item Justification

This Project funds research and investigates adaptive optics, beam control, laser diodes, target and beacon illuminator lasers, laser diagnostics and new tracking algorithms to increase future High Energy Laser weapon system lethality effectiveness. This Project determines critical activities to enable next generation directed energy technical innovations and funds core competencies in Lethality and Directed Energy.

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

	FY 2021	FY 2022	FY 2023
Title: Next Generation Direct Energy Concept Development and Analysis	-	-	6.281
Description: This effort funds research for future High Energy Laser weapons to effectively engage an array of threats. Research includes prioritized aim points on identified threats and time to defeat the threats for each aim point. In addition, this effort investigates the full spectrum of target lethality engagements of flying targets in relevant scenarios. Effort funds core in-house technical competencies for adaptive optics, beam control, laser diodes and laser illuminators.			
FY 2023 Plans: Investigates advanced adaptive optics concepts for use in deep turbulence environments. Investigates direct diode laser design concepts and pulsed illuminator / gate fine track sensor design concepts to develop improved size, weight, and power (SWaP) and improve the effective range of HEL weapon systems. System Characterization, Hardware in the Loop (HWIL) and Software in the Loop (SWIL) will increase efficiency in characterizing prototype(s) and HEL science and technology efforts, advancing future HEL weapon component and system effectiveness.			
FY 2022 to FY 2023 Increase/Decrease Statement: This Project is an Administrative Realignment from Program Element (PE) 0602150A (Air and Missile Defense Technology) / Project AD2 (High Energy Laser (HEL) Enabling and Support Techn).			
Accomplishments/Planned Programs Subtotals	-	-	6.281

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602150A / <i>Air and Missile Defense Technology</i>	Project (Number/Name) DC1 / <i>Next Generation DE Concept Development & Analysis</i>
C. Other Program Funding Summary (\$ in Millions) N/A		
Remarks		
D. Acquisition Strategy N/A		