Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army											Date: March 2023	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**Cost To Complete**	**Total Cost**
Total Program Element	-	201.221	253.539	104.470	-	104.470	108.668	108.239	103.354	104.825	0.000	984.316
AY6: *Soldier Squad Small Arms Armaments Technology*	-	8.503	10.897	10.143	-	10.143	10.322	10.422	10.428	10.601	0.000	71.316
AY8: *Small Arms Fire Control Technology*	-	4.019	2.170	-	-	-	-	-	-	-	0.000	6.189
AZ2: *Body Armor & Integrated Headborne Technology*	-	6.406	6.617	6.321	-	6.321	5.795	5.803	5.806	5.870	0.000	42.618
AZ5: *Soldier Protection Technology - Vulnerability*	-	9.016	11.141	11.370	-	11.370	11.374	11.387	11.394	11.518	0.000	77.200
AZ9: *Soldier Protection Advanced Tech - Detectability*	-	1.815	1.762	-	-	-	-	-	-	-	0.000	3.577
BB4: *Dismounted Soldier Survivability Materials*	-	2.725	3.023	4.985	-	4.985	5.256	5.345	7.852	7.890	0.000	37.076
BB5: *Physical Augmentation: Tech for Human Interactions*	-	1.283	0.574	-	-	-	-	-	-	-	0.000	1.857
BB9: *Human Performance Tech for Mobility & Lethality*	-	2.839	-	-	-	-	-	-	-	-	0.000	2.839
BC2: *Next Gen Mobility & Lethality Tech for Warfighters*	-	7.422	4.333	6.894	-	6.894	11.347	11.109	11.078	11.149	0.000	63.332
BC6: *Human Perf - Tech for Warfighter Enhancement*	-	3.212	1.377	-	-	-	-	-	-	-	0.000	4.589
BC7: *Training Technology (Other than STE)*	-	13.724	25.247	33.822	-	33.822	33.395	28.988	21.463	21.706	0.000	178.345
BD1: *Adv Soldier Sensors/ Displays Tech for Dismounts*	-	11.226	16.229	16.557	-	16.557	16.565	16.576	16.587	16.769	0.000	110.509
BD6: *Soldier Sys Interfaces/ Integration- Sensor Tech*	-	0.495	0.237	0.301	-	0.301	-	-	-	-	0.000	1.033
BD8: *Soldier & Sm Unit Tactical Energy Tech*	-	4.304	6.291	6.911	-	6.911	7.450	10.554	10.038	10.520	0.000	56.068

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army											Date: March 2023	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*							
BE3: *Joint Service Combat Feeding Technology*	-	3.877	4.627	4.074	-	4.074	4.073	4.320	4.970	5.024	0.000	30.965
BE6: *Reactive/Resp Surfaces & Matls-Soldiers & Sys*	-	2.836	-	-	-	-	-	-	-	-	0.000	2.836
BE8: *Synthetic Training Environment (STE) Technology*	-	14.170	5.902	-	-	-	-	-	-	-	0.000	20.072
BP9: *Soldier Lethality Technologies (CA)*	-	100.000	149.700	-	-	-	-	-	-	-	0.000	249.700
BR9: *Personnel & Airdrop Safety Technology*	-	3.349	3.412	3.092	-	3.092	3.091	3.735	3.738	3.778	0.000	24.195

Note

Project BB9 (Human Performance Tech for Mobility & Lethality) is Terminated starting in Fiscal Year 2023 (FY23)

A. Mission Description and Budget Item Justification

This Program Element (PE) conducts fundamental research on Soldier Lethality technologies to develop an integrated Soldier and Squad architecture of equipment and systems that improve Soldier and Small Combat Unit survivability, sustainability, mobility, combat effectiveness, and individual cognitive and physical readiness. To address the challenges of integrating multiple technologies and sub-systems, research conducted in this PE, significant Science and Technology applied research investments in all areas of Soldier Lethality, focus on how to improve the effectiveness of the technologies a Soldier utilizes and apply systems-level practices to mitigate constraints from size and weight of the equipment. Research areas encompass individual and crew-served weapon designs and technologies as well as applied research in lightweight and transparent armor materials to mitigate effects from blast and ballistic threats, counter explosive hazard detection, counter-sensor capabilities, and signature management of weapons, equipment, personnel and high value targets. This PE investigates, develops and designs materials, technologies, methodologies and system models required to experiment and optimize Soldier lethality and survivability through investments in mobility, human-agent teaming, and improved situational awareness interfaces and display technologies as well as to provide Soldier-borne power and energy materials and components that support multiple Soldier-borne systems. This PE also investigates Warfighter training technologies and develops the underpinning technologies to establish architecture standards and interfaces necessary for creating realistic synthetic environments to create a single, interconnected synthetic training system to enable Army units and leaders to conduct realistic multi-echelon / multi-domain combined arms maneuver and mission command training, increasing proficiency through repetition. Human Factors Engineering projects conduct applied research to design weapon systems standards, guidelines, handbooks, and Soldier training curriculum and tools.

Results of these efforts are transitioned within the Army Futures Command, the Program Executive Offices, Army Training and Doctrine Command (TRADOC), Army Medical Command (MEDCOM), Human Systems Integration (HSI) Directorate (Army G1), and the Army Test and Evaluation Command (ATEC).

Work in this PE complements PE 0603118A (Soldier Lethality Advanced Technology) / Project AZ6 (Soldier Signature Management Advanced Technology).

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army	Date: March 2023
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*

Portions of this funding line support both the Soldier Lethality and Synthetic Training Environment (STE) Army Modernization Priorities.

Work in this PE is performed by the United States Army Futures Command (AFC).

B. Program Change Summary ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	205.058	103.839	109.924	-	109.924
Current President's Budget	201.221	253.539	104.470	-	104.470
Total Adjustments	-3.837	149.700	-5.454	-	-5.454
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	149.700			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-3.837	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-5.454	-	-5.454

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Project: BP9: *Soldier Lethality Technologies (CA)*		
Congressional Add: *Program increase - Pathfinder Airborne*	8.000	8.000
Congressional Add: *Program Increase - Pathfinder Air Assault*	10.000	-
Congressional Add: *Program increase - HEROES Program*	5.000	10.000
Congressional Add: *Program increase - Academic Accelerator Pilot Program*	15.000	-
Congressional Add: *Advanced Silicon Anode Material for Batteries*	10.000	-
Congressional Add: *Program Increase - ADVANCED TEXTILES AND SHELTERS*	6.000	6.000
Congressional Add: *Catalyst Traca Data Ready*	5.000	-
Congressional Add: *Program Increase - Digital Night Vision Technology*	5.000	9.700
Congressional Add: *Enhancing Soldier Ballistic Technologies*	5.000	-
Congressional Add: *Materials Development for Personal Protective Systems*	10.000	-
Congressional Add: *Military Footwear Research*	3.000	10.000
Congressional Add: *Program Increase - Nanolayered Polymer Optics*	10.000	10.000
Congressional Add: *Pathfinder Translational Research Advanced Capability Acceleration*	8.000	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army	Date: March 2023
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Congressional Add: *Program Increase - ADVANCED BALLISTIC PROTECTION TECHNOLOGY*	-	25.000
Congressional Add: *Program Increase - ARTIFICIAL INTELLIGENCE - ENHANCED EDUCATIONAL TECHNOLOGY AND LEARNING*	-	5.000
Congressional Add: *Program Increase - ENHANCED BALLISTIC PROTECTIVE EYEWEAR*	-	5.000
Congressional Add: *Program Increase - ENHANCING SOLDIER BALLISTIC TECHNOLOGIES*	-	5.000
Congressional Add: *Program Increase - FLAT PANEL TECHNOLOGY*	-	2.000
Congressional Add: *Program Increase - FUTURE FORCE REQUIREMENTS EXPERIMENTATION*	-	10.000
Congressional Add: *Program Increase - INNOVATIVE TRAINING TECHNOLOGIES*	-	5.000
Congressional Add: *Program Increase - LITHIUM-ION BATTERY CELL RESEARCH PILOT*	-	9.000
Congressional Add: *Program Increase - PATHFINDER ADAPTIVE EXPERIMENTATION FORCE*	-	5.000
Congressional Add: *Program Increase - PATHFINDER CYBER INITIATIVES*	-	12.000
Congressional Add: *Program Increase - REGIONAL WORKFORCE PILOT*	-	10.000
Congressional Add: *Program Increase - SOLDIER & SMALL UNIT TACTICAL ENERGY TECHNOLOGY*	-	3.000
Congressional Add Subtotals for Project: BP9	100.000	149.700
Congressional Add Totals for all Projects	100.000	149.700

Change Summary Explanation

Decreased funding to support higher priorities within the Science & Technology (S&T) portfolio.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) AY6 / *Soldier Squad Small Arms Armaments Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AY6: *Soldier Squad Small Arms Armaments Technology*	-	8.503	10.897	10.143	-	10.143	10.322	10.422	10.428	10.601	0.000	71.316

A. Mission Description and Budget Item Justification

This Project investigates individual and crew-served weapon designs and technologies that enhance the fighting capabilities and survivability of the dismounted Warfighter in support of all of the Services. In addition, it conceives and advances weapon concepts based on innovative ballistic and advanced incapacitation technologies that will enhance the defeat of hard and soft infantry targets at extended ranges based upon the Joint Service Small Arms Technology Development Strategy (JSATDS). The Project will continue to support technology needs from the all Services to include the Next Generation Family of Weapons. In addition, this Project will develop the technology/weapons concepts that will upgrade medium and heavy support weapons at echelons. Finally, this Project will perform research directed toward non-kinetic modalities to incapacitate combatants.

Work in this Project supports key Army needs and leverages the technical research of several Program Elements (PEs) to include PE 0601102A (Defense Research Sciences) / Project AA7 (Mechanics and Ballistics), PE 0603118A (Soldier Lethality Advanced Technology), and PE 0602141A (Lethality Technology).

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)	FY 2022	FY 2023	FY 2024
Title: Soldier/Squad Lethality Technology	3.880	4.676	3.848
Description: This effort conceives and investigates advanced weapons concepts based on innovative ballistic technologies that will enhance the defeat of hard and soft infantry targets at extended ranges to ensure overmatch for Soldier Lethality. This effort will also perform research directed toward non-ballistic modalities to incapacitate combatants.			
FY 2023 Plans: Will design and develop concepts and a projectile mechanism that is compatible with precision Soldier systems to allow integration of advanced effects into the related system; develop system demonstrators for medium and heavy weapons that offer significant improvements in size and weight reductions as well as lethality performance; determine threat environment and potential growth for medium and heavy weapons along with ability to combine effects in both the mounted and unmounted roles; utilize instrumentation to characterize technology concepts to enable a reduction in dispersion of complex projectiles.			
FY 2024 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AY6 / *Soldier Squad Small Arms Armaments Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Will develop lethal mechanisms related to the mounted machine gun roll to include defilade mission; investigate threat progression and how it relates to lethal mechanism performance in small caliber projectiles; complete development and validation of automatic jump range/approach for dispersion reduction; conduct advanced diagnostic experiments of novel propellant charges; investigate opportunities to improve performance of heavy mounted weapons in the platoon; mature weapon technologies enabling high performance, compact lightweight weapons; utilize modeling and simulation to assess the effects of standoff energy delivery and expand experimental capability. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding decrease supports planned lifecycle of this effort.			
Title: Small Arms Enabling Technologies ***Description:*** This effort designs and develops small arms weapon systems, enablers, and ammunition technologies that will maintain decisive lethal overmatch capabilities to the Joint Warfighter. This effort matures small arms weapon system designs through experimentation in support of Joint Warfighter's capability needs. ***FY 2023 Plans:*** Design and develop Non-line of sight, 3 dimensional battlefield target sensing and reconstruction technologies; Augmentation technologies for increased weapon system/man-in-the loop performance; Future ballistics and weapon operation for advanced targets; Next Generation small arms barrel technologies and analysis tools; future Soldier weapon concepts; and intelligent, autonomous, and remote small arms weapon technologies. Will conduct component technology research on future small arms concepts to enable a more efficient, effective, and lethal Joint Warfighter. ***FY 2024 Plans:*** Will investigate future small arms concepts to enable a more efficient and lethal Joint Warfighter; design concepts to explore new small arms characterization techniques and metrics; investigate machine gun component technology for increased volume fire effectiveness from small units; validate algorithms and models used for advanced ballistics and holistic weapon signature system analysis; investigate fire control components and methodologies to improve future small arms system precision; develop technologies supporting future remote small?arms systems. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.	4.623	6.067	6.295
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638. ***FY 2023 Plans:***	-	0.154	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AY6 / *Soldier Squad Small Arms Armaments Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638.			
Accomplishments/Planned Programs Subtotals	8.503	10.897	10.143

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) AY8 / *Small Arms Fire Control Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AY8: *Small Arms Fire Control Technology*	-	4.019	2.170	-	-	-	-	-	-	-	0.000	6.189

A. Mission Description and Budget Item Justification

This Project designs and develops technology for advanced small arms fire control in order to achieve lethality overmatch by supporting target prioritization, enhancing processing of information from multiple sources, and investigating aim assistance tools which remove Soldier aim error. This Project specifically supports the Army Science and Technology Soldier Lethality modernization priority.

Work in this Project complements work done in Program Element (PE) 0603118A (Soldier Lethality Advanced Technology) / AY7 (Small Arms Fire Control Advanced Technology).

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy, and the Soldier Lethality Cross Functional Team (CFT) efforts.

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Adv. Fire Control Tech	4.019	2.091	-
Description: This Project investigates software and hardware mechanisms to enable enhanced kill chain processes on small arms platforms. This includes investigating artificial intelligence and neural network hardware, conducting experiments on both Commercial and Government Off-The-Shelf (COTS and GOTS) artificial intelligence and machine learning algorithms, and validating Soldier accuracy performance models. It also includes investigation of lightweight optical components and determines viability of weight reduction and balancing approaches. ***FY 2023 Plans:*** Conduct experiments on target prioritization concepts in multiple scenarios, including both virtual modeling and simulation and real world environments; validate the technical performance parameters derived from experiments for applicability to system design; complete design approach for further component and system development. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding decrease represents planned lifecycle conclusion for this effort			
Title: SBIR/STTR Transfer	-	0.079	-
Description: Funding transferred in accordance with Title 15 USC §638			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AY8 / *Small Arms Fire Control Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2023 Plans: Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638.			
Accomplishments/Planned Programs Subtotals	4.019	2.170	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) AZ2 / *Body Armor & Integrated Headborne Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AZ2: *Body Armor & Integrated Headborne Technology*	-	6.406	6.617	6.321	-	6.321	5.795	5.803	5.806	5.870	0.000	42.618

A. Mission Description and Budget Item Justification

This Project investigates and develops materials for Soldier-borne protective equipment, such as body armor and combat helmets, to increase protection from ballistic, blast, and blunt impact threats. This Project also investigates and executes systematic studies to design and develop materials, devices, systems and methods that enable the identification of protective solutions against ballistic, blast and directed energy threats. Included are investigations of emerging technologies, novel materials, and test methods and integration of personal armor, combat helmets, hearing protection, eyewear, and other personal protective equipment items.

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)	FY 2022	FY 2023	FY 2024
Title: Body Armor & Integrated Headborne Technology	6.406	6.617	6.321
Description: This research effort supports the investigation of novel materials, component designs, and material modeling to design and develop technologies that protect Soldiers against ballistic, blast, and directed energy threats. This effort utilizes a cross-disciplinary, human-focused approach to develop technologies which optimize tradeoffs in ballistic and blast protective component design. This effort addresses the Army challenge of easing overburdened Soldiers in small units and aligns to Soldier protection modernization priorities.			
FY 2023 Plans: Conduct experiments using novel anti-fog test method to assess efficacy of active and passive anti-fog coatings for military eyewear and helmet-mounted displays; investigate film insert molding processing approaches that will enable the combination of multiple material layers to impart multiple protection capabilities (anti-scratch, laser protection, active anti-fog) into a single eyewear system of spherical geometry for the Warfighter, while maintaining optical clarity and ballistic integrity; investigate novel fabric constructs by integrating high strength ballistic fibers to produce lightweight fabric designs that provide increased protection from fragmentary blast debris; funds research of ultrasonic lamination of high performance materials and associated processing conditions to increase armor protection against small arms threats; investigate rigid fiber reinforcement composite architectures for improving ballistic performance against small arms threats.			
FY 2024 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AZ2 / *Body Armor & Integrated Headborne Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Will mature film- insert molding- processing approaches that will enable integration of multi-layered lenses for eyewear and head mounted displays; optimize anti-scratch coatings to produce extreme high hardness durable lens surfaces to protect sophisticated head mounted displays and eyewear; optimize active and passive anti-fog technology; design and develop active cooling technology for integration into combat helmet systems; optimize the ability to highly control and engineer the structure of high performance composite armor subsystems via ultrasonic lamination techniques to produce increased protection against small arms threats; investigate threat- specific failure mechanisms and their relationship to microstructural parameters. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Accomplishments/Planned Programs Subtotals	6.406	6.617	6.321

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) AZ5 / *Soldier Protection Technology - Vulnerability*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AZ5: *Soldier Protection Technology - Vulnerability*	-	9.016	11.141	11.370	-	11.370	11.374	11.387	11.394	11.518	0.000	77.200

A. Mission Description and Budget Item Justification

This Project investigates and develops Soldier protection methodologies, which includes the materials, methods, and models that enable design and integration of emerging material technologies into lightweight, flexible and modular Soldier equipment to protect against the range of existing and emerging battlefield threats for head, torso, and extremity protection. Specific research thrusts include the development of materials and mechanisms to enhance ballistic protection; computational models and associated experiments to provide a fundamental understanding of material properties and failure mechanisms, as well as correlation to ballistic/blast/blunt impact performance of Soldier personal protective equipment (PPE) and improved fibers, composite, and ceramic materials. Specific technologies support experimental helmets that reduce impact and blast loading to the head, Soldier torso protection systems to increase protection from ballistic and blunt impacts, and novel fibers and fabrics that provide additional survivability mechanisms.

Work in this Project supports key Army needs and is fully coordinated with several PEs to include PE 0602143A (Soldier Lethality Technology) and 0603118A (Soldier Lethality Advanced Technology); and leverages the technical research of several PEs to include PE 0601102A (Defense Research Sciences) / Project AA7 (Mechanics and Ballistics) and 0602144A (Ground Technology) / Project BL1 (Materials and Manufacturing Research Technology).

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)	FY 2022	FY 2023	FY 2024
Title: Soldier Protection Technologies	3.507	3.836	4.047
Description: This effort develops integrated lightweight, flexible, and modular protection equipment that is tailored to support the 'Soldier as a system' approach for defeat of emerging threats. Research areas encompass high fidelity ballistic impact injury models for hard and soft tissues, novel ceramic architectures to include graded and hierarchically structured ceramics, and novel fiber solutions for backing materials to deliver Soldier protection systems to meet emerging ballistic and signature management threats. This effort supports small caliber lethal mechanisms research in PE 0602143A (Soldier Lethality Technology) / Project AY6 (Soldier Squad Small Arms Armaments Technology).			
FY 2023 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AZ5 / *Soldier Protection Technology - Vulnerability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Develop terminal ballistic mechanisms for improved performance, additively manufactured ceramics for lightweight and high performance armors, and advanced composites materials for enhanced flexibility; investigate armor technology to defeat increment 2 ballistic threats; design armor concepts to enhance Soldier effectiveness. ***FY 2024 Plans:*** Will mature and transition armor design to defeat advanced threats; document ballistic performance and manufacturing requirements for the advanced armor technology; develop and analyze conformal armor concepts to improve Soldier effectiveness; validate improved computational tools for ceramic-composite armor technology. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase supports planned life cycle of this effort.			
Title: Soldier-Borne Composite Materials ***Description:*** Utilizing understanding of fibers, fabrics, and composite materials, conduct applied research of emerging lightweight materials and structures to enable affordable designs for head, torso, and extremity protection systems. Provide quantitative scientific basis for modeling and simulation that result in materials that utilize new schemes to enhance Warfighter survivability. This effort supports Soldier Protection Technologies bullet. ***FY 2023 Plans:*** Quantify the effects of processing conditions and constituent material properties on composite performance; develop and validate modeling tools that quantitatively predict the mechanical response of complex thermoplastic composite armors subject to high deformation impact, including the effects of multi-material and multi-orientation laminates; apply optimization tools that exploit these models to recommend favorable designs for improved ballistic and backface performance of body armor systems; initiate materials design and modeling efforts to enable lightweight polymer and polymer composite cartridges for small arms, including studies on the thermomechanical properties of thermoplastics during all stages of the firing process, physical aging of polymers, simulation of thermoplastic processing, and computer-aided design of reinforced composite cartridges. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** In FY 2024, funding for this effort is realigned to the Novel Camouflage and Concealment Materials effort within this Project.	2.626	2.776	-
Title: Soldier-Borne Advanced Protection Materials ***Description:*** Utilizing understanding of protection materials such as armor ceramics and associated failure mechanisms, conduct applied research of emerging armor materials to enable affordable design of lightweight ballistic protective systems for the future Soldier. Provide quantitative scientific basis for modeling and simulation that result in materials that utilize new lethal mechanisms/ protection schemes for the individual Warfighter. This effort supports Soldier Protection Technologies bullet and small caliber	2.883	4.123	4.398

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AZ5 / *Soldier Protection Technology - Vulnerability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
lethal mechanisms research in PE 0602143A (Soldier Lethality Technology) / Project AY6 (Soldier Squad Small Arms Armaments Technology), ***FY 2023 Plans:*** Investigate additively manufactured and diamond-composite ceramics to improve armor performance; minimize void content while maximizing high diamond content via strategic sizing of diamond phases and novel matrix infiltration and densification processes; characterize materials mechanically and with sub-scale and full-scale ballistic experiments, demonstrating high hardness and effective projectile dwell to increase armor integrity and performance; transition advanced ceramic materials and processing methodologies to Army and industrial partners for maturation; document key processing and performance parameters to enable robust manufacturing capability; develop lightweight, dynamic, and robust materials for camo and concealment; utilize advanced modeling and manufacturing tools to enable new coatings, films, and fibers that can be designed to provide tailored and adjustable reflective spectral response. ***FY 2024 Plans:*** Will further investigate highly diamond-loaded composite ceramics for advanced ceramic plates; refine and innovate novel manufacturing approaches for achieving improved diamond packing and bulk density; perform residual stress characterization, analysis, and optimization from micro-scale to meso-scale to achieve ideal pre-stresses at material interfaces; integrate diamond composites into heterogenous ceramic assemblies via strike face, layering, and inclusion strategies; develop improved processing, ply orientation, and consolidation strategies for high performance, fiber-reinforced composites to achieve optimal system-level mechanical performance; engineer bonding and integration strategies for composites and ceramics to create armor packages that incorporate improved ballistic response relative to state-of-the-art. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase supports planned lifecycle of this effort.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.406	-
Title: Novel Camouflage and Concealment Materials	-	-	2.925

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AZ5 / *Soldier Protection Technology - Vulnerability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Description: The modern battlefield presents a new generation of detection threats across a wide range of wavelengths and host platforms, coupled with increasingly sophisticated computational analysis tools for identification and targeting. This effort will develop new materials and manufacturing concepts that enable a new generation of lightweight, efficient camouflage and concealment systems for the dismounted Soldier. ***FY 2024 Plans:*** Will develop material synthesis pathways for creating fillers with tailored or dynamic spectral properties for future integration into coatings, fibers, and composites; characterize materials via directional spectroscopy, and utilize machine learning strategies for identifying optimized material designs; generate structurally robust, first-generation materials with engineered thermal conductivity, and characterize and report properties and pathways for further material development; identify opportunities for materials to influence decoy and deception systems, particularly for autonomous assets in support of small dismounted Soldier Teams. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding Increase for this effort is from the Soldier-Borne Composite Materials effort within this Project in FY 2024.			
Accomplishments/Planned Programs Subtotals	9.016	11.141	11.370

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) AZ9 / *Soldier Protection Advanced Tech - Detectability*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AZ9: *Soldier Protection Advanced Tech - Detectability*	-	1.815	1.762	-	-	-	-	-	-	-	0.000	3.577

Note

In FY 2024, funding in this effort is realigned to PE 0602143A Project BB4 Dismounted Soldier Survivability Materials

A. Mission Description and Budget Item Justification

This Project investigates and designs novel materials, technologies, techniques and applications increasing the capabilities of camouflage and concealment against known and emerging sensor threats. The results of this Project enable effective deception capabilities, combinations of physical and electronic signature decoy components, and determination of analytical processes for modeling signature management technologies during multi-domain operations. These technologies will provide subsystems and concepts that shall decrease the probability of detection and targeting by peer and near-peer adversaries, enabling freedom of movement of semi-independent and dispersed formations and increased protection of dismounted soldiers. Components designed under this Project will transition to Advanced Technology Development efforts in Soldier Lethality protection/survivability Projects to provide disruptive Camouflage, Concealment and Deception technologies to the Operational Army to support expeditionary maneuver in the Multi-Domain Battle Environment and retain windows of advantage.

Work in this Project supports key Army needs and leverages/complements the technical research of several Program Elements (PEs) to include PE 0601102A (Defense Research Sciences) and PE 0603118A (Soldier Lethality Advanced Technology) / Project AZ8 (Soldier - Small Unit Detectability Adv Technology).

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)	FY 2022	FY 2023	FY 2024
Title: Camouflage, Concealment and Decoys Technologies for Soldier and High-Value Assets	1.815	1.747	-
Description: This effort investigates and designs materials, processes, and concepts for innovative camouflage, concealment and deception technologies for Soldier to defeat advanced current and emerging adversary Intelligence, Surveillance and Reconnaissance (ISR) threats and to reduce the probability of detection in multi-domain operations. Investigates analytical processes to model material and system performance and predict probability of detection in the multi-domain operational environment, assisting in closing the capability gap between current camouflage, concealment, and deception technologies and defeating enemy sensorial capabilities in future operating environments.			
FY 2023 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AZ9 / *Soldier Protection Advanced Tech - Detectability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Expand on systematic studies of fiber processing, the incorporation of polymer film processing, and the incorporation of additives and coatings with optical properties to assess thermal transfer properties to potentially camouflage Soldier thermal signatures against adversary thermal-imager sensors; down select and investigate electrochromic polymer synthesis and processing techniques and their application for active color-changing materials in Soldier clothing and individual equipment. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The funding for this program ($1.411K) is realigned to PE 0602143A Project BB4 Dismounted Soldier Survivability Materials to integrate material research activities for Soldier protection.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.015	-
Accomplishments/Planned Programs Subtotals	1.815	1.762	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BB4 / *Dismounted Soldier Survivability Materials*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BB4: *Dismounted Soldier Survivability Materials*	-	2.725	3.023	4.985	-	4.985	5.256	5.345	7.852	7.890	0.000	37.076

Note

In FY 2024, Funding realigned from PE 0602143A AZ9 Soldier Protection Advanced Tech - Detectability

A. Mission Description and Budget Item Justification

This Project investigates fibers, textiles, components, and materials focused on enhancing Soldier survivability from combat threats (flame and thermal, blast and ballistic, multispectral sensor, and laser threats) and environmental threats (e.g., cold, heat, wet, vector, antimicrobial, etc.) to increase operational effectiveness while decreasing the Soldier's physical and cognitive burden. The results from this Project will transition knowledge, materials, subcomponents and methods to Advanced Technology Development efforts in support of enhancing Soldier Lethality by providing protective material solutions focused on the aspects of dismounted movement and maneuver operations of the Army. This Project develops and applies validation methods that enable systematic studies of human systems integration principles and practices to protective equipment materials and designs to advance the understanding of trade-offs between protection, lethality, and mobility.

Work in this Project supports key Army needs and leverages/complements the technical research of several Program Elements (PEs) to include PE 0601102A (Defense Research Sciences), PE 0602143A (Soldier Lethality Technology) / Project AZ5 (Soldier Protection Technology - Vulnerability), and PE 0603118A Soldier Lethality Advanced Technology / Project BB3 (Dismounted Soldier Survivability Equip/Tech Integ).

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)	FY 2022	FY 2023	FY 2024
Title: Dismounted Soldier Survivability Materials	2.725	2.948	4.985
Description: This effort investigates materials, devices and methods that aid in the design and development of multifunctional materials for Soldier protective clothing and individual equipment. This effort conducts research to investigate and identify multi-functional material properties at the micron and sub-micron level to mitigate Soldiers susceptibility and vulnerability to operational threat, i.e., flame, thermal, environmental, and multispectral sensors. Efforts also investigate and develop devices and systems that enable extended dismounted mission duration by reducing the demand for water resupply and enabling Squad organic water filtration systems			
FY 2023 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BB4 / *Dismounted Soldier Survivability Materials*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Research procedures and techniques using additives and thread coating approaches investigated in prior years for tailoring multi-functionality of textiles at very small length scales and impart capabilities at the fiber level to produce textiles with inherent vector protection, blast debris protection, and moisture wicking performance with the aim of reducing the weight and cost while increasing the performance of Soldier clothing and individual equipment; investigate the effects of machine parameters, textile design, and material compositions on fabric properties to tailor a fabric design that exhibits non-conventional fabric behavior and determine improved base layer fabric constructions to increase durability and environmental protection performance parameters of the Soldiers combat ensemble; expand investigation of and down select technical approaches capable of separating salt and other contaminants from brackish and salt water sources to produce emergency water purification capability at the individual Soldier and squad level; develop and validate handheld sensing concepts to provide instantaneous monitoring of water quality at the individual Soldier and squad level. ***FY 2024 Plans:*** Will validate the performance of four classes of engineered fibers and yarns (ballistic protection, vector protection, flame resistance, moisture wicking) at the textile and fabric level prior to multi-functional textile integration; integrate engineered fibers and yarns from the four classes of functionality into a single fabric to conduct investigations to assess baseline performance; investigate the effect of weave construction and machine processing parameters on the performance of multi-functional textiles to establish sub-system functionality and performance against target metrics; conduct a study on polymer compounding to design conductive fibers for e-textile applications; validate the electrical and data carrying capability of thread coated conductive yarns in breadboard e-textile designs; research the mechanical properties and durability of baseline e-textile materials; design and develop e-textiles interfaces between Soldier uniform and power and data platforms; research in collaboration with DEVCOM C5ISR partners the functional components of aided target recognition algorithms and their ability to detect, recognize and identify dismounted Soldiers in support of investigating novel camouflage material approaches to reduce the effectiveness of these emerging threat sensor capabilities. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase due to realignment from PE 0602143A AZ9 Soldier Protection Advanced Tech - Detectability to integrate material research activities for Soldier protection.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:***	-	0.075	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BB4 / *Dismounted Soldier Survivability Materials*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Funding transferred in accordance with Title 15 USC §638			
Accomplishments/Planned Programs Subtotals	2.725	3.023	4.985

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BB5 / *Physical Augmentation: Tech for Human Interactions*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BB5: *Physical Augmentation: Tech for Human Interactions*	-	1.283	0.574	-	-	-	-	-	-	-	0.000	1.857

Note

Beginning in FY24 all PE 0602143A / Soldier Lethality Technology Project BB5 / Physical Augmentation: Tech for Human Interactions funding will transition to PE 0602143A / Soldier Lethality Technology BC2 / Next Gen Mobility & Lethality Tech for Warfighters.

A. Mission Description and Budget Item Justification

This Project advances the understanding of human augmentation and interaction for enhanced operational performance with a focus on adaptation, training, human variability, metrics/methodologies for assessment, and task quantification. Research encompasses conducting applied research to develop metrics, measures, tools, and techniques to quantify and understand the relationships that enable maximum effectiveness of integrated Soldier-augmentation technologies. The resulting data are the basis for physical augmentation systems and equipment design standards, guidelines, and intelligent agent requirements to improve equipment operation and Soldier-system synergy. Application of this research will yield reduced workload, reduced Soldier training requirements, enhanced Soldier lethality/survivability, user acceptance, and allow Soldiers to achieve maximum performance. Major efforts explore novel techniques for Soldier assessment, characterization of individual variability effects on performance, development of evidence-based design guidance for the application of augmentation technologies, exploration of the relationship of exoskeleton and physical-assist device adaptation and baseline Soldier parameters such as gait, neuromuscular motor control and proprioception. This Project will also explore novel training paradigms for reduced Soldier-augmentation technology adaptation times to address current and future warrior performance issues. Individual efforts exploit wearable sensor technologies, translate surrogate task performance to operational outcomes, develop approaches to distinguish tasks and individual state and intent of movement, establish database of human movement variability to inform intelligent system design, and identify high impact applications of augmentation.

Work in this Project supports key Army needs and leverages the technical research of several Program Elements (PEs) to include PE 0602143A (Soldier Lethality Technology) / Project BC2 (Next Gen Mobility & Lethality Tech for Warfighters) and Project BC6 (Human Perf - Tech for Warfighter Enhancement); and supports PE 0603118A (Soldier Lethality Advanced Technology) / Project BC1 (Human Performance AdvTech for Mobility & Lethality). Additionally, work in this Project complements and is fully coordinated with the Medical Research and Development Command under the Military Operational Medicine Research Program within PE 0602787A (Medical Technology) / Project MK4 (Warfighter Health Applied Research Technology), and the Veteran Administration's exoskeleton research area. This Project also complements and is fully coordinated with work performed across Army, Navy, and Air Force under the Reliance 21 Human Systems Community of Interest: Protection, Sustainment, and Warfighter Performance and with our international partners through The Technical Cooperation Program / Human Resources and Performance Group / Panel JP1 (TTCP HUM JP1).

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).

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BB5 / *Physical Augmentation: Tech for Human Interactions*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Training Adaptation and Movement Science ***Description:*** This effort investigates the science behind movement for physical augmentation to maximize mobility capacity and training adaptation to decrease learning curve with physical augmentation systems (e.g., physical-assist devices, exoskeletons). This work will enable the Army to make informed decisions on the ultimate effectiveness of human augmentation technologies before significant resources are expended. ***FY 2023 Plans:*** Implement classification and prediction algorithms into smart controllers capable of anticipating changes in movement states (e.g.,run to walk, walk to stair climb, etc) into and actuated device to optimize human-system synergy and performance outcomes; investigate feasibility of using such devices on common activities and Soldiering tasks to assess relevance; identify differences between actuated device with and without smart controllers and assess the impact of the algorithms on human-system performance in order to inform system design. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding decrease reflects realignment of funding ($1.142K) to PE 0602143 Project BC2 (Next Gen Mobility & Lethality Tech for Warfighters) to consolidate enhancement work.	1.283	0.567	-
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.007	-
Accomplishments/Planned Programs Subtotals	1.283	0.574	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army												Date: March 2023
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*				Project (Number/Name) BB9 / *Human Performance Tech for Mobility & Lethality*			
COST ($ in Millions)	**Prior Years**	**FY 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**Cost To Complete**	**Total Cost**
BB9: *Human Performance Tech for Mobility & Lethality*	-	2.839	-	-	-	-	-	-	-	-	0.000	2.839

Note

Project BB9 (Human Performance Tech for Mobility & Lethality) planned completion in Fiscal Year 2022.

A. Mission Description and Budget Item Justification

This Project investigates human performance based information portrayal system design parameters that integrate mobility & lethality considerations (such as cognitive workload, target discrimination and engagement, and fatigue) into training/education tools, mission command platforms, and technologies that help Soldiers more rapidly and efficiently acquire complex skills and make decisions quickly from training through mission planning and execution.

This Project supports key Army needs and leverages the technical research of several Projects in Program Element (PE) 0603118A (Soldier Lethality Advanced Technology) / Project BD7 (Soldier Sys Interfaces/ Integration-Sensor Adv Tech), Project AY9 (Body Armor & Integrated Headborne Advanced Tech), and Project BC9 (Adv Soldier Sensors/Displays AdvTech for Dismounts).

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy and the Soldier Lethality Cross Functional Team (CFT).

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Human Interaction for Situational Understanding	2.839	-	-
Description: This effort investigates, designs, and develops design guidance for information portrayal systems and sub-systems in augmented/virtual reality that enable Soldiers to make better, faster decisions for close combat operations at the small unit level. This effort also conducts experiments to populate performance models that have application across materiel and non-materiel solutions.			
Accomplishments/Planned Programs Subtotals	2.839	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BB9 / *Human Performance Tech for Mobility & Lethality*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BC2 / *Next Gen Mobility & Lethality Tech for Warfighters*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BC2: *Next Gen Mobility & Lethality Tech for Warfighters*	-	7.422	4.333	6.894	-	6.894	11.347	11.109	11.078	11.149	0.000	63.332

Note

Beginning in FY24 all PE 0602143A / Soldier Lethality Technology Project BB5 / Physical Augmentation: Tech for Human Interactions and BC6 / Human Perf - Tech for Warfighter Enhancement funding will realign to PE 0602143A / Soldier Lethality Technology BC2 / Next Gen Mobility & Lethality Tech for Warfighters.

A. Mission Description and Budget Item Justification

This Project investigates the means to monitor, assess, predict and optimize/enhance Soldier and squad decision-making and shoot and move performance. In addition, it will provide design guidance for individual and mission specific equipment (e.g., individual protection, small arms, load carriage, information portrayal etc.) and quantitative impacts of mission and associated clothing and individual equipment (CIE) on individual and small unit performance. Research conducted focuses on translating mission tasks to measures of human performance. These measures of human performance will inform predictive algorithms, human based modeling and simulation, and assessment tools that enable Soldier performance trade space analysis for acquisition, training, and operations. These data and algorithms will allow us to determine the impact of new capabilities on Soldier and Squad performance and effectiveness, understand deficiencies in performance and investigate novel strategies to optimize and enhance performance.

This Project supports key Army needs and leverages the technical research of several Program Elements (PEs) to include the following: PE 0602143A (Soldier Lethality Technology) / Projects BC6 (Human Perf-Tech for Warfighter Enhancement), and PE 0603118A (Soldier Lethality Advanced Technology)/ Projects BC1 (Human Performance AdvTech for Mobility & Lethality). This Project also supports and leverages PE 0603118A (Soldier Lethality Advanced Technology) / Project AY9 (Body Armor & Integrated Headborne Advanced Tech), and , Project BD7 (Soldier Sys Interfaces/Integration- Sensor AdvTech).

Work in this Project complements and is fully coordinated with the Medical Research and Development Command under the Military Operational Medicine Research Program as well as Defense Medical Research and Development Program under Military Operational Medicine (JPC-5) to include Projects in PE 0602787A (Medical Technology). This Project also complements and is fully coordinated with work performed across Army, Navy, and Air Force under the Reliance 21 Human Systems Community of Interest: Protection, Sustainment, and Warfighter Performance.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy, and the Soldier Lethality Cross Functional Team (CFT).

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Human Interaction for Mobility & Lethality	7.422	4.259	6.894

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC2 / *Next Gen Mobility & Lethality Tech for Warfighters*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Description: This effort investigates and develops human performance based design guidance for protection and weapon systems and sub systems to improve the mobility and lethality of individuals and small units. The applied research translates traditional means for measuring and understanding human performance to the means to conduct assessment for Warfighter and small unit readiness and/or new capabilities. ***FY 2023 Plans:*** Conduct targeted laboratory and field experiments to populate research gaps identified in previous year's predictive modeling work, emphasizing the ability for Soldiers to shoot, move, communicate, navigate and decide during conditions of physical and cognitive stress elicited by operational scenarios; conduct experiments on the effects of head-support load and distribution configurations on Soldier task performance to refine head supported mass guidelines and modeling and simulation tools to understand the headborne trade space; develop ear and female & male head models for headborne system design guidance; conduct experiments to understand and develop optimal augmented reality (AR) design elements, interactions, applications, and performance metrics to enhance situation awareness (SA) and provide design guidance for heads-up display (HUD) systems. ***FY 2024 Plans:*** Will investigate stressor interactions on Soldier, small unit, and leader tactical outcomes to advance predictive modeling; conduct experiments on the effects of head-support load and distribution configurations on female and male Soldier task performance to refine head supported mass guidelines and modeling and simulation tools; develop female & male neck models (or other anatomical models as needed) for headborne system design guidance; conduct experiments to address gaps in the optimization of augmented reality (AR) design elements, interactions, applications, and performance metrics to inform heads-up display (HUD) systems; begin the development of novel HSI test methodologies to inform lethality trade space impacts of Soldier clothing and individual equipment (CIE) and technologies; investigate novel cognitive and physical enhancement strategies on Soldier task performance and recovery. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects the realignment of funds from BB5 / Physical Augmentation: Tech for Human Interactions ($1.142K) and BC6 / Human Perf - Tech for Warfighter Enhancement ($1.290K) to consolidate enhancement work.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:***	-	0.074	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC2 / *Next Gen Mobility & Lethality Tech for Warfighters*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Funding transferred in accordance with Title 15 USC §638			
Accomplishments/Planned Programs Subtotals	7.422	4.333	6.894

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BC6 / *Human Perf - Tech for Warfighter Enhancement*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BC6: *Human Perf - Tech for Warfighter Enhancement*	-	3.212	1.377	-	-	-	-	-	-	-	0.000	4.589

Note

Beginning in FY24 all PE 0602143A / Soldier Lethality Technology Project BC6 / Human Perf - Tech for Warfighter Enhancement funding will realign to PE 0602143A / Soldier Lethality Technology BC2 / Next Gen Mobility & Lethality Tech for Warfighters.

A. Mission Description and Budget Item Justification

This Project investigates and develops mechanisms for safely and effectively optimizing and enhancing Warfighter ability to shoot, move, communicate, and decide. These mechanisms have the potential to exploit the Soldier and Squad as the capability platform beyond materiel solutions provided to the individual and small unit. This project also conducts experiments to populate human performance models that enable trade space analysis for portions of doctrine, organization, training, materiel, leadership and education, personnel and facilities (DOTMLPF) analysis.

This Project supports key Army needs and leverages the technical research of several Program Elements (PEs) / Projects to include: PE 0602143A (Soldier Lethality Technology) / BE3 (Joint Service Combat Feeding Technology) and BE2 (Joint Service Combat Feeding Advanced Technology).

Work in this Project complements and is fully coordinated with the Medical Research and Development Command under the Military Operational Medicine Research Program as well as Defense Medical Research and Development Program under Military Operational Medicine (JPC-5) to include Projects in PE 0602787A (Medical Technology). This Project also complements and is fully coordinated with work performed across Army, Navy, and Air Force under the Reliance 21 Human Systems Community of Interest: Protection, Sustainment, and Warfighter Performance. Work in this Project complements and is fully coordinated with research at the US Army Combat Capabilities Development Command Army Research Laboratory (ARL).

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy, and the Soldier Lethality Cross Functional Team (CFT).

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Human Performance Technology for Warfighter Enhancement	3.212	1.348	-
Description: This effort investigates mechanisms for exploiting human physiology to develop safe and effective interventions that create smarter, faster, more lethal Close Combat Warfighters. This work will result in a Soldier's ability to shoot, move,			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC6 / *Human Perf - Tech for Warfighter Enhancement*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
communicate, and decide faster than an adversary. Findings from these investigations will leverage existing systems and platforms to get the greatest human performance return in training and operations. ***FY 2023 Plans:*** Develop meta-regression model and software tool to predict neurostimulation effects on cognitive and physical performance; limited iterative testing and validation of the model with Commercial Off-The-Shelf (COTS) devices will occur. Exercise the Gastro-Intestinal Joint Automated Army Colon on a Bench (GI-jA2COB) in vitro lower GI tract model to down-select the highest impact, most mature performance enhancement intervention from those currently being studied (muscle recovery performance probiotics, prebiotics for high altitude performance resiliency and engineered probiotics for sleep fatigue mitigation). ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding decrease reflects administrative realignment of funding ($1.290K) to PE 0602143 Project BC2 (Next Gen Mobility & Lethality Tech for Warfighters).			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.029	-
Accomplishments/Planned Programs Subtotals	3.212	1.377	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BC7 / *Training Technology (Other than STE)*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BC7: *Training Technology (Other than STE)*	-	13.724	25.247	33.822	-	33.822	33.395	28.988	21.463	21.706	0.000	178.345

A. Mission Description and Budget Item Justification

This Project funds research into technologies and their applications that can inform and/or enhance the Army's live, virtual, and constructive training systems. This Project conducts research in immersive virtual, mixed, and augmented reality (AR) environments that stimulate human senses (e.g. sight, sound, and touch) and also conducts experiments to understand how users interface with the technology in order to improve the realism of simulation environments and therefore create enhanced immersion and more effective training systems. Models and simulations are designed are developed to allow realistic, fair fight engagements across all training environments and training devices, to include the cyberspace domain. Included in the investigations of this Project are also medical training systems (e.g., part-task trainers and physiological modeling).

Work in this Project supports key Army needs and complements efforts in Program Element (PE) 0603118A (Soldier Lethality Advanced Technology) / Project BC8 (Training Advanced Technology (Other than STE)).

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) and at the Institute for Creative Technologies (ICT) University Affiliated Research Center (UARC) at the University of Southern California.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Medical Training Technology	3.511	3.111	3.599
Description: Included in this effort will be the development of new medical training simulations to train medical personnel across all levels of care. Improvements in haptic capabilities will ensure hyper bio-fidelity for all levels of care. Automated measures of student performance will support Army medical Individual Critical Task Lists (ICTLs). Research areas will also include more realistic tissue properties supporting part-task trainers and modular patient simulator systems. Initial exploration of Army ICTLs will result in early proof-of-concept development of proof-of concept training systems to support non-traditional medical areas, such as dental training simulations.			
FY 2023 Plans: Investigate the usability and training effectiveness of an integrated collective live, virtual, constructive medical training capability; determine optimum physiology engine(s) and haptic configuration leveraging modular manikin and haptic capabilities for emerging scenarios, such as extended care in an austere environment, gender care differences, and patient hand-off.			
FY 2024 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC7 / *Training Technology (Other than STE)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Will mature the usability and training effectiveness of an integrated collective live, virtual, constructive medical training capability; design and develop optimum physiology engine(s) and haptic configuration leveraging modular manikin and haptic capabilities for defined scenarios that support Army medical training, such as extended care in an austere environment, gender care differences, and patient hand-off. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects the design and development of physiology engine(s).			
Title: Warfighting M/S Concepts and Design (ICT) ***Description:*** This Project designs and develops photorealistic synthetic environments, multi-sensory interfaces, artificially intelligent agents, and human performance assessment technologies to create virtual, augmented, and mixed reality simulation environments for training. This Project uses advanced modeling, simulation, and leadership development techniques to leverage the emerging immersive technologies of industry and the research and development community to advance the Army's capabilities. ***FY 2023 Plans:*** Investigate automation techniques to develop individual agent and aggregate unit behaviors to represent friendly forces, hostile forces, and civilian groups in virtual training exercises; investigate and develop a rapid capture technology to generate three-dimensional (3D), fully body personalized avatars that replicate a trainee's non-verbal behavior styles allowing for increased realism in virtual training environments; evaluate methods for various sensor-based reconstructions of real-world terrain and environments to represent live battlespaces effectively in simulations that provide highly accurate and feature-rich 3D geospatial data. ***FY 2024 Plans:*** Will mature automation techniques to develop individual agent and aggregate unit behaviors to represent friendly forces, hostile forces, and civilian groups in virtual training exercises; investigate methods for the realistic physical and mental representation of individual Soldiers; fund research to determine how to improve Soldier cognitive and experiential learning; investigate adaptive, multi-modal interfaces for Army-specific applications of augmented reality technologies; validate methods to synchronize light detection and ranging (LIDAR) and photogrammetry data collected in the real world to enhance the realism of simulation-based training. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort	3.731	6.995	7.360
Title: Cyberspace Electromagnetic Activities (CEMA) Effects Modeling and Simulation	1.418	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC7 / *Training Technology (Other than STE)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Description: This effort investigates and develops capabilities to more accurately model and simulate CEMA necessary to support training events for Corps and below.			
Title: Innovative Synthetic Training Technology ***Description:*** This effort investigates and designs methods of applying AI into the STE to simulate a fully immersive environment in large urban settings with a population of adaptable, noncombatant virtual human agents for increasing the realism and complexity of training scenarios. In addition, it develops tools, techniques and technologies for improving the immersion of human senses within simulation environments with the goal of creating enhanced realism within the simulated environment.	2.885	-	-
Title: STE Live Training ***Description:*** This effort investigates technology to enhance the fidelity of live training systems and investigates future live training capabilities for conducting force-on-force, combined arms exercises to enhance readiness at Army home stations and Combat Training Centers.	2.179	-	-
Title: Digital Terrain for Live Training ***Description:*** This effort investigates technologies to enhance the fidelity and visual effects of digital terrain for live training systems, with an objective metric of reducing overall training time to gain proficiency in the live environment. It addresses live training needs for conducting force-on-force, combined arms exercises to enhance readiness at Army home stations and Combat Training Centers by enhancing vertical terrain resolution, physics-based blast effects on terrain, and data compression technologies. ***FY 2023 Plans:*** Investigate existing physics-based algorithms, new wireless data compression methods, and feature attribution for live-synthetic training environments; fund research on terrain accuracy metrics and digital terrain level of detail needs for live training. ***FY 2024 Plans:*** Will mature existing physics-based algorithms for munitions effects;, design novel wireless data compression methods for feature attribution in live- synthetic training environments; design data model extensions for terrain accuracy metrics and digital terrain level of detail needs for live training; and design a layered and scalable terrain architecture to support dynamic Live training interactions. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects the start of component and architecture design.	-	5.478	6.970
Title: Simulation Management Technologies	-	3.378	8.081

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC7 / *Training Technology (Other than STE)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Description: This effort aims to automate management of resources and equipment associated with the planning, preparation, execution, and assessment of individual through collective training exercises. This effort will inform requirements and research capabilities to enable a self-healing simulation architecture that can automatically architect, configure, detect, deploy, and manage resources to support individual and collective training use-cases. The design and development of fully autonomous constructive models will be leveraged within this architecture to further automate exercise execution and greatly increase time and effectiveness of training and readiness opportunities within the distributed training environment. ***FY 2023 Plans:*** Investigate required simulation components for enhanced architecture and decompose/derive minimum training requirements for each specified MDO Use Case; begin Cognitive Behavior Use Case development and Front End Analysis to inform minimum technical requirements in support of defined readiness objectives; identify applicable artificial intelligence (AI) algorithms and begin development to meet initial use-case prototyping objectives. ***FY 2024 Plans:*** Will investigate hardware acceleration and common platform components; design and develop dynamic behavior algorithms and fitness functions based on training use-cases; design and develop configuration and authoring components to support simulation execution; and conduct experiments aligned to training use-cases to validate architecture. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects the start of design and development activities, as well as the beginning of architecture validation experiments.			
Title: Multi-Domain Environments for Training ***Description:*** This effort will define a new, common MDO competency framework to drive machine-supported training performance data collection, tracking and readiness projections for current and new MDO use-cases. This effort also investigates emerging operational/training paradigms, including a detailed focus on modeling non-combat factors of operational environments and developing models necessary to train for Information Advantage. ***FY 2023 Plans:*** Investigate knowledge, skills, abilities, and behaviors (KSABs) across major MDO task structures; start development of re-usable Measures of Performance/Effectiveness (MOPs/MOEs) that apply to synthetic data sources; investigate first, second, and third order effects for the information warfare domain. ***FY 2024 Plans:***	-	5.392	7.812

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC7 / *Training Technology (Other than STE)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Will continue development of reusable Measures of Performance/Effectiveness (MOPs/MOEs); design MDO profiles and authoring tools/user interfaces aligned to knowledge, skills, abilities, and behaviors (KSABs) across identified MDO task structures; conduct experiments to validate first order effects in information warfare domain. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects beginning of authoring tool design and first experiments to validate first order effects in information warfare domain.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.893	-
Accomplishments/Planned Programs Subtotals	13.724	25.247	33.822

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BD1 / *Adv Soldier Sensors/Displays Tech for Dismounts*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BD1: *Adv Soldier Sensors/ Displays Tech for Dismounts*	-	11.226	16.229	16.557	-	16.557	16.565	16.576	16.587	16.769	0.000	110.509

A. Mission Description and Budget Item Justification

This Project designs and develops low power, next generation modular sensor and display components for detection and identification of both threats and friendlies in all environments to increase situational awareness, decrease fratricide, and enable Soldiers to respond more quickly for greater lethality.

This effort supports work done in Program Element (PE) 0603118A (Soldier Lethality Advanced Technology) / BC9 (Adv Soldier Sensors/Displays AdvTech for Dismounts).

Work in this Project supports the Army Science and Technology Soldier Lethality, Next Generation Combat Vehicle, and Future Vertical Lift Army Modernization Priorities.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy, and supports the Soldier Lethality Cross Functional Team (CFT).

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Advanced Soldier Sensors/Displays Technology for Dismounts	11.226	15.939	16.557
Description: This effort models, simulates, investigates, designs, and develops novel low power, modular electro-optic / infrared (EO/IR), displays, augmented reality approaches and integrates aided/automatic target detection and recognition techniques to enable improved Soldier maneuver and lethality through greater information fidelity to increase Soldier probability of recognition/ identification and tracking of all threats.			
FY 2023 Plans: Investigate new mixed and augmented reality (MR/AR) component technologies to enhance multi sensor and multi system simulation capabilities; improve algorithm evaluation capabilities to validate performance of Electro Optic/Infrared (EO/IR) sensor systems; develop tools and techniques to advance synthetic image generation for augmenting existing data and creation of new training data; develop improved low light level sensors capable of adjusting to a dynamic imaging environment in order to provide actionable information and situational awareness no matter the illumination conditions; design lower SWAP, high definition			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BD1 / *Adv Soldier Sensors/Displays Tech for Dismounts*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
longwave infrared (LWIR) bolometer sensors with enhanced sensitivity to provide full awareness to Soldiers in every illumination environment; validate improved performance of AR systems when paired with higher dynamic range low light imaging sensors. ***FY 2024 Plans:*** Will investigate mixed and augmented reality (MR/AR) content to Heads Up Displays (HUDs) for representation of threats via automated threat cueing from UAV sources; develop modular virtual prototype environments for expedited User feedback; develop image fusion optimization processes to improve target acquisition of sensor systems with multiple camera sources; conduct experiments to determine performance of Electro Optic/Infrared (EO/IR) sensor performance prediction models; investigate advanced materials and processing methods for improvement in operations within lowest lighting conditions with digital low light sensors; develop material and processing methods to design advanced, high definition longwave infrared (LWIR) sensors for tailorable SWaP and/or target acquisition performance. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects planned lifecycle of this effort.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.290	-
Accomplishments/Planned Programs Subtotals	11.226	16.229	16.557

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BD6 / *Soldier Sys Interfaces/Integration-Sensor Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BD6: *Soldier Sys Interfaces/ Integration- Sensor Tech*	-	0.495	0.237	0.301	-	0.301	-	-	-	-	0.000	1.033

A. Mission Description and Budget Item Justification

This Project investigates, designs, and validates advanced technologies and algorithms for enhancing dismounted Soldier deployed robotics and autonomous systems used to improve the Small Unit's situational awareness, survivability, and lethality. Technologies to be investigated may include: algorithms for dismounted robotic systems to enable autonomous navigation, automated object recognition, persistent surveillance, launch and recovery from vehicles, networked lethality, manned-unmanned teaming, and collaborative behaviors; and advanced user interfaces to optimize human-robotic interaction during dismounted operations. These advanced technologies will enable Squad and Platoon level autonomous reconnaissance using robotic systems to minimize the operator's dedicated control of the systems and reduce their cognitive burden, thus allowing Soldiers to be more lethal and survivable.

Work in this Project supports key Army needs and leverages the technical research of several Program Elements (PEs) / Projects to include PE 0603118A (Soldier Lethality Advanced Technology) / Project BD7 (Soldier Sys Interfaces/Integration-Sensor AdvTech) and Project BC9 (Adv Soldier Sensors/Displays AdvTech for Dismounts).

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)	FY 2022	FY 2023	FY 2024
Title: Soldier System Interfaces & Integration (Sensor Technology)	0.495	0.237	0.301
Description: This effort will investigate, design, and validate advanced dismounted Soldier robotic and autonomous systems technologies to enable autonomous navigation, manned-unmanned teaming, and networked reconnaissance to improve Soldier lethality, situational awareness, and survivability during tactical operations.			
FY 2023 Plans: Investigate, design, and develop advanced motion planning and precision landing algorithms to enable extended operations and autonomous search capability for resource constrained Small Unmanned Aerial Systems (SUAS); verify functionality of these algorithms on open architecture SUAS platforms in laboratory and simulated environment to reduce risk and improve system design.			
FY 2024 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BD6 / *Soldier Sys Interfaces/Integration-Sensor Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Will conduct experiments on autonomy and teaming technologies for resource constrained Small Unmanned Aerial Systems (SUAS) operating in complex environments to enhance navigation, search capabilities, and extend operations. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding realigned ($300K) from PE 0603118A (Soldier Lethality Advanced Technology) / Project BD7 (Soldier Sys Interfaces/ Integration-Sensor AdvTech)			
Accomplishments/Planned Programs Subtotals	0.495	0.237	0.301

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BD8 / *Soldier & Sm Unit Tactical Energy Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BD8: *Soldier & Sm Unit Tactical Energy Tech*	-	4.304	6.291	6.911	-	6.911	7.450	10.554	10.038	10.520	0.000	56.068

A. Mission Description and Budget Item Justification

This Project conducts applied research and development on materials and component level power and energy technologies in the areas of energy storage, power generation, alternative energy, and intelligent power distribution and thermal management designs that support Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) and Soldier power needs to include next generation squad weapons and advanced optical devices and sensors. Enables future Soldier lethality and mobility for longer mission durations at lighter weights to provide enhanced lethality and tactical overmatch of adversaries, and to reduce the burden on the Soldier.

This Project support key Army needs and complements the technical research of Program Element 0602184 (Soldier Applied Research) / Project CO1 (Soldier Power and Energy Concepts) and Program Element 0603118A (Soldier Lethality Advanced Technology) / BD9 (Soldier & Sm Unit Tactical Energy AdvTech).

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)	FY 2022	FY 2023	FY 2024
Title: Tactical Power for Soldier Lethality	3.427	5.341	5.946
Description: This effort investigates, designs, and develops innovative materials and component level power generation and energy storage technologies that support next generation weapons, sensors, radios, and human augmentation devices enabling Soldiers and Small Units to maximize probability of target hits, improve collective situational awareness, ensure multiple communication streams, and assist with tactical tasks in order to decrease Soldier load and power burden, and increase power capabilities by providing more energy to prolong mission run-time.			
FY 2023 Plans: Down-select, design, and develop safe, high voltage electrolyte materials and investigate pairing these materials against improved Si anode and Li-metal technologies to verify and validate performance of the Technology Readiness Level (TRL) 5 components. These safe, lightweight power and energy technologies with energy densities from 400-600Wh/kg will enable substantially longer runtimes in multiple soldier-worn portable electronic devices identified by the Soldier Lethality CFT. Investigate and design Soldier and Squad power generation technologies to provide recharging and power scavenging capability from available resources to sustain energy storage technologies while on-the-move in order to limit battery swaps and enable longer mission durations for			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BD8 / *Soldier & Sm Unit Tactical Energy Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Soldier Tactical Power, Robotics, and other critical Soldier Lethality applications for 7 day semi-autonomous operations with limited resupply. ***FY 2024 Plans:*** Will mature safe, high voltage electrolyte materials paired with improved Si anode technologies to verify and validate performance of 2x increase for the Conformal Wearable Battery (CWB); design and develop Li-metal components that will enable a 2-3x increase in energy and pair it with safer, high voltage electrolyte materials; design and develop breadboard components for Soldier and Squad power generation technologies, such as fuel cells and solar, to provide battery recharge capability to sustain on-the-move operations and limit battery swaps to enable longer mission durations; investigate scaling 2x power density fuel cell stacks to platoon power generation requirement; develop and validate family of Si-Anode based Small Tactical Universal Batteries (STUB) to support enabler and small handheld devices for the Soldier. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Increase represents investments in promising power generation technologies that can be implemented across multiple platforms for Soldier and Squad.			
Title: Materials & Component Technologies for Energy Independence ***Description:*** The effort develops technologies to substantially reduce the number of batteries required to accomplish dismounted Soldier/Squad mission objectives by developing more efficient power and thermal management for small systems and harvesting energy and alternative energy technologies thereby significantly reducing Soldier-borne load and logistics requirements for Soldier/Squad power and energy. ***FY 2023 Plans:*** Explore and determine conversion efficiency and power density limits for a thermal conversion approach comprised of a gray-body radiant emitter and back surface reflector-based thermophotovoltaic cell coupled with heat recirculating meso-scale reactors under relevant size constraints for portable power generation; investigate multiplexed microreactors including models, designs, and fabrication of conceptual reactors with increasing multiplexing to investigate performance at different scales for wearable or portable multi-fuel fired power generator heat sources. ***FY 2024 Plans:*** Will investigate compact heat recirculating burners, including models, designs, and fabrication of burners to increase heat transfer rates that increase power density and efficiency; explore thermophotovoltaic and thermionic designs and improvements that increase power density and efficiency of the thermal-to-electric conversion, and improve coupling efficiency with novel heat sources. ***FY 2023 to FY 2024 Increase/Decrease Statement:***	0.877	0.950	0.965

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BD8 / *Soldier & Sm Unit Tactical Energy Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Funding increase reflects planned lifecycle of this effort.			
Accomplishments/Planned Programs Subtotals	4.304	6.291	6.911

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BE3 / *Joint Service Combat Feeding Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BE3: *Joint Service Combat Feeding Technology*	-	3.877	4.627	4.074	-	4.074	4.073	4.320	4.970	5.024	0.000	30.965

A. Mission Description and Budget Item Justification

This Project investigates and develops nutrient compositions and stabilization techniques to maximize the Warfighter's physical and cognitive performance on the battlefield, investigates technologies to enhance detection and identification capabilities of chemical and biological threats in foods, and develops innovative ration and field feeding technologies to reduce resupply requirements for the multi-domain battlefield. The Army serves as the Executive Agent for this Department of Defense (DoD) program, with oversight and coordination provided by the DoD Combat Feeding Research and Engineering Board.

Work in this Program Element (PE) is related to and fully coordinated with PE 0602787A (Medical Technology) / Project MK4 (Warfigher Health Applied Rsch Technology) to develop technologies and concepts; Army Additive Manufacturing Community of Practice to enable customization, increase readiness, and improve sustainment due to fabrication of end-use items at point of need; Defense Threat Reduction Agency to maximize protection of rations from contamination; Defense Health Agency (DHA) to transition and develop materiel solutions in the microbiome technical areas; and DHA Joint Program Committee-5, which seeks to develop effective nutritional countermeasures against stressors and to maximize health, performance, and well-being.

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)	FY 2022	FY 2023	FY 2024
Title: Joint Service Combat Feeding Technology	3.877	4.627	4.074
Description: This effort investigates, designs, and develops nutrient compositions and stabilization techniques to maximize the Warfighter's physical and cognitive performance on the battlefield. The effort investigates technologies to enhance detection and identification capabilities of chemical and biological threats in foods and develops innovative ration and field feeding technologies to reduce resupply requirements. Work in this area results in increased performance, less food-borne illness, and overall increased readiness of the Warfighter.			
FY 2023 Plans: Determine optimal dietary fat levels in weight reduced rations to sustain warfighter physical performance; investigate effect of physical and chemical state of food on fat stability to inform calorically dense ration component design; determine efficacy of nutritional interventions and bioactives on 3D intestinal tissue model to prevent effects of military related stressors; conduct experiments to identify potential of stress adaptation to induce probiotic cultures to survive military ration storage requirements;			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BE3 / *Joint Service Combat Feeding Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
determine efficacy of residual sanitizers and disinfectants against bacteria and viruses on multiple surfaces; design and develop shelf stable polyphenol containing food products to reduce performance decrements. ***FY 2024 Plans:*** Will conduct mathematical analysis of lipid stability in nutrient dense rations; investigate compounds to promote protective potential for the probiotic strain during freeze- drying; develop nutritional intervention and placebo bars in support of human performance research in extreme environments; analyze theoretical/empirical data & characterize materials to examine responsiveness of advanced insulating materials to various stimuli - electro/magneto/thermo/solar; conduct accelerated storage study to mature packaging reduction technologies for operational rations. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding decrease reflects planned lifecycle of this effort to progress into PE 0603118A (Soldier Lethality Advanced Technology) / BE2 (Joint Service Combat Feeding Advanced Technology), to enable efforts which increase performance, decrease food-borne illness, and increase overall readiness of the Warfighter .			
Accomplishments/Planned Programs Subtotals	3.877	4.627	4.074

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army												Date: March 2023
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*				Project (Number/Name) BE6 / *Reactive/Resp Surfaces & Matls-Soldiers & Sys*			
COST ($ in Millions)	**Prior Years**	**FY 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**Cost To Complete**	**Total Cost**
BE6: *Reactive/Resp Surfaces & Matls-Soldiers & Sys*	-	2.836	-	-	-	-	-	-	-	-	0.000	2.836

Note

In Fiscal Year (FY) 2023, this project is administratively realigned to Program Element 0602184A (Soldier Applied Research) Project CW9 (Syn Bio for Reactive-Resp Matls-Soldiers & Sys).

A. Mission Description and Budget Item Justification

This Project designs, fabricates, and assesses a variety of bio-based materials through the application of biotechnology advances to develop material capabilities that respond and adapt to a wide range of external stimuli and biological processes for protection, situational awareness, and sustainment. Innovative materials will be sought that are capable of sensing and responding, as well as adapting response, to a broad spectrum of environmental variables. Research will develop materials that are able to self-monitor, self-heal, and self-sustain. Research will explore new biology-based methods for controlled synthesis and assembly to create materials with precise chemistries, microstructures, properties, and responsive functionalities through controlled molecular placement, spatial architectures, and interfacial structures. These materials have potential to enable more survivable, situationally aware, lighter weight Soldier systems and electronics. Research conducted focuses on unique and/or novel material properties, developing models, materials characterization techniques, non-destructive testing methods and advanced fabrication/processing methodologies.

Work in this Program Element (PE) complements PE 0601102A (Defense Research Sciences) / Project AA3 (Single Investigator Basic Research), Project AA7 (Mechanics and Ballistics), and Project AA5 (Biotechnology and Systems Biology) and informs PE 0603118A (Soldier Lethality Advanced Technology) / BB3 (Dismounted Soldier Survivability Equip/Tech Integ).

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)	FY 2022	FY 2023	FY 2024
Title: Bio-enabled Materials and Processes	2.836	-	-
Description: This effort conducts applied research through the application of biotechnology advances to develop materials with capabilities to respond and adapt to a wide range of external stimuli and biological processes. Investment in bio-enabled materials research allows for the design of materials that are capable of sensing and responding, as well as adapting to a broad spectrum of environmental variables with the ability to self-monitor, self-heal, and self-sustain. Investments in this area could lead to future			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BE6 / *Reactive/Resp Surfaces & Matls-Soldiers & Sys*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
applications in Soldier performance, situational awareness, protection and sustainment. Research from this effort has potential to transition to multiple end items and applications.			
Accomplishments/Planned Programs Subtotals	2.836	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BE8 / *Synthetic Training Environment (STE) Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BE8: *Synthetic Training Environment (STE) Technology*	-	14.170	5.902	-	-	-	-	-	-	-	0.000	20.072

Note

In FY2024 funding realigned to PE 0602184A Project CN2 Intelligent Weapons Concepts and Technology

A. Mission Description and Budget Item Justification

This Project designs and develops technologies supporting the Army's Synthetic Training Environment (STE). The STE is the next generation holistic collective training capability that will train units where they will fight, with whom they will fight, and in complex operational environments to include dense urban and sub-terrain; within the entire range of combined arms maneuver tasks in support of Multi- Domain Operations. STE Information Systems (STE-IS) delivers the Common Synthetic Environment consisting of Global Terrain/One World Terrain (OWT), Training Simulation Software (TSS), and Training Management Tools (TMT). The STE will be available where training occurs (home station, combat training centers, armories, institutions, shipboard, deployed) and will include Air and Ground Reconfigurable Virtual Collective Trainers (RVCTs), a Soldier/Squad Virtual Training (S/SVT), and a live training capability. The STE will be cloud-enabled, compatible with the Army Enterprise Network, and service-based through the Common Operating Environment, including Live and Constructive. The STE will provide the realistic repetitions necessary to fight 25 bloodless battles before the first battle.

This Project is coordinated with work done in Program Element (PE) 0603118A (Soldier Lethality Advanced Technology) / Project BE9 (STE Advanced Technology).

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy and supports the STE Cross Functional Team efforts.

Work in this Project is performed by the United States Army Futures Command (AFC) and at the Institute for Creative Technologies (ICT) University Affiliated Research Center (UARC) at the University of Southern California

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: STE One World Terrain	5.339	3.744	-
Description: This effort investigates and designs tools and methods to improve the speed and fidelity of a terrain capability that provides a representation of the globe, fully accessible through the Army network and usable by all simulation trainers; develops complex representations (including megacities and subterranean) of the operational environment and the Multi-Domain battlefield in synthetic training environments.			
FY 2023 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BE8 / *Synthetic Training Environment (STE) Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Investigate tools, algorithms and communities of practice to influence terrain collection sensor design principles to include data and surfaces that portray positional information in three physical dimensions that may incorporate multiple heights at any given horizontal position directly contributing to military urban operations (e.g., single building with multiple levels); investigate the automation and convergence (fusion and decimation techniques) of geospatial sensor byproducts to support and advance the utility of 3D geospatial data across the broader force structure. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding decrease reflects a maturation of STE-related OWT technologies and a shift in research focus to longer- term research supporting training of multi-domain operations on complex, data-intensive battlefields. Effort ends in FY2023			
Title: STE Training Management Tool ***Description:*** This effort investigates Adaptive Training (AT) methods to facilitate authoring, distribution, management, and evaluation of tailored instruction for both individuals and teams; and evaluates the impact of training and education tools/ methods on comprehension, reasoning, learning, performance, retention, and transfer of knowledge and acquired skills to assess Training Effectiveness (TE) in Synthetic Training Environments. ***FY 2023 Plans:*** Investigate and validate approaches to model team competencies based on automated performance assessments from infantry squads in both live and simulated environments; develop a scenario agnostic call for fire assessment engine; conduct experiments to improve the function of dynamic, role-based assessments in teams using intelligent tutoring technologies; mature natural language processing techniques to improve near real-time assessment of teamwork using verbal communications; expand and mature the design of competency tracking architectures to include other teams including armor crews and mission command groups; validate data and reinforcement learning-driven coaching models that apply feedback and scenario adaptations to drive team development across synthetic and mixed reality environments. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding realigned to PE 0602184A Project CN2 Intelligent Weapons Concepts and Technology in FY 2024 to increase research into Human-Agent Interactions for Intelligent Squad Weapons.	4.805	1.999	-
Title: STE Training Simulation Software ***Description:*** This effort designs and develops Modeling and Simulation (M&S) technologies to enable the Army's STE TSS. This includes technologies that enable the representation of the development of synthetic military forces and noncombatants leveraging emerging Artificial Intelligence (AI) methods and techniques. This application of AI to simulation use is focused on enabling more complex modeling of the Operational Environment and the representation of Multi-Domain Operations. This effort also investigates methods and means to enable a pipeline of modeling development and reuse from authoritative sources to	4.026	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BE8 / *Synthetic Training Environment (STE) Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
simulation environments considering the complexities of simulating various echelons of warfare and their application in support of multiple collective training use cases and user interfaces to access the TSS.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.159	-
Accomplishments/Planned Programs Subtotals	14.170	5.902	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army											Date: March 2023	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*				Project (Number/Name) BP9 / *Soldier Lethality Technologies (CA)*			
COST ($ in Millions)	**Prior Years**	**FY 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**Cost To Complete**	**Total Cost**
BP9: *Soldier Lethality Technologies (CA)*	-	100.000	149.700	-	-	-	-	-	-	-	0.000	249.700

Note

Congressional Interest Item funding provided for Soldier Lethality Technologies.

A. Mission Description and Budget Item Justification

This Project is for congressional increases that support applied research in support of Soldier Lethality, where the Soldier and Squad are treated as an integrated combat platform.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023
Congressional Add: Program increase - Pathfinder Airborne ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Pathfinder Airborne ***FY 2023 Plans:*** Congressional Interest Item funding provided for Pathfinder Airborne	8.000	8.000
Congressional Add: Program Increase - Pathfinder Air Assault ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Pathfinder Air Assault	10.000	-
Congressional Add: Program increase - HEROES Program ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for HEROES ***FY 2023 Plans:*** Congressional Interest Item funding provided for HEROES	5.000	10.000
Congressional Add: Program increase - Academic Accelerator Pilot Program ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Academic Accelerator Program	15.000	-
Congressional Add: Advanced Silicon Anode Material for Batteries ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Advanced Silicon Anode Material for Batteries	10.000	-
Congressional Add: Program Increase - ADVANCED TEXTILES AND SHELTERS ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Advanced Textiles and Shelters ***FY 2023 Plans:*** Congressional Interest Item funding provided for ADVANCED TEXTILES AND SHELTERS	6.000	6.000
Congressional Add: Catalyst Traca Data Ready	5.000	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BP9 / *Soldier Lethality Technologies (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023
FY 2022 Accomplishments: Congressional Interest Item funding provided for Catalyst TRACA Data Ready		
Congressional Add: Program Increase - Digital Night Vision Technology ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Digital Night Vision Technology ***FY 2023 Plans:*** Congressional Interest Item funding provided for Digital Night Vision Technology	5.000	9.700
Congressional Add: Enhancing Soldier Ballistic Technologies ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Enhancing Soldier Ballistic Technologies	5.000	-
Congressional Add: Materials Development for Personal Protective Systems ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Materials Development for Personal Protective Systems	10.000	-
Congressional Add: Military Footwear Research ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Military Footwear Research ***FY 2023 Plans:*** Congressional Interest Item funding provided for Military Footwear Research	3.000	10.000
Congressional Add: Program Increase - Nanolayered Polymer Optics ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Nanolayered Polymer Optics ***FY 2023 Plans:*** Congressional Interest Item funding provided for Nanolayered Polymer Optics	10.000	10.000
Congressional Add: Pathfinder Translational Research Advanced Capability Acceleration ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Pathfinder Translational Research Advanced Capability Acceleration	8.000	-
Congressional Add: Program Increase - ADVANCED BALLISTIC PROTECTION TECHNOLOGY ***FY 2023 Plans:*** Congressional Interest Item funding provided for ADVANCED BALLISTIC PROTECTION TECHNOLOGY	-	25.000
Congressional Add: Program Increase - ARTIFICIAL INTELLIGENCE - ENHANCED EDUCATIONAL TECHNOLOGY AND LEARNING ***FY 2023 Plans:*** Congressional Interest Item funding provided for ARTIFICIAL INTELLIGENCE - ENHANCED EDUCATIONAL TECHNOLOGY AND LEARNING	-	5.000
Congressional Add: Program Increase - ENHANCED BALLISTIC PROTECTIVE EYEWEAR	-	5.000

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BP9 / *Soldier Lethality Technologies (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023
FY 2023 Plans: Congressional Interest Item funding provided for ENHANCED BALLISTIC PROTECTIVE EYEWEAR		
Congressional Add: Program Increase - ENHANCING SOLDIER BALLISTIC TECHNOLOGIES ***FY 2023 Plans:*** Congressional Interest Item funding provided for ENHANCING SOLDIER BALLISTIC TECHNOLOGIES	-	5.000
Congressional Add: Program Increase - FLAT PANEL TECHNOLOGY ***FY 2023 Plans:*** Congressional Interest Item funding provided for Flat Panel Technology	-	2.000
Congressional Add: Program Increase - FUTURE FORCE REQUIREMENTS EXPERIMENTATION ***FY 2023 Plans:*** Congressional Interest Item funding provided for FUTURE FORCE REQUIREMENTS EXPERIMENTATION	-	10.000
Congressional Add: Program Increase - INNOVATIVE TRAINING TECHNOLOGIES ***FY 2023 Plans:*** Congressional Interest Item funding provided for Innovative Training Technologies	-	5.000
Congressional Add: Program Increase - LITHIUM-ION BATTERY CELL RESEARCH PILOT ***FY 2023 Plans:*** Congressional Interest Item funding provided for LITHIUM-ION BATTERY CELL RESEARCH PILOT	-	9.000
Congressional Add: Program Increase - PATHFINDER ADAPTIVE EXPERIMENTATION FORCE ***FY 2023 Plans:*** Congressional Interest Item funding provided for PATHFINDER ADAPTIVE EXPERIMENTATION FORCE	-	5.000
Congressional Add: Program Increase - PATHFINDER CYBER INITIATIVES ***FY 2023 Plans:*** Congressional Interest Item funding provided for PATHFINDER CYBER INITIATIVES	-	12.000
Congressional Add: Program Increase - REGIONAL WORKFORCE PILOT ***FY 2023 Plans:*** Congressional Interest Item funding provided for Regional Workforce Pilot	-	10.000
Congressional Add: Program Increase - SOLDIER & SMALL UNIT TACTICAL ENERGY TECHNOLOGY ***FY 2023 Plans:*** Congressional Interest Item funding provided for SOLDIER & SMALL UNIT TACTICAL ENERGY TECHNOLOGY	-	3.000
Congressional Adds Subtotals	100.000	149.700

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BP9 / *Soldier Lethality Technologies (CA)*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BR9 / *Personnel & Airdrop Safety Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BR9: *Personnel & Airdrop Safety Technology*	-	3.349	3.412	3.092	-	3.092	3.091	3.735	3.738	3.778	0.000	24.195

A. Mission Description and Budget Item Justification

This Project funds the research and investigation of component technologies to enhance cargo and personnel airdrop capabilities for global precision delivery, rapid deployment, and insertion for force projection into hostile regions. Areas of emphasis include parachute technologies, parachutist injury reduction, precision offset aerial delivery, soft landing technologies, and airdrop simulation. Technologies support the Soldier Lethality Army Modernization Priority. New operational concepts call for increased precision of personnel and cargo in austere environments in which small units are dispersed and logistical supply is limited. The Army requires enhanced payload extraction and other increased capabilities to support the airdrop requirement for current and future vehicles exceeding aircraft payload weight capacity.

Work in this Project supports key Army needs and complements the technical research of several Program Elements (PEs) to include PE 0601102A (Defense Research Sciences), PE 0602143A (Soldier Lethality Technology) / Project BD6 (Soldier Sys Interfaces/ Integration- Sensor Tech), and PE 0603118A (Soldier Lethality Advanced Technology) / Project BE5 (Personnel & Airdrop Safety 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.

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Personnel & Airdrop Safety Technology	3.349	3.337	3.092
Description: This effort investigates technologies that enhance payload extraction, which will allow current vehicles to be dropped with more armor and support equipment, and reduce the design constraint on future vehicles that have airdrop as an operational requirement, increase parachute gliding capabilities, and mature delivery accuracy of cargo aerial delivery systems that support varying payload weights. Research in the area of novel parachute materials will provide increased capabilities for cargo and personnel aerial delivery systems. This effort will support an investigation of new Modeling and Simulation (M&S) tools to develop validation methods for airdrop concepts. This effort also investigates technologies that advance airborne personnel insertion safety requirements to modernize the Airborne Soldier and provide the ability to effectively execute the airborne mission through reducing safety risk and increasing capabilities.			
FY 2023 Plans: Design and develop technologies to increase the level of autonomy (e.g. fully autonomous takeoff and landing) for the manned and unmanned long range aerial resupply/insertion of a vehicle(s); design and develop safe human-in-the-loop teaming with these autonomous technologies for use with the manned personnel infiltration/exfiltration system (PIES); funds research on mission			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BR9 / *Personnel & Airdrop Safety Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
planning interfaces and algorithms to reduce a soldier's cognitive burden when planning for and executing insertion and resupply missions in a complex, contested environment. ***FY 2024 Plans:*** Will investigate non-traditional delivery approaches and platforms to support resupply methods in dispersed, contested environments; design and develop personnel infiltration/exfiltration system fuselage to increase reliability with optional autonomous guidance and flight control for a soldier and their supplies; design and develop technologies to facilitate autonomous long distance precision aerial delivery of multiple effects with expanded Global Positioning System (GPS) - degraded/denied capabilities (to include inclement weather, nighttime) and enhanced mission planning algorithms; mature models/simulation in support of cargo resupply methods and atmospheric constraints by analyzing and comparing with flight test data; ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects reduction of maturation of models effort.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.075	-
Accomplishments/Planned Programs Subtotals	3.349	3.412	3.092

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A