Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army											Date: April 2022	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2021**	**FY 2022**	**FY 2023 Base**	**FY 2023 OCO**	**FY 2023 Total**	**FY 2024**	**FY 2025**	**FY 2026**	**FY 2027**	**Cost To Complete**	**Total Cost**
Total Program Element	-	201.511	205.058	103.839	-	103.839	109.924	117.521	112.793	104.888	0.000	955.534
AY6: *Soldier Squad Small Arms Armaments Technology*	-	13.122	8.825	10.897	-	10.897	10.098	13.670	16.239	16.235	0.000	89.086
AY8: *Small Arms Fire Control Technology*	-	1.828	4.172	2.170	-	2.170	-	-	-	-	0.000	8.170
AZ2: *Body Armor & Integrated Headborne Technology*	-	6.575	6.649	6.617	-	6.617	6.693	5.763	5.765	5.763	0.000	43.825
AZ5: *Soldier Protection Technology - Vulnerability*	-	11.738	9.357	11.141	-	11.141	11.320	11.310	11.313	11.310	0.000	77.489
AZ9: *Soldier Protection Advanced Tech - Detectability*	-	3.278	1.883	1.762	-	1.762	1.468	2.135	2.217	2.239	0.000	14.982
BB4: *Dismounted Soldier Survivability Materials*	-	2.991	2.828	3.023	-	3.023	3.095	3.092	3.093	3.092	0.000	21.214
BB5: *Physical Augmentation: Tech for Human Interactions*	-	1.451	1.332	0.574	-	0.574	1.188	1.199	1.200	1.199	0.000	8.143
BB7: *Exoskeleton: Technology for Man-Machine Interface*	-	1.541	-	-	-	-	-	-	-	-	0.000	1.541
BB9: *Human Performance Tech for Mobility & Lethality*	-	2.997	2.947	-	-	-	-	-	-	-	0.000	5.944
BC2: *Next Gen Mobility & Lethality Tech for Warfighters*	-	7.245	7.704	4.333	-	4.333	4.432	7.159	6.371	6.109	0.000	43.353
BC3: *Soldier Decision Making & Comms Performance Tech*	-	4.375	-	-	-	-	-	-	-	-	0.000	4.375
BC6: *Human Perf - Tech for Warfighter Enhancement*	-	2.918	3.334	1.377	-	1.377	1.342	3.088	3.651	3.880	0.000	19.590
BC7: *Training Technology (Other than STE)*	-	13.651	14.244	25.247	-	25.247	33.673	33.208	29.601	22.246	0.000	171.870
BD1: *Adv Soldier Sensors/ Displays Tech for Dismounts*	-	11.100	11.651	16.229	-	16.229	16.484	16.472	16.469	16.465	0.000	104.870

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army											Date: April 2022	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*							
BD6: *Soldier Sys Interfaces/ Integration- Sensor Tech*	-	1.084	0.513	0.237	-	0.237	-	-	-	-	0.000	1.834
BD8: *Soldier & Sm Unit Tactical Energy Tech*	-	9.043	4.467	6.291	-	6.291	6.881	7.408	7.386	6.864	0.000	48.340
BE3: *Joint Service Combat Feeding Technology*	-	4.109	4.024	4.627	-	4.627	4.698	4.692	4.934	4.933	0.000	32.017
BE6: *Reactive/Resp Surfaces & Matls-Soldiers & Sys*	-	6.215	2.944	-	-	-	-	-	-	-	0.000	9.159
BE8: *Synthetic Training Environment (STE) Technology*	-	13.649	14.708	5.902	-	5.902	5.474	5.251	0.843	0.843	0.000	46.670
BP9: *Soldier Lethality Technologies (CA)*	-	79.000	100.000	-	-	-	-	-	-	-	0.000	179.000
BR9: *Personnel & Airdrop Safety Technology*	-	3.601	3.476	3.412	-	3.412	3.078	3.074	3.711	3.710	0.000	24.062

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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*

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).

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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	201.750	105.168	0.000	-	0.000
Current President's Budget	201.511	205.058	103.839	-	103.839
Total Adjustments	-0.239	99.890	103.839	-	103.839
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	100.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.239	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	103.839	-	103.839
• FFRDC Transfer	-	-0.110	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
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	10.000
Congressional Add: *Program increase - Rapidly Deployable Shelters*	3.000	-
Congressional Add: *Program increase - UTDD Catalyst*	5.000	-
Congressional Add: *Program increase - Lightweight Body Armor Mechanisms and Materials*	10.000	-
Congressional Add: *Program increase - Advanced Textile-Based Products*	6.000	-
Congressional Add: *Program increase - HEROES Program*	5.000	5.000
Congressional Add: *Program increase - Soldier Ballistic Technologies*	5.000	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Congressional Add: *Program increase - Medical Simulation and Training*	4.000	-
Congressional Add: *Program increase - Body Armor Study*	4.000	-
Congressional Add: *Program increase - Academic Accelerator Pilot Program*	15.000	15.000
Congressional Add: *Program increase - Advanced Ballistics Technology for Personal Protective Systems*	4.000	-
Congressional Add: *Advanced Silicon Anode Material for Batteries*	-	10.000
Congressional Add: *Advanced Textiles and Shelters*	-	6.000
Congressional Add: *Catalyst Traca Data Ready*	-	5.000
Congressional Add: *Digital Night Vision Technology*	-	5.000
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
Congressional Add: *Nanolayered Polymer Optics*	-	10.000
Congressional Add: *Pathfinder Translational Research Advanced Capability Acceleration*	-	8.000
Congressional Add Subtotals for Project: BP9	79.000	100.000
Congressional Add Totals for all Projects	79.000	100.000

Change Summary Explanation

Fiscal Year 2023 (FY23) funding increase reflects the fact that the FY22 President's Budget request did not include out-year funding.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) AY6 / *Soldier Squad Small Arms Armaments Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AY6: *Soldier Squad Small Arms Armaments Technology*	-	13.122	8.825	10.897	-	10.897	10.098	13.670	16.239	16.235	0.000	89.086

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 2021	FY 2022	FY 2023
Title: Soldier/Squad Lethality Technology	4.103	3.880	4.743
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 2022 Plans: Will design the basic theory for dispersion to reduce the dispersion complex lethal mechanisms required by next generation individual and precision (sniper) weapons; investigate advanced experimental capabilities to reduce the time and significantly increase the capacity of free flight spark ranges; investigate the potential capability for medium and heavy weapons that offer significant improvements in size, weight (reductions), and lethality (classified) performance; continue pursuing incapacitation potential of advanced high powered microwave and acoustic directed energy technologies in small and large animal models using new experimental facilities for determining underlying theory of these technologies.			
FY 2023 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AY6 / *Soldier Squad Small Arms Armaments Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
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 2022 to FY 2023 Increase/Decrease Statement:*** Funding increase supports additional research into system demonstrators for medium and heavy weapons concepts.			
Title: Human-Agent Interactions for Intelligent Squad Weapons ***Description:*** This effort investigates enhanced target acquisition, situational awareness, and shooting performance through Soldier-centered integration of intelligent technologies and distributed information in augmented squad weapons. Enhances operational performance of individuals and teams of Soldiers through novel weapon and human-agent interaction technologies.	3.713	-	-
Title: Next Generation Family of Ammo (NGFoA) ***Description:*** This effort designs and develops a family of ammunition for automatic rifles and carbine weapons with the objective of decreasing weight, increasing lethality and hit performance over current fielded systems; develops capabilities to defeat threat targets at extended ranges.	1.677	-	-
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 2022 Plans:*** Will Investigate and conduct experiments on remote armaments for precision, volume, and counter defilade fires; augmentation technologies for increased weapon system/man-in-the loop performance; non-line of sight, three-dimensional battlefield target sensing and reconstruction; and technologies that reduce small arms weapon maintenance. Will investigate component technologies for future small arms concepts to enable a more efficient, effective, and lethal Joint Warfighter. ***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,	3.629	4.623	6.154

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AY6 / *Soldier Squad Small Arms Armaments Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
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 2022 to FY 2023 Increase/Decrease Statement:*** The increase provides for investigation and experiments for the Dismounted Soldier advances in denied and austere environments in the areas of Next Generation Squad Weapons (NGSW) supporting component technologies, passive technologies to reduce weapon system signature, and leverage and integrate emerging AI technology to weapon enablers.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.322	-
Accomplishments/Planned Programs Subtotals	13.122	8.825	10.897

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) AY8 / *Small Arms Fire Control Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AY8: *Small Arms Fire Control Technology*	-	1.828	4.172	2.170	-	2.170	-	-	-	-	0.000	8.170

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.

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.

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Adv. Fire Control Tech	1.828	4.019	2.170
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 2022 Plans: Will investigate and validate mature technology development work for enhanced dismounted combatant/non-combatant automated target recognition algorithms; design improved decision aides for small arms maneuver; validate technical approaches through modeling and simulation; conduct investigations into the ability to recognize threats based on behavior.			
FY 2023 Plans: Will 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 2022 to FY 2023 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AY8 / *Small Arms Fire Control Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Funding decrease represents planned lifecycle change for this effort as Fiscal Year 2023 (FY23) is the last year of funding.			
Title: FY2022 SBIR/STTR Transfer	-	0.153	-
Description: Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	1.828	4.172	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 2023 Army			Date: April 2022
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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AZ2: *Body Armor & Integrated Headborne Technology*	-	6.575	6.649	6.617	-	6.617	6.693	5.763	5.765	5.763	0.000	43.825

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 2021	FY 2022	FY 2023
Title: Body Armor & Integrated Headborne Technology	6.575	6.406	6.617
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 2022 Plans: Will investigate the application of single lens technology with variable light transmission and active and passive anti-fog mitigation approaches from single curve substrates to complex curves shapes for incorporation into future head mounted displays and eye protection; execute concept exploration efforts to study alternative headborne protection concepts from blast overpressure threats utilizing the advanced blast simulator to systematically study headborne equipment in a controlled blast environment; conduct experiments to systematically study emerging high performance materials, associated processing conditions to include layups, consolidation methods, temperature and pressure consolidation conditions with the objective of increasing protection against future small arms threat requirements.			
FY 2023 Plans: Will 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			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AZ2 / *Body Armor & Integrated Headborne Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
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; will investigate rigid fiber reinforcement composite architectures for improving ballistic performance against small arms threats. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.243	-
Accomplishments/Planned Programs Subtotals	6.575	6.649	6.617

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) AZ5 / *Soldier Protection Technology - Vulnerability*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AZ5: *Soldier Protection Technology - Vulnerability*	-	11.738	9.357	11.141	-	11.141	11.320	11.310	11.313	11.310	0.000	77.489

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 2021	FY 2022	FY 2023
Title: Soldier Protection Technologies	3.700	3.507	3.981
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 2022 Plans:*** Will validate armor mechanisms to protect dismounted Soldiers from advanced ballistic threats through experimental and computational analysis; conduct simulations and analyze results for active armor concepts across anthropometric spectrum (e.g.			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AZ5 / *Soldier Protection Technology - Vulnerability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
body measurements and proportions such as height and weight); explore helmet material designs to improve protection against ballistic impacts and blast exposure while reducing helmet weight ***FY 2023 Plans:*** Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle 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 2022 Plans:*** Will assess improved material composite backers and helmet shells that utilize computational geometry and layering, improved fibers and films, and novel manufacturing methods such as pressure processing and fiber placement. ***FY 2023 Plans:*** Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.	2.311	2.626	2.881
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/	2.730	2.883	4.279

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AZ5 / *Soldier Protection Technology - Vulnerability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
protection schemes for the individual Warfighter. This effort supports Soldier Protection Technologies bullet and small caliber lethal mechanisms research in PE 0602143A (Soldier Lethality Technology) / Project AY6 (Soldier Squad Small Arms Armaments Technology), ***FY 2022 Plans:*** Will explore computational methods to capture failure mechanisms in different material architectures, allowing pathways for future rifle projectile defeat materials development; investigate alternative processing methodologies for multi-scale architecture that provide higher resolution, broader geometric flexibility, or tailored interfaces, and explore novel ceramic blends and ceramic structures for improved ballistic performance at reduced weight; design high throughput modeling and experimental methodologies to accelerate correlations between material structure, properties, and processing with ballistic performance. ***FY 2023 Plans:*** Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding increase supports additional research into the lightweight and dynamic materials for camo and concealment.			
Title: Multifunctional Soldier Materials - Soldier Augmentation ***Description:*** This effort researches novel multifunctional Soldier protection materials and associated processing science aimed at enabling critical Army applications in survivability via Soldier augmentation technologies. Research efforts include: multifunctional fibers, films, and coatings; adaptive and responsive materials for passive biomechanical assistance; materials for sensing body forces and kinematics; materials for high power and high speed actuation; actuator fibers and textiles; functionally graded materials; and color-changing materials.	2.997	-	-
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:***	-	0.341	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AZ5 / *Soldier Protection Technology - Vulnerability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	11.738	9.357	11.141

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) AZ9 / *Soldier Protection Advanced Tech - Detectability*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
AZ9: *Soldier Protection Advanced Tech - Detectability*	-	3.278	1.883	1.762	-	1.762	1.468	2.135	2.217	2.239	0.000	14.982

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 2021	FY 2022	FY 2023
Title: Camouflage, Concealment and Decoys Technologies for Soldier and High-Value Assets	3.278	1.815	1.762
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 2022 Plans:*** Will conduct systematic studies of fiber processing, additives, coatings and complex geometries to assess new techniques that enable heat transfer and emission control of Soldier thermal signatures against near peer and peer sensor threats operating in the electromagnetic spectrum; investigate virtual reality based methods to assess operational impact of camouflage effectiveness against direct line of sight small arms engagement scenarios and developing advanced (lifelike) Soldier camouflage avatars;			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** AZ9 / *Soldier Protection Advanced Tech - Detectability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
continue to design and mature components of active color changing materials assessing film based materials incorporating recent advancements in electrowetting, electrodesposition, and plasmonics, for future integration into Soldier clothing and individual equipment. ***FY 2023 Plans:*** Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.068	-
Accomplishments/Planned Programs Subtotals	3.278	1.883	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 2023 Army			Date: April 2022
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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BB4: *Dismounted Soldier Survivability Materials*	-	2.991	2.828	3.023	-	3.023	3.095	3.092	3.093	3.092	0.000	21.214

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 2021	FY 2022	FY 2023
Title: Dismounted Soldier Survivability Materials	2.991	2.725	3.023
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 2022 Plans: Will explore the incorporation of additional dimensions to fabric structures by researching approaches to take fibers and fabrics from traditional two-dimensional substrates to a third dimension, adding functionality within the substrate, to include stimuli-responsive fibers and yarns for real-time situational awareness, physiological monitoring, and environmental protection; investigate non-traditional procedures and techniques using additive approaches to tailor multi-functionality of Soldier personnel			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BB4 / *Dismounted Soldier Survivability Materials*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
protective equipment at very small length scales and incorporate the results of prior year?s multi-functional and e-textile findings; in support of developing personal water filtration capabilities to enable Soldiers to filter and hydrate from contaminated water sources, conduct experiments of leading candidate sophisticated breadboard hardware, capable of separating salt and other contaminants from brackish and salt water sources; investigate the potential of handheld or embedded sensing concepts to provide continuous monitoring of water quality, before and after treatment. ***FY 2023 Plans:*** Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.103	-
Accomplishments/Planned Programs Subtotals	2.991	2.828	3.023

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BB4 / *Dismounted Soldier Survivability Materials*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BB5 / *Physical Augmentation: Tech for Human Interactions*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BB5: *Physical Augmentation: Tech for Human Interactions*	-	1.451	1.332	0.574	-	0.574	1.188	1.199	1.200	1.199	0.000	8.143

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).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Training Adaptation and Movement Science	1.451	1.283	0.574

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BB5 / *Physical Augmentation: Tech for Human Interactions*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
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 2022 Plans:*** Will refine and modify training interventions for more complex, potentially multi-joint devices that may require novel or adjusted training interventions to optimize physical interactions between the Soldier and augmentation systems; improve robustness of smart control systems for characterizing movement and predicting movement intent, and will evaluate in varied environments; expand experiments to include additional Soldier loads, grades, and speeds, that manipulate control parameters of augmentation systems to determine optimal control settings for additional Soldier tasks (e.g., loaded walking, running) and to account for individual variability. ***FY 2023 Plans:*** Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding decrease reflects realignment to support higher priority efforts in PE 0602184A (Soldier Applied Research) / CO2 (Soldier-Intelligent Technology Research).			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.049	-
Accomplishments/Planned Programs Subtotals	1.451	1.332	0.574

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BB5 / *Physical Augmentation: Tech for Human Interactions*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BB7 / *Exoskeleton: Technology for Man-Machine Interface*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BB7: *Exoskeleton: Technology for Man-Machine Interface*	-	1.541	-	-	-	-	-	-	-	-	0.000	1.541

A. Mission Description and Budget Item Justification

This Project conducts applied research on metrics, measures, tools, and techniques to understand the relationships which 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 allows the Soldier and systems to jointly achieve maximum performance. Major efforts explore novel techniques for Soldier assessment, characterization of individual variability effects on performance, and development of evidence based design guidance for the application of augmentation technologies 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, establish database of human movement variability to inform intelligent system design, and identify high impact applications of augmentation.

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 2021	FY 2022	FY 2023
Title: Exoskeleton ***Description:*** This effort will accelerate Soldier lifting and mobility capabilities through applied research on exoskeleton systems with improved safety and reduced training requirements.	1.541	-	-
Accomplishments/Planned Programs Subtotals	1.541	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BB9 / *Human Performance Tech for Mobility & Lethality*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BB9: *Human Performance Tech for Mobility & Lethality*	-	2.997	2.947	-	-	-	-	-	-	-	0.000	5.944

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 2021	FY 2022	FY 2023
Title: Human Interaction for Situational Understanding	2.997	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.			
FY 2022 Plans: Will conduct experiments to determine the best approaches for visually cueing Soldiers for rapid target acquisition via augmented reality displays; continue to investigate the impact of mixed reality design parameters (e.g., graphical level of detail, uncertainty, degraded network conditions, focal depth) in ambulatory settings on decision-making, situational awareness, and navigation (including subterranean environments). This work will transition for further maturation and demonstration to a variety of partners including the United States Army Training and Doctrine Command (TRADOC) Mobile (for schoolhouse distribution), the Combat			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BB9 / *Human Performance Tech for Mobility & Lethality*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Capabilities Development Command (CCDC) Armaments Center, CCDC Command, Control, Computers, Communications, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) Center, the Synthetic Training Environment-CFT, and the Integrated Visual Augmentation System (IVAS). ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflective of planned task ending in FY2022 upon the conclusion of the OSD Measuring and Advancing Soldier Tactical Readiness and Effective (MASTR-E) Science and Technology program funding increase in FY2022.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.108	-
Accomplishments/Planned Programs Subtotals	2.997	2.947	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BC2 / *Next Gen Mobility & Lethality Tech for Warfighters*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BC2: *Next Gen Mobility & Lethality Tech for Warfighters*	-	7.245	7.704	4.333	-	4.333	4.432	7.159	6.371	6.109	0.000	43.353

A. Mission Description and Budget Item Justification

This Project investigates the means to monitor, assess and predict Soldier and squad shoot and move performance to provide design guidance for individual and mission specific equipment (e.g., individual protection, small arms, load carriage, etc.). Research conducted focuses on translating mission tasks to measures of human performance. These measures of human performance will inform predictive algorithms and human based modeling and simulation 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.

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 leverages PE 0603118A (Soldier Lethality Advanced Technology) / Project AY9 (Body Armor & Integrated Headborne Advanced Tech), Project AY5 (Soldier Squad Small Arms Armaments Advanced Technology), Project BD7 (Soldier Sys Interfaces/Integration-Sensor AdvTech), and Project BB6 (Physical Augmentation: Adv Tech for Field Demo).

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 2021	FY 2022	FY 2023
Title: Human Interaction for Mobility & Lethality	7.245	7.422	4.333
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.			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC2 / *Next Gen Mobility & Lethality Tech for Warfighters*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
FY 2022 Plans: Will design processing pipeline to prepare data for analysis and interpretation; validate innovative wearable sensors for maturity of the technology and evaluate dimensionality reduction techniques; validate predictive algorithms for monitoring and assessment of situational awareness, cognitive state and decision-making during critical Soldier tasks to provide the means for Soldier and Squad assessment for both training and test & evaluation purposes; refine predictive measures for Soldier shoot, move, communicate, navigate, and decide tasks during conditions of physical and cognitive stress in future operating scenarios; through machine learning, develop performance algorithms and a predictive squad performance model for validation in a relevant environment; develop additional head supported mass requirements based on Soldier task performance, design guidance for maxillofacial protection, and guidance for the design of headborne displays that enables cognitive/perceptual performance, including decision making and situation awareness ***FY 2023 Plans:*** Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding decrease reflects the conclusion of Office of the Secretary of Defense (OSD) Measuring and Advancing Soldier Tactical Readiness and Effective (MASTR-E) Science and Technology program funding increase in Fiscal Year 2022 (FY22). Funding also reflects a shift from PE 0602143A (Soldier Lethality Technology) /AZ2 (Body Armor & Integrated Headborne Technology), PE 0630118A (Soldier Lethality Advanced Technology) / BC1 (Human Performance Adv Tech for Mobility & Lethality), BD7 (Soldier Sys Interfaces Integration-Sensor Adv Tech), and BD9 (Soldier & Sm Unit Tactical Energy Adv Tech) to focus on the gaps discovered during the OSD plus up of the MASTR-E program.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:***	-	0.282	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC2 / *Next Gen Mobility & Lethality Tech for Warfighters*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	7.245	7.704	4.333

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BC3 / *Soldier Decision Making & Comms Performance Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BC3: *Soldier Decision Making & Comms Performance Tech*	-	4.375	-	-	-	-	-	-	-	-	0.000	4.375

A. Mission Description and Budget Item Justification

This Project conducts applied research to create analytical and empirical capabilities to characterize, model, and forecast human behavior related to cyber electromagnetic events through experimentation and field data collection. The result is increased mission effectiveness that enables strong mission command, intelligence operations, and cyber defenses, which lead to high information sharing, situational awareness, and collaboration. Major efforts focus on applied research to understand the conduct of effective cyber electromagnetic operations in that knowledge is required to create and effectively deploy cyber work systems that optimize human-machine interactions and account for operator and adversary behavior to achieve maximum effects.

Results of these efforts are provided to Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) Program Managers, Human Systems Integration (HSI) Directorate (Army G1), and the Army Test and Evaluation Command (ATEC).

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 2021	FY 2022	FY 2023
Title: Soldier Performance in Sociotechnical Environments	2.926	-	-
Description: This research provides human cyber operations assessment and advanced human decision-support capabilities to deploy cyber work systems that optimize human-machine interactions and account for operator and adversary behavior. Without these capabilities, future cyber work systems will be too complex and burdensome for operator use and training resulting in critical bottlenecks as operators have to ?catch-up? with the speed of cyber activity. This research also supports technologies for Squad-level SA assessment (information visualization) that provide command-level decision support with communication and intervention capabilities. Research focuses on algorithms for the quantification and visualization of collective uncertainty at the squad level for mission command decision making. This effort also supports the monitoring and assessing of Soldier tactical readiness and effectiveness through technologies and approaches for opportunistic human sensing.			
Title: Algorithms for Sensing Soldier in Mission Context	1.449	-	-
Description: This effort investigates enhanced decision making under conditions of uncertain, complex, time sensitive, and dynamically changing information to optimize human-artificial intelligence (AI) shared situational understanding. Enhances			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC3 / *Soldier Decision Making & Comms Performance Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
operational performance of individuals and teams of Soldiers through novel visualization technologies that represent complex time-sensitive information in uncertain dynamic environments.			
Accomplishments/Planned Programs Subtotals	4.375	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BC6 / *Human Perf - Tech for Warfighter Enhancement*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BC6: *Human Perf - Tech for Warfighter Enhancement*	-	2.918	3.334	1.377	-	1.377	1.342	3.088	3.651	3.880	0.000	19.590

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), PE 0603118A (Soldier Lethality Advanced Technology) / BD7 (Soldier Sys Interfaces/Integration-Sensor AdvTech), 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 2021	FY 2022	FY 2023
Title: Human Performance Technology for Warfighter Enhancement	2.918	3.212	1.377
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, 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 2022 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC6 / *Human Perf - Tech for Warfighter Enhancement*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Will design beta neurostimulation trade space tool and continue experiments to investigate for whom, when, and how neurostimulation is effective for improving tactically relevant skill acquisition and performance; conduct experiments and collect data to quantify the impact of neurostimulation on measures of small arms kill chain performance including threat detection, classification, and marksmanship; investigate biomarkers from the gut microbiome related to Soldier performance outcomes; conduct experiments to characterize candidate probiotic interventions to augment Soldier performance and recovery in stressful operational environments. ***FY 2023 Plans:*** Will 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. Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding change results in a reduction of iterative testing and validation of the meta-regression model with COTs neurostimulation devices (from 5 to 2 iterations), a reduction of GI-jA2COB experiments/iterations and biomarker discovery experiments as related to Soldier performance will be de-scoped.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.122	-
Accomplishments/Planned Programs Subtotals	2.918	3.334	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 2023 Army			Date: April 2022
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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BC7: *Training Technology (Other than STE)*	-	13.651	14.244	25.247	-	25.247	33.673	33.208	29.601	22.246	0.000	171.870

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 2021	FY 2022	FY 2023
Title: Medical Training Technology	3.190	3.511	3.225
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 2022 Plans: Will design automated, multi-sensor, computer vision and artificial intelligence (AI)-based medical grading and mentoring capabilities; determine if direct brain measures can be correlated to medical knowledge transfer; investigate additive manufacturing capabilities to create soft and hard tissues based on human anatomic measures; determine smart medical device			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC7 / *Training Technology (Other than STE)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
surrogates for training on dumb patient manikins; investigate the usability of hyper fidelity haptic delivery in mixed and virtual medical training environments. ***FY 2023 Plans:*** Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
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 2022 Plans:*** Will investigate visual abstraction techniques to portray objects in resource constrained (low bandwidth, reduced computing power) virtual environments without a loss in training effectiveness; design a common framework allowing collaboration across multiple disciplines to design virtual human appearances and behaviors to create interactive artificially intelligent characters for training. ***FY 2023 Plans:*** Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding realigned from another task within this Project (Innovative Training Technology) reflecting a shift in research focus from the near term development of the Synthetic Training Environment (STE) capabilities to longer term research supporting training of multi-domain operations.	1.272	3.731	7.252
Title: Cyberspace Electromagnetic Activities (CEMA) Effects Modeling and Simulation	1.464	1.418	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC7 / *Training Technology (Other than STE)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Description: This effort investigates and develops capabilities to more accurately model and simulate CEMA necessary to support training events for Corps and below. ***FY 2022 Plans:*** Will investigate the training fidelity of cloud-based network simulation services to support collective Army cyber training events; design and develop software to tag information on simulated networks to enable training Information Warfare techniques relevant to the conduct of Multi-Domain Operations (MDO); investigate techniques to validate collective training measurement methods for CEMA training assessments. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding decrease reflects planned lifecycle of this effort to progress into advanced technology development under the Synthetic Cyberspace Effects for Training task in PE 0603118A (Soldier Lethality Advanced Technology) / BC8 (Training Advanced Technology (Other than STE)).			
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. ***FY 2022 Plans:*** Will investigate reinforcement learning techniques using neural networks to create artificially intelligent entities in synthetic, virtual training environments to simulate complex military training behaviors; investigate the use of photogrammetric techniques to create photorealistic 3D synthetic terrains for the use in virtual and augmented reality training applications; investigate using advanced virtual humans using sensory feedback, natural language, and cognitive architectures to create simulated social engagements focused on leader development; design a simulation environment to accelerate the design and assessment of emerging simulation technologies using artificial intelligence. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding realigned to another task within this Project (Warfighting M/S Concepts and Design) reflecting a shift in research focus from the near term development of the STE capabilities to longer term research supporting training of multi-domain operations through the application of artificial intelligence.	5.507	2.885	-
Title: STE Live Training	2.218	2.179	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC7 / *Training Technology (Other than STE)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
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. ***FY 2022 Plans:*** Will investigate state-of-the-art sensor technologies to establish a baseline sensor suite with acceptable size, weight, power and performance characteristics; design capability to simulate tactical engagements using high fidelity micro terrain; design and develop algorithms to simulate ballistic fly-out of various infantry munitions to determine validity of geo-pairing solution in a virtual environment. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects a shift in research focus from the near term development of the STE capabilities to longer term research supporting training of multi-domain operations on complex, data-intensive battlefields.			
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:*** Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects a shift in research focus from the near term development of the STE capabilities to longer term research supporting training of multi-domain operations on complex, data-intensive battlefields.	-	-	5.679
Title: Simulation Management Technologies ***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.	-	-	3.502

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC7 / *Training Technology (Other than STE)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
FY 2023 Plans: Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects a shift in research focus from the near term development of the STE capabilities to longer term research supporting training of multi-domain operations on complex, data-intensive battlefields.			
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:*** Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects a shift in research focus from the near term development of the Synthetic Training Environment (STE) capabilities to longer term research supporting training of multi-domain operations on complex, data-intensive battlefields.	-	-	5.589
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.520	-
Accomplishments/Planned Programs Subtotals	13.651	14.244	25.247

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BC7 / *Training Technology (Other than STE)*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BD1 / *Adv Soldier Sensors/Displays Tech for Dismounts*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BD1: *Adv Soldier Sensors/ Displays Tech for Dismounts*	-	11.100	11.651	16.229	-	16.229	16.484	16.472	16.469	16.465	0.000	104.870

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 2021	FY 2022	FY 2023
Title: Advanced Soldier Sensors/Displays Technology for Dismounts	11.100	11.226	16.229
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 2022 Plans: Will conduct experiments with mixed reality (MR) applications to validate sensor system target performance; investigate atmospheric simulation techniques to improve the generation of images in the visible and infrared spectrums; examine tools that support image generation from a synthetic low light level sensor to enable data augmentation and virtual prototyping efforts; design high quantum efficiency (QE) low light level focal plane arrays; determine dark current and system noise reduction techniques to improve the sensitivity for low light level sensor performance under starlight; investigate digital readout integrated circuits (ROICs) with the Application Specific Integrated Chips (ASIC) and processing approaches to enable dynamically binned readouts for high resolution, high definition imagery in light conditions, and improved sensitivity in dark conditions; investigate			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BD1 / *Adv Soldier Sensors/Displays Tech for Dismounts*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
frame rate throttling of sensors to adapt to environmental and usage conditions including low-light to avoid degradation of situational awareness. ***FY 2023 Plans:*** Will investigate new mixed and augmented reality (MR/AR) component technologies to enhance multi sensor and multi system simulation capabilities; will 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 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding increase represents the development of needed hardware componentry to enable the next generation of dismounted Soldier sensors.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.425	-
Accomplishments/Planned Programs Subtotals	11.100	11.651	16.229

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BD6 / *Soldier Sys Interfaces/Integration-Sensor Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BD6: *Soldier Sys Interfaces/ Integration- Sensor Tech*	-	1.084	0.513	0.237	-	0.237	-	-	-	-	0.000	1.834

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 2021	FY 2022	FY 2023
Title: Soldier System Interfaces & Integration (Sensor Technology)	1.084	0.495	0.237
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 2022 Plans: Will investigate, design, and develop autonomous navigation algorithms (e.g. collaborative autonomy, dynamic retasking and task decomposition), to enhance the movement and maneuver of dismounted Small Unmanned Aerial Systems (SUAS); investigate, design, and develop algorithms to enable perch and stare and precision landing capabilities for SUAS to enable extended operations; investigate, design, and develop target pose estimation and advanced motion planning algorithms to enhance autonomous search capability for resource constrained SUAS; investigate, design, and develop multi-agent teaming algorithms and associated user interfaces to enable collaboration between Platoon and Squad level autonomous systems;			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BD6 / *Soldier Sys Interfaces/Integration-Sensor Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
validate functionality of algorithms on open architecture SUAS platforms in laboratory and simulated environment to reduce risk and improve system design. ***FY 2023 Plans:*** Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.018	-
Accomplishments/Planned Programs Subtotals	1.084	0.513	0.237

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BD8 / *Soldier & Sm Unit Tactical Energy Tech*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BD8: *Soldier & Sm Unit Tactical Energy Tech*	-	9.043	4.467	6.291	-	6.291	6.881	7.408	7.386	6.864	0.000	48.340

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 2021	FY 2022	FY 2023
Title: Tactical Power for Soldier Lethality	3.695	3.427	5.341
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 2022 Plans: Research High Voltage Electrolyte (HiVE) and innovative high power density cathode materials; investigate pairing these research materials with Silicon and Li-Metal anode technologies to validate the functionality of the Technology Readiness Level 4 material developments in a laboratory environment, which will enable greater material energy densities from 400-600 WH/Kg for longer runtimes, in distributed operations, with limited resupply; conduct experiments to quantify power trade space and requirements analysis that will enable development of high energy density materials for longer runtime durations for Soldier Tactical Power, Robotics, and Swarming unmanned aircraft systems (UAS) or other priorities identified by the Soldier Lethality Cross Functional			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BD8 / *Soldier & Sm Unit Tactical Energy Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Team (CFT); investigate power generation technologies to provide autonomous, on-the-move recharging through power management and distribution for critical Soldier Lethality applications and enable extended duration missions. ***FY 2023 Plans:*** Will down-select, design, and develop safe, high voltage electrolyte materials and will 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. Will 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 Soldier Tactical Power, Robotics, and other critical Soldier Lethality applications for 7 day semi-autonomous operations with limited resupply. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding in this effort was realigned from PE 0603118A (Soldier Lethality Advanced Technology) / Project BC9 (Adv Soldier Sensors/Displays AdvTech for Dismounts) and will be used to down select 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 2022 Plans:*** Will design, develop, and validate conceptual device that couples multifuel, excess enthalpy reactors with solid state thermal energy conversion for portable power generation; explore microchannel and porous media surface composition and thermal designs to vaporize liquid fuels while minimizing carbon deposits on microchannel walls and pressure drop; investigate fabrication and integration methods that enhance cavity design flexibility including packaging for vacuum or thermally insulating sealed cavities between microreactors, spectral control elements, and photovoltaic cells to enable high view factors, providing lower energy losses across the small gaps in the cavity, and low thermal loss when scaling for compact, thin profiles for wearable power sources ***FY 2023 Plans:*** Will 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	5.348	0.877	0.950

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BD8 / *Soldier & Sm Unit Tactical Energy Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
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 2022 to FY 2023 Increase/Decrease Statement:*** Funding increase reflects planned lifecycle of this effort.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.163	-
Accomplishments/Planned Programs Subtotals	9.043	4.467	6.291

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BE3 / *Joint Service Combat Feeding Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BE3: *Joint Service Combat Feeding Technology*	-	4.109	4.024	4.627	-	4.627	4.698	4.692	4.934	4.933	0.000	32.017

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 2021	FY 2022	FY 2023
Title: Joint Service Combat Feeding Technology	4.109	3.877	4.627
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 2022 Plans: Will validate effects of high fat intake on physical performance to ensure optimal nutrient profiles in weight reduced rations; determine effects of nutritional factors on intestinal function, investigate feasibility of developing a three-dimensional (3D) intestinal tissue model to identify effects of nutritional interventions and bioactives on immune function and gastrointestinal health and investigate effect of nutrient compounds on circulating biomarkers and immune function to prevent performance decrements in deployed troops;determine correlations between lipid oxidation analysis techniques and sensory results to improve monitoring			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BE3 / *Joint Service Combat Feeding Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
ability in ration components and ensure optimized nutrition; investigate individual warfighter hydration methods to decrease logistical burdens in multi-domain operations and investigate augmented reality technologies to enable food safety inspections in austere environments ***FY 2023 Plans:*** Will 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; 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding realigned from PE 0603118A (Soldier Lethality Advanced Technology) / BE2 (Joint Service Combat Feeding Advanced Technology). Funding increase in Fiscal Year 2023 (FY)23 will enable additional development efforts to increase performance, decrease food-borne illness, and increase overall readiness of the Warfighter.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.147	-
Accomplishments/Planned Programs Subtotals	4.109	4.024	4.627

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BE6 / *Reactive/Resp Surfaces & Matls-Soldiers & Sys*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BE6: *Reactive/Resp Surfaces & Matls-Soldiers & Sys*	-	6.215	2.944	-	-	-	-	-	-	-	0.000	9.159

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 2021	FY 2022	FY 2023
Title: Bio-enabled Materials and Processes	2.882	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 2023 Army		Date: April 2022
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 2021	FY 2022	FY 2023
applications in Soldier performance, situational awareness, protection and sustainment. Research from this effort has potential to transition to multiple end items and applications. ***FY 2022 Plans:*** Will design strategies to integrate biological building blocks with sensor platforms; mature peptide-based building blocks for strength and selectivity of target interactions, and down select candidate peptide materials; validate models and use computational and experimental tools to investigate properties of novel molecules for improved adhesion and structural stability of composites; build characterization and computation tools for rapid prototyping of biomaterials; down-select targets and use computational and analytical tools to validate models of accelerated degradation of high value targets; explore biological engineering strategy to counter material degradation. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding administratively realigned to PE 0602184A (Soldier Applied Resaerch) / CW9 (Syn Bio for Reactive-Responsive Matls-Soldiers & Sys) in FY 2023.			
Title: Scalable and On-Demand Production of Novel Molecules ***Description:*** This effort conducts applied research through the investigation of new methods to produce novel biological molecules. Typical customized molecule production is extremely expensive and difficult to achieve. Investment in synthetic biomanufacturing techniques will further the applicability and widespread use of novel molecules to further Warfighter performance.	3.333	-	-
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.108	-
Accomplishments/Planned Programs Subtotals	6.215	2.944	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BE6 / *Reactive/Resp Surfaces & Matls-Soldiers & Sys*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BE8 / *Synthetic Training Environment (STE) Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BE8: *Synthetic Training Environment (STE) Technology*	-	13.649	14.708	5.902	-	5.902	5.474	5.251	0.843	0.843	0.000	46.670

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 2021	FY 2022	FY 2023
Title: STE One World Terrain	5.832	5.339	3.848
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 2022 Plans: Will investigate tools, algorithms and communities of practice to develop automated complex terrain features for Dense Urban Environments and determine level of attribution required to extend OWT data model support for dynamic and cascading effects (e.g., transportation tunnels, civilian infrastructure); investigate and determine OWT data model compliant metadata (e.g.,			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BE8 / *Synthetic Training Environment (STE) Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
geometry, attributes) towards enriching OWT three-dimensional (3D) terrain mesh generation; design terrain correlated material maps with textures to advance simulation sensor implementations and enable physics-based calculation for terrain modification. ***FY 2023 Plans:*** Will 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding decrease reflects a shift in research focus from the near term development of the STE capabilities to longer term research supporting training of multi-domain operations on complex, data-intensive battlefields.			
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 2022 Plans:*** Will validate techniques for automating team performance assessments and actionable automated after action review (AAR) feedback to teams, leaders, and instructors; continue design of adaptive, intelligent tutor for teaming to maximize training outcomes at the point of need; investigate team tutor technologies to assess team training measures and effectiveness; determine reinforcement learning-based planning models to deliver run-time feedback to teams during simulation-based training; investigate team intelligent tutoring based on roles and functions within the team to assess the overall team readiness level; design team communication analysis toolkit using natural language processing and deep learning neural networks to analyze and assess team communications during simulated training exercises; investigate team performance assessments for the instructors using artificial intelligence models to determine an evaluation of a team?s performance and recommendations to optimize training toward an acceptable readiness level; investigate the association between squad level performance measures for individuals and teams and determine how to best deliver data to assess their performance. ***FY 2023 Plans:*** Will 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	5.269	4.805	2.054

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BE8 / *Synthetic Training Environment (STE) Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
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 2022 to FY 2023 Increase/Decrease Statement:*** Funding decrease reflects a shift in research focus from the near-term development of the STE` capabilities to longer term research supporting training of multi-domain operations on complex, data-intensive battlefields.			
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 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. ***FY 2022 Plans:*** Will investigate application of Artificial Intelligence (AI) techniques to enable autonomous squad-level interactions between friendly forces, non-combatants, and enemy threats in support of squad battle drills; will design methods to connect Operational Environment (OE) models, data and algorithms with emerging AI techniques in order to automate generation of representative OE simulation for collective training; will investigate cross-cutting modeling capabilities required to enable Multi-Domain Operations and their effect on model interactions, such as the introduction of complex weather modeling, that could impact the ability to deliver collective training. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding decrease reflects a shift in research focus from the near term development of the STE capabilities to longer term research supporting training of multi-domain operations on complex, data-intensive battlefields.	2.548	4.026	-
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:***	-	0.538	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BE8 / *Synthetic Training Environment (STE) Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638			
Accomplishments/Planned Programs Subtotals	13.649	14.708	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 2023 Army										Date: April 2022		
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 2021**	**FY 2022**	**FY 2023 Base**	**FY 2023 OCO**	**FY 2023 Total**	**FY 2024**	**FY 2025**	**FY 2026**	**FY 2027**	**Cost To Complete**	**Total Cost**
BP9: *Soldier Lethality Technologies (CA)*	-	79.000	100.000	-	-	-	-	-	-	-	0.000	179.000

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 2021	FY 2022
Congressional Add: Program increase - Pathfinder Airborne ***FY 2021 Accomplishments:*** Conducted applied research in Pathfinder Airborne. Work executed by Army Futures Command. ***FY 2022 Plans:*** Congressional Interest Item funding provided for Pathfinder Airborne	8.000	8.000
Congressional Add: Program Increase - Pathfinder Air Assault ***FY 2021 Accomplishments:*** Conducted applied research in Pathfinder Air Assault. Work executed by Army Futures Command. ***FY 2022 Plans:*** Congressional Interest Item funding provided for Pathfinder Air Assault	10.000	10.000
Congressional Add: Program increase - Rapidly Deployable Shelters ***FY 2021 Accomplishments:*** Conducted applied research in Rapidly Deployable Shelters. Work executed by Army Futures Command.	3.000	-
Congressional Add: Program increase - UTDD Catalyst ***FY 2021 Accomplishments:*** Conducted applied research in UTDD Catalyst. Work executed by Army Futures Command.	5.000	-
Congressional Add: Program increase - Lightweight Body Armor Mechanisms and Materials	10.000	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BP9 / *Soldier Lethality Technologies (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022
FY 2021 Accomplishments: Conducted applied research in Lightweight Body Armor Mechanisms and Materials. Work executed by Army Futures Command.		
Congressional Add: Program increase - Advanced Textile-Based Products ***FY 2021 Accomplishments:*** Conducted applied research in Advanced Textile-Based Products. Work executed by Army Futures Command.	6.000	-
Congressional Add: Program increase - HEROES Program ***FY 2021 Accomplishments:*** Conducted applied research in HEROES Program. Work executed by Army Futures Command. ***FY 2022 Plans:*** Congressional Interest Item funding provided for HEROES	5.000	5.000
Congressional Add: Program increase - Soldier Ballistic Technologies ***FY 2021 Accomplishments:*** Conducted applied research in Soldier Ballistic Technologies. Work executed by Army Futures Command.	5.000	-
Congressional Add: Program increase - Medical Simulation and Training ***FY 2021 Accomplishments:*** Conducted applied research in Medical Simulation and Training. Work executed by Army Futures Command.	4.000	-
Congressional Add: Program increase - Body Armor Study ***FY 2021 Accomplishments:*** Conducted applied research in Body Armor Study. Work executed by Army Futures Command.	4.000	-
Congressional Add: Program increase - Academic Accelerator Pilot Program ***FY 2021 Accomplishments:*** Conducted applied research in Academic Accelerator Pilot Program.	15.000	15.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BP9 / *Soldier Lethality Technologies (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022
Work executed by Army Futures Command. ***FY 2022 Plans:*** Congressional Interest Item funding provided for Academic Accelerator Program		
Congressional Add: Program increase - Advanced Ballistics Technology for Personal Protective Systems ***FY 2021 Accomplishments:*** Conducted applied research in Advanced Ballistics Technology for Personal Protective Systems. Work executed by Army Futures Command.	4.000	-
Congressional Add: Advanced Silicon Anode Material for Batteries ***FY 2022 Plans:*** Congressional Interest Item funding provided for Advanced Silicon Anode Material for Batteries	-	10.000
Congressional Add: Advanced Textiles and Shelters ***FY 2022 Plans:*** Congressional Interest Item funding provided for Advanced Textiles and Shelters	-	6.000
Congressional Add: Catalyst Traca Data Ready ***FY 2022 Plans:*** Congressional Interest Item funding provided for Catalyst TRACA Data Ready	-	5.000
Congressional Add: Digital Night Vision Technology ***FY 2022 Plans:*** Congressional Interest Item funding provided for Digital Night Vision Technology	-	5.000
Congressional Add: Enhancing Soldier Ballistic Technologies ***FY 2022 Plans:*** Congressional Interest Item funding provided for Enhancing Soldier Ballistic Technologies	-	5.000
Congressional Add: Materials Development for Personal Protective Systems ***FY 2022 Plans:*** Congressional Interest Item funding provided for Materials Development for Personal Protective Systems	-	10.000
Congressional Add: Military Footwear Research ***FY 2022 Plans:*** Congressional Interest Item funding provided for Military Footwear Research	-	3.000
Congressional Add: Nanolayered Polymer Optics ***FY 2022 Plans:*** Congressional Interest Item funding provided for Nanolayered Polymer Optics	-	10.000
Congressional Add: Pathfinder Translational Research Advanced Capability Acceleration	-	8.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022
FY 2022 Plans: Congressional Interest Item funding provided for Pathfinder Translational Research Advanced Capability Acceleration		
Congressional Adds Subtotals	79.000	100.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602143A / *Soldier Lethality Technology*	Project (Number/Name) BR9 / *Personnel & Airdrop Safety Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
BR9: *Personnel & Airdrop Safety Technology*	-	3.601	3.476	3.412	-	3.412	3.078	3.074	3.711	3.710	0.000	24.062

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 2021	FY 2022	FY 2023
Title: Personnel & Airdrop Safety Technology	3.601	3.349	3.412
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 2022 Plans: Will mature high altitude personnel and cargo insertion technologies that facilitate extended offset insertions in GPS denied conditions; carry out research on high offset air insertion and resupply mission capability enhancements; perform research into sensor integration and fusion techniques to produce robust navigational datasets suitable for guidance, navigation and control			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602143A / *Soldier Lethality Technology*	**Project (Number/Name)** BR9 / *Personnel & Airdrop Safety Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
of autonomous systems in contested and challenging mission environments; determine feasibility of materiel and non-materiel solutions focused on reduction of airdrop platform signature. ***FY 2023 Plans:*** Will 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 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 2022 to FY 2023 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: FY2022 SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC ?638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC ?638	-	0.127	-
Accomplishments/Planned Programs Subtotals	3.601	3.476	3.412

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A