Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Army											Date: May 2021	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602184A *I Soldier Applied Research*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	-	-	11.064	-	11.064	-	-	-	-	-	-
CK9: *Advancing Concepts and Technology Forecasting Tech*	-	-	-	2.289	-	2.289	-	-	-	-	-	-
CN2: *Intelligent Weapons Concepts and Technologies*	-	-	-	2.178	-	2.178	-	-	-	-	-	-
CN9: *Soldier Enabling University Applied Research*	-	-	-	0.939	-	0.939	-	-	-	-	-	-
CO1: *Soldier Power And Energy Concepts and Technologies*	-	-	-	1.241	-	1.241	-	-	-	-	-	-
CO2: *Soldier-Intelligent Technology Research*	-	-	-	4.417	-	4.417	-	-	-	-	-	-

Note

This is a new start in FY 2022.

This is a new Program Element in FY 2022.

A. Mission Description and Budget Item Justification

This PE investigates, designs, and performs research focused on technologies necessary for capability enhancements for the Soldier and Squad over the long-term well beyond those technologies planned within the Soldier Lethality Cross- Functional Team. Applied research projects investigate nascent and enduring science and technology areas that are applicable to the individual Soldier and Squads of Soldiers needs with emphasis on maximizing Soldier and Squad performance, lethality, mobility and survivability. This PE designs and validates technologies that are necessary and foundational for future capabilities with far-reaching impact on mission success. The outputs of these efforts transition to advanced research efforts that mature and demonstrate potential opportunities to realize improved Soldier performance and inform technical requirements for future Soldier systems.
The PE will fund civilian salaries for in-house researchers/scientists and program managers collaborating with external subject matter experts in academia and industry who are leaders in these technology research areas.

In FY20 the Army restructured Science and Technology resources to align to the Secretary of the Army's six modernization priorities and allow transparent accountability of these priorities. Creation of this PE will facilitate the Soldier Lethality priority identification of technologies that enable multiple Soldier systems and are enduring (e.g. power generation, storage and distribution; protective materials; network integration; human systems integration, personnel research). This PE creation completes the FY20 restructuring process and ensures consistency across the six priority areas PE structures, with each priority area having two PEs per Budget Activity: one aligned to Soldier efforts that support priority systems (e.g. Next Generation Squad Weapons, Integrated Virtual Augmentation System) and the other aligned to enduring

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Army	Date: May 2021
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*

enabling technologies projects for future capabilities and/or technology upgrades. The enabling projects will be moved from the Soldier Technologies PE 622143A to this new PE, improving visibility of Army research efforts that enable the future operating environment.

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 (US) Army Futures Command (AFC).

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	11.064	-	11.064
Total Adjustments	0.000	0.000	11.064	-	11.064
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	11.064	-	11.064

Change Summary Explanation

New Program Element in Fiscal Year (FY) 2022 established for enabling science and technology efforts that support applied soldier research.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army			Date: May 2021
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602184A / *Soldier Applied Research*	Project (Number/Name) CK9 / *Advancing Concepts and Technology Forecasting Tech*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
CK9: *Advancing Concepts and Technology Forecasting Tech*	-	-	-	2.289	-	2.289	-	-	-	-	-	-

Note

This is a new start in FY 2022.

In Fiscal Year 2022 (FY22) this is a New Project.

A. Mission Description and Budget Item Justification

This Project works across the Army Futures Command Combat Capabilities Development Command (AFC CCDC) and with the Futures & Concepts Center (FCC) to explore current and future emerging and disruptive applied scientific research in order to translate, integrate, and ingrain applied research outcomes with Army Warfighting Concepts to describe how the Army will fight in the mid and far-term future. Applied research outcomes describe the projected future operational effects of science in the context of Army concepts to mitigate risk for future Army capabilities and enable informed decision making across the Army Modernization Enterprise. This Project ensures Army Concepts are grounded by recent discoveries in applied scientific research, Army applied research is capability use-inspired to deliver the right future capability identified in the Army Concepts, and learning opportunities are created to advance Army Concepts and operationalize science for transformational overmatch.

This Project also performs long-range technology forecasts and trend analysis, informed by the threat and the predicted future state of technology, of Army-relevant applied research topics to enable informed decision making for the near-, mid-, and far-terms.

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 2020	FY 2021	FY 2022
Title: Advancing Concepts and Technology Forecasting	-	-	2.289
Description: Advancing Concepts and Technology Forecasting identifies and translates emerging and disruptive applied scientific research current and future outcomes in order to integrate and ingrain applied scientific data and knowledge with Army Warfighting Concepts which describe how the Army will fight in the mid- and far-term future. This effort also provides long-range, scientifically grounded technology forecasts and trend analysis, informed by the threat and future predicted state of technology, of applied research topics to enable informed decision-making for the near-, mid-, and far-terms.			
FY 2022 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*	**Project (Number/Name)** CK9 / *Advancing Concepts and Technology Forecasting Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Will integrate knowledge of applied scientific research outcomes with warfighting concepts with a focus on mid- and far-term Maneuver, Fires, and Mission Command Army Warfighting Concepts; perform long-range technology forecasts and near/mid-term horizon scanning of the Army Priority Research Areas; provide reports, briefings, and information papers to the Army Modernization Enterprise to influence personnel and funding decisions. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding increase reflects realignment of funding to create this New Project for enabling informed decision making across the Army Modernization Enterprise and ensure Army Concepts are grounded by recent discoveries in applied scientific research.			
Accomplishments/Planned Programs Subtotals	-	-	2.289

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army			Date: May 2021
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602184A / *Soldier Applied Research*	Project (Number/Name) CN2 / *Intelligent Weapons Concepts and Technologies*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
CN2: *Intelligent Weapons Concepts and Technologies*	-	-	-	2.178	-	2.178	-	-	-	-	-	-

Note

In FY 2022, Project is realigned form PE 0602143A (Soldier Lethality Technology) / Project AY6 (Soldier Squad Small Arms Armaments Technology).

A. Mission Description and Budget Item Justification

This effort focuses on far-term, overarching lethality technologies by investigating techniques for Soldiers to guide the in-field adaptation of intelligent small arm technologies to respond to changing mission requirements, novel environments, and adversarial actions. Research areas include cognition-centric displays to ensure Soldiers maintain appropriate situational awareness in augmented reality environments, opportunistic shooter sensing, and interactive machine learning techniques to ensure small arm technologies can adapt to changing situations quickly and with reduced data requirements as compared to non-human guided machine learning and Artificial Intelligence (AI). The results of this Project will enhance operational performance of individuals and teams of Soldiers in the future operational environment through novel weapon and human-agent interaction technologies.

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 2020	FY 2021	FY 2022
Title: Human-Agent Interactions for Intelligent Squad Weapons	-	-	2.178
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.			
FY 2022 Plans: Will investigate methods to label relevant data from Soldier-systems interactions through opportunistic sensing and drive the adaptation of intelligent small-arms technology; design initial approaches for human-computer vision teamed augmented reality.			
FY 2021 to FY 2022 Increase/Decrease Statement: Funding change reflects realignment of funding from PE 0602143A (Soldier Lethality Technology) / Project AY6 (Soldier Squad Small Arms Armaments Technology) in FY 2022.			
Accomplishments/Planned Programs Subtotals	-	-	2.178

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*	**Project (Number/Name)** CN2 / *Intelligent Weapons Concepts and Technologies*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army			Date: May 2021
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602184A / *Soldier Applied Research*	Project (Number/Name) CN9 / *Soldier Enabling University Applied Research*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
CN9: *Soldier Enabling University Applied Research*	-	-	-	0.939	-	0.939	-	-	-	-	-	-

Note

This is a new start in FY 2022.

In Fiscal Year 2022 (FY22), this is a New Project.

A. Mission Description and Budget Item Justification

This Project investigates technologies from academia that will improve capabilities and systems to advance Soldier and Squad lethality-overmatch and Soldier performance. This Project funds collaborative, enduring applied extramural university-based research and brings together competitively selected universities with Army research teams into Technical Alliances. This Project will determine discovery solutions and inform capabilities development for mid- to far-term Army modernization priorities while also maintaining delivery of near-term technologies fundamental to the modernization priorities. The technical scope of this Project includes the investigation and design of overarching Soldier-centric technologies including, human systems integration, robotics, synthetic environments for training, advanced materials, power management, energy, Warfighter endurance, and computational technologies. This effort conducts applied research for potential emerging technologies in areas of strategic importance to the Army in Soldier capabilities related to increased protection, performance, agility, situational awareness, and lethality. This Project will continuously strive to engage and collaborate with entities that might not otherwise collaborate with the DoD to identify and determine novel Soldier-centric technologies for accelerating the adoption of emerging technologies for the Warfighter in the Army Soldier portfolio.

Work in this Project supports the Army Modernization Priority Synthetic Training Environment, and Soldier Lethality and the overall Soldier portfolio.

The cited work is consistent with 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 (US) Army Futures Command.

Work in this Project complements and transitions to Soldier Enabling University Advanced Development in PE 0603044A (Soldier Advanced Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Soldier Training and Performance	-	-	0.639
Description: Collaboratively investigate technologies for Soldier capabilities related to increased protection, performance, agility, situational awareness, training, and lethality.			
FY 2022 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*	**Project (Number/Name)** CN9 / *Soldier Enabling University Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Investigate automated testing framework to guarantee that synthetic training environments are highly trustworthy, reliable, and usable, to ensure that Soldiers are efficiently trained; Optimize intelligent real time edge processing of streams for wide area persistent surveillance, signature event detection and tracking towards the Army's next generation active protection and situational awareness systems; investigate timely and reliable monitoring and assessment technologies for the health and readiness of Warfighters through digital biomarkers and biosensors. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding increase reflects realignment of funding to create this New task to support collaborative, enduring research with competitively selected universities that investigates Soldier-centric technologies to promote the adoption of emerging technologies for the Soldier.			
Title: Soldier Electronics for the Integrated Combat Platform ***Description:*** Design and determine advanced materials and electronics that are standardized to the Soldier and their equipment through integrated combat platform. ***FY 2022 Plans:*** Funds research to design and investigate Soldier electronics and standardize data, and power interfaces and connection points across the Soldier and Squad combat platform. Investigate and develop energy storage and other materials such as self-healing and super materials for increased protection, flexible electronics, and power generation. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding increase reflects realignment of funding to create this New task to support university-driven, enduring research that investigates Soldier-centric electronics technologies for integration with the combat platform to support adoption of emerging technologies for the Soldier that reduce burden and promote mobility.	-	-	0.300
Accomplishments/Planned Programs Subtotals	-	-	0.939

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army			Date: May 2021
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602184A / *Soldier Applied Research*	Project (Number/Name) CO1 / *Soldier Power And Energy Concepts and Technologies*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
CO1: *Soldier Power And Energy Concepts and Technologies*	-	-	-	1.241	-	1.241	-	-	-	-	-	-

Note

In FY 2022, this new Project is realigned from PE 0602143A (Soldier Lethality Technology) / Project BD8 (Soldier & Sm Unit Tactical Energy Tech).

A. Mission Description and Budget Item Justification

This Project conducts applied research to improve safe, compact, efficient, rugged, lightweight, and energy dense power sources for increased capabilities for the mounted and dismounted force. This Project also investigates materials, processes, and component level energy storage and conversion technologies that enable tactical overmatch and reduce the physical and cognitive burden on Soldiers. Research will focus on safe electrochemical energy storage, high specific energy storage and conversion, novel materials and processing for energy and power, and new cell designs that address the power needs of future capabilities including the Next Generation Squad Weapons (NGSW), Integrated Visual Augmentation System (IVAS), and other advanced sensors, communications systems, and electronic Warfighting capabilities. Enabling and emerging technologies are supported in this Project to address future Soldier power needs necessary for increased lethality, increased mobility, and longer mission durations at reduced physical burden to the Soldier in the future operating environment.

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 2020	FY 2021	FY 2022
Title: Tactical Energy Sources and Energy Materials	-	-	1.241
Description: This effort conducts overarching power and energy research to determine and design alternative energy capabilities to replace current energy systems. Research focuses on new materials and processing techniques as well as energy storage technologies that support advanced sensors, communications systems, and electronic Warfighting capabilities.			
FY 2022 Plans: Will investigate improved anodes and cathode materials and electrode structures for aqueous electrolyte batteries including silicon based anode materials for high energy, safe, non-flammable aqueous batteries; extend aqueous electrolytes to other multivalent cations including zinc rechargeable systems; investigate zinc metal reversibility for high energy rechargeable safe batteries; explore the solvation, interface, and transport of highly concentrated electrolytes and the effects on electrode/electrolyte interfaces; assess energy conversion materials and technologies for FY 2023 inclusion.			
FY 2021 to FY 2022 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*	**Project (Number/Name)** CO1 / *Soldier Power And Energy Concepts and Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Funding change in FY 2022 reflects realignment of funding from PE 0602143A (Soldier Lethality Technology) / BD8 (Soldier & Sm Unit Tactical Energy Tech).			
Accomplishments/Planned Programs Subtotals	-	-	1.241

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army			Date: May 2021
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602184A / *Soldier Applied Research*	Project (Number/Name) CO2 / *Soldier-Intelligent Technology Research*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
CO2: *Soldier-Intelligent Technology Research*	-	-	-	4.417	-	4.417	-	-	-	-	-	-

Note

In FY 2022 this new project is realigned from PE 0602143A (Soldier Lethality Technology) / Project BC3 (Soldier Decision Making & Comms Performance Tech).

A. Mission Description and Budget Item Justification

This Project investigates research gaps related to human and intelligent systems to enhance decision making in response to changing conditions. Applied research is conducted on novel and emerging visualization technologies as well as methodologies for intelligent systems and Soldier to co-adapt for the real-time quantification, prediction, and enhancement of squad-level shared situational awareness (SA) and situational understanding (SU) across dynamic, complex, and uncertain operating environments, leading to demonstrated increases in mission effectiveness. The result of this effort will inform various efforts that rely on human and intelligent system interactions including systems that adapt the behavior of autonomous assets and intelligent Soldier tools, based on dynamic needs of the Soldier/squad, using real-time opportunistic measures of Soldier SA and changing mission environment. In addition, this Project will design novel approaches to represent uncertain and dynamically changing information, to increase Soldier comprehension and enhanced mission effectiveness, with reduced Soldier/squad burden and training requirements.

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 2020	FY 2021	FY 2022
Title: Soldier Performance in Sociotechnical Environments	-	-	2.981
Description: Technologies for squad-level situational awareness 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.			
FY 2022 Plans: Will explore methods for how autonomous systems can leverage real-time measures of squad-level situational awareness to improve mission outcomes; design initial capability to opportunistically assess group performance in dismounted virtual environments; validate group performance measures in augmented reality systems.			
FY 2021 to FY 2022 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*	**Project (Number/Name)** CO2 / *Soldier-Intelligent Technology Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Funding change in FY 2022 reflects realignment of funding from PE 0602143A (Soldier Lethality Technology) / BC3 (Soldier Decision Making & Comms Performance Tech).			
Title: Algorithms for Sensing Soldiers in Mission Context ***Description:*** This effort investigates novel and emerging visualization technologies representing complex, time-sensitive information in the dynamic operating environment as well as technologies for human and artificial intelligence (AI) situational understanding for enhanced operational performance and decision making under conditions of time sensitive and dynamically changing information. ***FY 2022 Plans:*** Will design techniques for tailoring the representation of uncertain battlespace information in time-sensitive environments for increased Soldier situation awareness and improved mission relevant decision making. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding change in FY 2022 reflects realignment of funding from PE 0602143A (Soldier Lethality Technology) / BC3 (Soldier Decision Making & Comms Performance Tech).	-	-	1.436
Accomplishments/Planned Programs Subtotals	-	-	4.417

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A