Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army											Date: March 2023	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**Cost To Complete**	**Total Cost**
Total Program Element	-	239.284	277.445	166.500	-	166.500	166.523	171.140	161.329	152.140	0.000	1,334.361
BF3: *Combat Vehicle Robotics Tech*	-	16.105	20.614	17.443	-	17.443	16.832	16.010	15.707	15.878	0.000	118.589
BF6: *Crew Augmentation and Optimization Tech*	-	8.558	10.761	11.664	-	11.664	11.668	10.101	10.108	10.217	0.000	73.077
BF8: *Artificial Intelligence & Machine Learning Tech*	-	13.261	19.906	20.329	-	20.329	17.477	17.498	17.510	17.702	0.000	123.683
BF9: *Sensors for Autonomous Operations and Surv Tech*	-	34.174	22.666	25.327	-	25.327	24.722	24.890	25.639	25.919	0.000	183.337
BG2: *Modeling and Simulation for MUMT Technology*	-	6.473	5.591	5.526	-	5.526	4.591	4.267	4.419	4.043	0.000	34.910
BG6: *Advanced Concepts for Active Defense Technology*	-	29.415	33.656	32.668	-	32.668	33.005	37.824	34.056	25.215	0.000	225.839
BG8: *Obscuration Technology*	-	2.482	2.722	-	-	-	-	-	-	-	0.000	5.204
BH5: *Platform Electrification and Mobility Tech*	-	13.278	14.226	13.763	-	13.763	17.168	19.957	15.514	14.398	0.000	108.304
BI2: *Sensor Protection Technology*	-	5.615	6.229	5.532	-	5.532	5.955	8.462	7.734	7.819	0.000	47.346
BI4: *Materials Application and Integration Tech*	-	7.369	7.722	7.505	-	7.505	7.508	7.047	7.051	7.128	0.000	51.330
BI9: *Vehicle System Security Technology*	-	2.273	-	-	-	-	-	-	-	-	0.000	2.273
BJ2: *Tactical and Navigation Lasers Sensors Technology*	-	5.168	5.673	5.790	-	5.790	5.851	5.854	5.857	5.921	0.000	40.114
BJ9: *Autonomous Mobility Tech*	-	3.671	-	-	-	-	-	-	-	-	0.000	3.671
BK2: *Virtual Prototyping Technology*	-	7.871	9.622	9.910	-	9.910	9.934	10.648	10.656	10.772	0.000	69.413

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army											Date: March 2023	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602145A *I Next Generation Combat Vehicle Technology*							
BK3: *Next Gen Intelligent Fire Control (NG-IFC) Tech*	-	0.926	-	-	-	-	-	-	-	-	0.000	0.926
BK5: *Adv Direct In-Direct Armament Sys (ADIDAS) Tech*	-	8.845	13.526	11.043	-	11.043	11.812	8.582	7.078	7.128	0.000	68.014
BP5: *Ground Vehicle Technology (CA)*	-	73.800	103.500	-	-	-	-	-	-	-	0.000	177.300
CU5: *Platform Agnostic Armaments Applied Technology*	-	-	1.031	-	-	-	-	-	-	-	0.000	1.031

A. Mission Description and Budget Item Justification

This Program element (PE) line is directly aligned to the Next Generation Combat Vehicle (NGCV) Army Modernization Priority. This PE researches, designs, and evaluates combat vehicle technologies that enable the Army to have a smarter, faster, more lethal, more precise, more protected, and more adaptable force. The focus is on building upon the foundational vehicle architectures to support the Next Generation of Combat Vehicles, to include autonomy architecture, power architecture, vehicle electronic architecture, physical architecture, lethality architecture and vehicle protection architecture. The research conducted will provide technologies to enable leap ahead capabilities for manned, optionally manned and unmanned vehicles that deliver decisive lethality.

Work in this PE complements PE 0602141A (Lethality Technology), PE 0602144A (Ground Technology), PE 0602146A (Network C3I Technology), PE 0603116A (Lethality Advanced Technology), PE 0603119A (Ground Advanced Technology), PE 0603462A (Next Generation Combat Vehicle Advanced Technology), and PE 0603463A (Network C3I Advanced Technology).

Work in this PE will transition to PE 0603462A (Next Generation Combat Vehicle 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 is performed by the United States Army Futures Command and United States Army Engineer Research and Development Center.

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army	Date: March 2023
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602145A *I Next Generation Combat Vehicle Technology*

B. Program Change Summary ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	245.525	174.090	174.430	-	174.430
Current President's Budget	239.284	277.445	166.500	-	166.500
Total Adjustments	-6.241	103.355	-7.930	-	-7.930
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	103.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-6.241	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-7.930	-	-7.930
• FFRDC Transfer	-	-0.145	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Project: BP5: *Ground Vehicle Technology (CA)*		
Congressional Add: *Program Increase - Silicon Carbide Electronics*	5.500	6.000
Congressional Add: *Program Increase - Highly Electrified Vehicles*	5.000	3.000
Congressional Add: *Program Increase - Prototyping Energy Smart Autonomous Ground Systems*	10.000	10.000
Congressional Add: *Advanced Materials Development for Survivability*	5.000	10.000
Congressional Add: *Advanced Optics Program*	4.300	-
Congressional Add: *Program Increase - Digital Design and Simulated Testing*	4.000	5.000
Congressional Add: *Program Increase - Fast-Refueling Fuel Cell Engines*	7.000	7.000
Congressional Add: *Program Increase - Hydrogen Technologies*	10.000	15.000
Congressional Add: *Program Increase - Machine Learning Optimized Power Electronics*	3.000	3.000
Congressional Add: *Systems Engineering for Autonomous Ground Vehicles*	9.000	-
Congressional Add: *Vehicle Equivalency Framework Utilizing Multiple Additive Manufacturing Platforms*	5.000	-
Congressional Add: *Virtual Experimentation of Autonomous and Non-Autonomous Combat Vehicles*	3.000	-
Congressional Add: *Program Increase - Zero Emission Combat Vehicles*	3.000	3.000
Congressional Add: *Program Increase - ADVANCED MANUFACTURING FOR COMBAT LOGISTICS SUPPORT*	-	2.000
Congressional Add: *Program Increase - ENTERPRISE AND CROSS-FUNCTIONAL LVC FOR ACCELERATED DEVELOPMENT*	-	8.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army	Date: March 2023
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602145A *I Next Generation Combat Vehicle Technology*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Congressional Add: *Program Increase - MOBILITY MATERIALS RESEARCH*	-	5.000
Congressional Add: *Program Increase - MODULAR ELECTRIC MOTORS*	-	5.500
Congressional Add: *Program Increase - SMALL UNIT TECHNOLOGY ADVANCEMENTS*	-	10.000
Congressional Add: *Program Increase - SOLID OXIDE FUEL CELL DEVELOPMENT*	-	5.000
Congressional Add: *Program Increase - STRUCTURAL THERMOPLASTICS*	-	6.000
Congressional Add Subtotals for Project: BP5	73.800	103.500
Congressional Add Totals for all Projects	73.800	103.500

Change Summary Explanation

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

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BF3 / *Combat Vehicle Robotics Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BF3: *Combat Vehicle Robotics Tech*	-	16.105	20.614	17.443	-	17.443	16.832	16.010	15.707	15.878	0.000	118.589

A. Mission Description and Budget Item Justification

This Project designs, develops, and evaluates a variety of innovative technologies that enable scalable integration of multi-domain robotic and autonomous system capabilities teamed within Army formations supporting all combat warfighting functions (close combat, reconnaissance, targeting and acquisition, etc.). This Project focus areas include autonomous architecture, autonomous behaviors and perception, and soldier machine Interface. Autonomous Behaviors efforts focus on enhancing the performance of autonomy such as obstacle detection and avoidance. Soldier Machine interface efforts focus on design and development of technologies to become more efficient and effective for a robotic operator to complete missions on government owned Warfighter Machine Interface (WMI) software.

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 supports the Next Generation Combat Vehicle (NGCV) Army Modernization Priority .

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

This work is done in coordination with PE 0603462A (Next Generation Combat Vehicle Advanced Technology) and transitions to PE 0604017A (Robotics Development).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Autonomous Behaviors and Perception	9.018	13.034	9.827
Description: This effort contributes to the NGCV Robotic Autonomous Strategy (RAS) to advance the mobility performance of autonomous systems within complex environments/ operations to allow for the completion of mission goals in separate and teaming configurations at varying levels of autonomy.			
FY 2023 Plans: Develop and validate object classification and scene understanding for autonomous vehicles, enabling them to identify objects in the environment and their significance in the overall scenario within government autonomy software, Robotic Technology Kernel (RTK). Mature the basic scene understanding framework created in Fiscal Year 2022 (FY22), resulting in an improved framework enabling customized reactions to specific situations and arbitrating between existing tasks. Research a comprehensive cyber-hardened software suite to make RAS resilient to existing and emerging cyber threats. Research the use of enhanced a-priori data for advanced navigation and reconnaissance maneuvers for implementation in RTK. Investigate space, weight, and power (SWAP) reduction for RTK autonomy kit hardware on small unmanned ground vehicles (UGVs). Develop and mature additional mission subsets and task decompositions within the operational reference models for the AGVRA. Develop an experimental			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BF3 / *Combat Vehicle Robotics Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
unified architecture and associated model profile, library and views realizing current technologies within a model-based systems engineering (MBSE) environment. Develop and mature the ROS-M to support the registration and distribution of developed autonomous software solutions and supporting tools. ***FY 2024 Plans:*** Will develop and validate complex obstacle detection and obstacle avoidance at operationally relevant speeds and over rough terrain, enabling autonomous vehicles to successfully navigate in unstructured environments. Further develop, validate, and certify the object classification and scene understanding created in FY 2023, resulting in a matured framework for customized and trusted reactions to specific situations. Will investigate teaming and tactical behaviors for multi-vehicle goal negotiation, using the enhanced scene understanding from FY 2023 with a focus on human-understandable autonomy within the Army's Robotic Technology Kernel (RTK) autonomy stack (system). Will develop methods for using map data merged with current sensor data to increase situational awareness and conduct reconnaissance maneuvers with an emphasis on autonomous implementation and tools. Will continue to mature the Autonomous Ground Vehicle Reference Architecture (AGVRA) framework by building additional large and small team mission models and task decomposition within the operational reference models. Will mature ground vehicle robotics architecture and associated model profile, library, and views, advancing current technologies within a model-based systems engineering environment. Will continue to develop interface model definition and tools to facilitate model integration. Will continue to develop and mature the Robot Operating System - Military (ROS-M) to support the ability to register and distribute concepts, specifications, requirements, standards and architectures, in addition to autonomous software solutions and supporting tools. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding is decreased in FY 2024 for Autonomous Behaviors & Perception due to the transition of technology to PE 0603462A / Next Generation Combat Vehicle Advanced Technology Project BF4: Combat Vehicle Robotics Advanced Tech - Unmanned Maneuver.			
Title: Human Robotic Interaction ***Description:*** This effort contributes to the NGCV RAS to implement a focused approach to deliver optimized unmanned system and manned-unmanned system team performance through reduced cognitive burden for the Soldier while maintaining real-time unmanned system status/activity, overall mission effectiveness, and predictive capability of the system's intended activity. ***FY 2023 Plans:*** Design and develop robotic soldier machine interface technologies to become more efficient and effective for a robotic operator to complete missions in a simulated combat scenario built on government owned Warfighter Machine Interface (WMI) software.	7.087	5.296	3.423

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BF3 / *Combat Vehicle Robotics Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Investigate improved language control with tactical commands for a robotic operations to bring a more natural implementation of teaming within a command and control scenario to improve mission timelines and overall mission success. ***FY 2024 Plans:*** Will continue to design robotic warfighter machine interface (WMI) technologies to become more efficient and effective for a robotic operator to demonstrate the ability to complete mission in a combat scenario. Will continue to investigate improved language control with tactical commands for robotic operations to bring a more natural implementation of teaming within a command and control scenario, improving mission time and overall mission success. Will investigate improved methodologies to express autonomy systems' decision process and intent to the operator. Will investigate ways for the operator to influence autonomous decisions through the WMI tools. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding is decreased in FY 2024 for Human Robotic Interaction due to the transition of technology to PE 0603462A Combat Vehicle Robotics Advanced Technology Soldier Robotic Interface Integration.			
Title: M&S for Autonomy Enabled Ground Systems	-	2.002	2.081
Description: This effort contributes to the NGCV RAS program by designing and developing modeling and simulation (M&S) tools for the development and evaluation of autonomy technologies. The effort designs and develops tools necessary to virtually evaluate autonomy algorithms developed under the Combat Vehicle Robotics (CoVeR) program. The capabilities and contents of the M&S tools will emulate the CoVeR Engineering Evaluation Test (EET) events conducted in PE 0603462A (Next Generation Ground Vehicle Advanced Technology) / Project BF4 (Combat Vehicle Robotics Adv Tech) and allowing these tools to be run at scale on other Army and Department of Defense compute platforms. ***FY 2023 Plans:*** Mature M&S capability to support CoVeR evaluations with the first Virtual EET planned for the Fall of 2024. Mature the architecture to integrate and interoperate with key CoVeR technologies to include the RTK, Robotic Vehicle Integration and Safety (RVIS) and Warfighter Machine Interface (WMI). M&S capability, focus on real-time models of CoVeR platforms and sensors operating in terrains and scenarios focused on the 2024 EET event. Initial capability, focus on run-time configurability for experimental parameters and building the fundamental capabilities within the simulation to run at scale on externally provided cloud or High Performance Computing (HPC) resources. ***FY 2024 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BF3 / *Combat Vehicle Robotics Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Will enhance and develop Robotic Technology Kernel (RTK), Robotic Vehicle Integration and Safety (RVIS) and Warfighter Machine Interface (WMI) M&S started in FY 2023. Will use M&S to ensure readiness of the various technologies to be incorporated in the FY 2025 EET. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects planned lifecycle of this effort.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.282	-
Title: Small Unmanned Ground Vehicle (UGV) as Deployable Sensor ***Description:*** This effort advances unmanned system teaming between autonomous small Unmanned Ground Vehicles (UGVs) and Next Generation Combat Vehicles (NGCV) to execute collaborative mission tasks in support of reconnaissance and clearing missions. ***FY 2024 Plans:*** Will continue to develop and further advance autonomous behaviors to enable small robot autonomy teaming with NGCV systems. Will update and expand the task-distribution architecture as well as autonomy behaviors to optimize small UGVs and NGCV teaming in support of mission tasks such as route and area reconnaissance, Listening Post/Observation Post (LP/OP), and clearing missions. In addition, the effort will advance Artificial Intelligence (AI) enabled sensing and communication Modular Mission Payloads (MMPs) to support the mission tasks. Will validate these enhancements through Engineering Evaluation Testing (EET) to ensure the autonomy teaming technology and integrated MMPs are fully evaluated for performance and safety. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** This is a new effort in FY 2024.	-	-	2.112
Accomplishments/Planned Programs Subtotals	16.105	20.614	17.443

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BF3 / *Combat Vehicle Robotics Tech*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BF6 / *Crew Augmentation and Optimization Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BF6: *Crew Augmentation and Optimization Tech*	-	8.558	10.761	11.664	-	11.664	11.668	10.101	10.108	10.217	0.000	73.077

A. Mission Description and Budget Item Justification

This Project designs capabilities for reduced vehicle crew sizes to successfully operate a larger number of closed-hatch manned and remote unmanned vehicles in a complex multi-domain operations environment. This Project will enable future crews to perform complex missions with increasingly sophisticated technologies, and in increasingly complex, dynamic socio-technical environments. The applied research will provide the fundamental technologies to enable integrated performance-improved Learning - Warfighter Machine Interfaces (WMIs) that are scalable to multiple crew hardware and functional configurations; reconfigurable frameworks and simulation for concept experimentation and exploration; and team-centered dynamic tasking by machine intelligence to effectively utilize full capabilities of crew and technologies. The research will generate soldier-informed data, reports, and analysis to support operational use in future vehicles through soldier experimentation and assessment of technical concepts in simulation and in-field WMIs. The capabilities created by this research will lead to increased overall crew and team performance; improved soldier safety due to fewer soldier per vehicle, closed-hatch operations, and improved standoff from effective control; and vehicles that can effectively perform across multiple domains of battle.

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 supports the Next Generation Combat Vehicle (NGCV) Army Modernization Priority .

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

This work is done in coordination with PE 0603462A (Next Generation Combat Vehicle Advanced Technology) and PE 0602143A (Soldier Lethality Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Crew & Robotic Mission with Agent Technology	0.468	-	-
Description: This effort focuses on the design, development and validation of hardware and software for establishing crew to robotic mission operator interactions to address full vehicle performance. Included are simulation tools and hardware for Soldier-in-the-loop testing including the Learning Warfighter Machine Interface (L-WMI), a seven-Soldier vehicle crew configuration command vehicle simulator; personalization of crew and robotic operator configurations to permit reconfiguration for role, mission requirements and Soldier monitoring; optimization of vehicle crew interactions to permit sharing, reallocation and management of tasks, as well as situational awareness and data management.			
Title: Crew Capability Enhancement	3.107	3.397	3.447

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BF6 / *Crew Augmentation and Optimization Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Description: This effort focuses on the dynamic interaction of Soldiers, responsible for both manned and unmanned ground vehicles, working together within a platoon formation. The project funds research on the simultaneous use of multiple technologies by Soldiers including transparent multi-modal user interfaces, commander's tools for maintaining and enhancing situation awareness, decision aids for enabling dynamic resource allocation and orchestration, and tools to interact with and adapt vehicle based autonomy. Products will include artificial intelligence algorithms, information display technologies, and team-centric design principles. ***FY 2023 Plans:*** Design and develop tools and technology aids within the Warfighter Machine Interface to ensure data sharing is customized to individual operators based on their roles in order to improve Soldier-autonomous system team function and cohesion. Augment data-driven approaches to cue Vehicle Commander of potential task sharing opportunities through the addition of learning based methodologies. ***FY 2024 Plans:*** Will design and implement a component-level Warfighter-Machine Interface-embedded capability allowing autonomous systems to learn from multiple forms of Soldier interaction; implement automatic team re-tasking components for dynamic task allocation based on operator workload, mission, or personalization. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects planned lifecycle of this effort.			
Title: Characterize Soldier-Adaptive AI Interactions	1.089	2.569	2.608
Description: This effort develops approaches for characterizing Soldier interactions and overall human-system performance of mixed Soldier and intelligent-agent teams to enable robust human system performance for manned and unmanned teams. This effort will focus on flexible, tailorable methodologies for laboratory-grade, high-resolution characterization of joint Soldier and Artificial Intelligence (AI) enabled intelligent-agent adaption in complex environments. ***FY 2023 Plans:*** Mature initial capability for characterizing Soldier-autonomous system teams by incorporating novel techniques that allow vehicle crews to increase the mission data viewed during after action reviews and compare to what was viewed while conducting the missions. Determine initial visualizations of dynamic systems-based measures of crew-autonomous system effectiveness. Investigate initial predictive models incorporating mission and human-in-the-loop data to predict team outcomes. ***FY 2024 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BF6 / *Crew Augmentation and Optimization Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Will develop and implement Next Generation Combat Vehicle (NGCV) Dashboard tool for subject matter experts to conduct performance assessments of Soldier-Autonomous System Teams using data collected during the mission; augment visualizations of dynamic systems-based measures of crew-autonomous system effectiveness with subject matter expert-derived labels to improve observer understanding of team states; conduct experiments on intelligent signal management techniques to improve predictive model accuracy. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects planned lifecycle of this effort.			
Title: Human Augmentation for Collective Training ***Description:*** This effort investigates assessment techniques of crew performance to inform the development of individual and collective training for military vehicles. Assessment techniques will be applicable across a wide-variety of vehicle platforms, training tasks and vehicle crew roles. This effort will support training and increased force readiness of vehicle crews in complex environments by developing accurate and efficient performance assessment techniques evaluated in complex Operational Environments (OE) enabled by the latest advances in simulation and training technology. ***FY 2023 Plans:*** Design and develop an embedded training architecture to be implemented within simulation environments and prototype ground vehicle platforms. Architecture development will support the conduct of experimentation into multi-modal embedded training approaches across a wide-variety of vehicle platforms and novel user interfaces. Investigate instructional design based approaches and mature tools enabling immediate point of need training, classroom based training or after action reviews, and interactive episodic training across individual and crew configurations. Investigate the underlying technical demands required for embedded or peripheral training systems to support maneuverability and fires within the robotics and autonomous systems domain. ***FY 2024 Plans:*** Will mature subcomponents of an embedded training architecture to facilitate crew-to-section training and conduct software validation experiments for whole system performance within applicable simulation or platform environments; conduct experiments to determine ground platform operator roles supported by the embedded training architecture, training modes for effective instruction within or outside the immersive training environment, and continued functional architecture development which will enable manned-unmanned platform teaming concepts; investigate digital terrain considerations pertinent to effective team training and operation of robotics or autonomous systems. ***FY 2023 to FY 2024 Increase/Decrease Statement:***	1.809	1.890	1.918

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BF6 / *Crew Augmentation and Optimization Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Funding change reflects planned lifecycle of this effort.			
Title: Platoon Teaming Capability	2.085	2.905	3.691
Description: This effort focuses on the design, development and validation of intelligent, real-time, within-vehicle task management; data-driven allocation of situational awareness (SA) across platforms within the platoon; coordinated platoon-level manned-unmanned teaming (MUM-T) semi-autonomous maneuver with complex formations; and on-the-fly, platoon-level task optimization. This effort includes WMI modification to conduct experiments with these capabilities in application of intelligent task management and data-driven prediction of crew to support changing mission goals. ***FY 2023 Plans:*** Validate approaches to efficiently process and share critical data for enhanced mutual crew-agent situational awareness across a mixed manned-unmanned platoon-level formation. Validate algorithms to cue the vehicle commander of possible task sharing opportunities within a crew at the platoon level. ***FY 2024 Plans:*** Will further develop, integrate at system level, and validate intelligent technology aids and embedded training software to increase platoon-level crew situational awareness and enable soldier adaptation of autonomous systems; integrate software algorithms at system level and validate approaches to automatically re-task critical tasks based on workload, mission requirements and operator strengths/weaknesses, across a mixed manned-unmanned platoon-level formation. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase is in accordance with the project plan and reflects the focus on automating task sharing and soldier adaptation of autonomous systems.			
Accomplishments/Planned Programs Subtotals	8.558	10.761	11.664

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army											Date: March 2023	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*				Project (Number/Name) BF8 / *Artificial Intelligence & Machine Learning Tech*			
COST ($ in Millions)	**Prior Years**	**FY 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**Cost To Complete**	**Total Cost**
BF8: *Artificial Intelligence & Machine Learning Tech*	-	13.261	19.906	20.329	-	20.329	17.477	17.498	17.510	17.702	0.000	123.683

A. Mission Description and Budget Item Justification

This Project develops and characterizes artificial intelligence and machine learning software and algorithms to team with soldiers in support of fully autonomous maneuver of the Next Generation Combat Vehicle (NGCV) and other autonomous systems, both physical and non-embodied. Efforts develop capabilities for NGCV and other autonomous agents that increase autonomy, unburdening the soldier operator, with a high degree of survivability and lethality in a highly contested environment. This work also investigates power distribution and conversion technologies to provide compact, efficient, and high power capabilities for electrical and electro-mechanical loads supporting both mobile and stationary unmanned platforms. Research enables combat vehicles to rapidly learn, adapt, and reason faster than the adversary; accomplish missions in contested, austere and congested environments, characterized by lack of structure, adversarial actions, and minimal a priori knowledge; and provide force reduction through self-learning vehicles that can operate in complex militarily relevant environments. This Project also matures emerging research leading to potential technology development in areas of strategic importance to the Army by bringing competitively selected Universities with research teams into Technical Alliances.

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.

This work is done in coordination with PE 0603462A (Next Generation Combat Vehicle Advanced Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Scalable, Adaptive, and Resilient Autonomous Systems	2.757	8.104	8.484
Description: This effort develops emerging research in Autonomous Vehicle intelligence and decision making, human agent teaming, scalable and collaborative behaviors, embodied and embedded intelligence, and autonomous operations for next generation Army platforms in dynamic Army relevant environments, architectures, and missions. Specific focus will be on the application of Artificial Intelligence/Machine Learning (AI/ML) to autonomous systems and human-intelligent agent teaming; scalable and collaborative behaviors in support of heterogeneous air and ground manned-unmanned teaming (MUM-T) operations; methods for embodied and embedded intelligence for increased understanding, manipulation, and reflexive maneuver through and interaction with dynamic environments; techniques for improved perception, decision making, and adaptive behaviors in contested environments for MUM-T; and new methods for testing and evaluating emerging technologies for intelligent and autonomous systems under Army relevant constraints and environments and in Army relevant architectures.			
FY 2023 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BF8 / *Artificial Intelligence & Machine Learning Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Design and develop methods to increase operational speed and distances in complex terrain. Develop methods to integrate terrain awareness and platform capability into tactical decision-making process. Design and develop methods to cooperate with multiple air and ground autonomous agents for improved maneuvers in complex terrain engaging vehicle perception, learning, reasoning, navigation and physical maneuver. ***FY 2024 Plans:*** Will design and develop methods to rapidly identify and adapt on the fly to changing ground vehicle terrain; create methods and techniques that allow for longer-duration ground vehicle autonomy, measured by time between human interventions; conduct experiments to increase operational speed and mission distances in complex terrain; continue to identify methods to integrate terrain awareness and platform capability into tactical decision-making process; validate methods to advance cooperation with multiple air and/or ground autonomous systems for improved vehicle perception, learning, reasoning, navigation and physical maneuver in complex terrain. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects the planned lifecycle of this effort.			
Title: Context-Based Information Dynamics ***Description:*** This effort investigates techniques that integrate on-board and external information sources, and it applies ML analytic approaches to support automated intelligence analysis and decision making. The goal is to enable tactical agents to cooperatively share relevant and timely tactical information within a distributed environment. ***FY 2023 Plans:*** Experimentally validate intelligent system methods and interfaces that can identify, characterize, and exploit data from sensors and other information assets that are built on theories and fundamental models for human decision making. Investigate novel and emerging visualization technologies and data driven decision tools that help develop situational awareness and understanding at varying echelons to more quickly and accurately assess and integrate information across domains in Multi Domain Operations (MDO) thereby enhancing mission effectiveness by improving decision cycles. ***FY 2024 Plans:*** Will develop computer vision algorithms that can provide enhanced estimates of objects of relevance when operating with limited or missing information; investigate rule-based and machine learning approaches for intelligent systems that interpret multisource information to infer meaning, create shared understanding, and support decision-making; define inferencing algorithms to derive context from multi-modal multi-source information for automated decision-making and course of action generation. ***FY 2023 to FY 2024 Increase/Decrease Statement:***	2.335	2.561	2.640

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BF8 / *Artificial Intelligence & Machine Learning Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Funding increase reflects the planned lifecycle of this effort.			
Title: Heterogeneous Computing and Computational Sciences ***Description:*** This effort funds research to develop algorithms and architectures that allow adaptable, energy efficient information processing across different computing hardware platforms. The goal of this research is to provide high performance computing and processing capabilities to the Soldier on the battlefield. ***FY 2023 Plans:*** Apply advanced algorithms to Army-relevant tasks on low size, weight, and power (SWaP) computing devices. Exercise the proposed algorithm/compute combinations on heterogeneous datasets to measure performance and efficiency. Implement scalable task scheduling mechanisms that are robust to adversarial and organic failures and can be applied in centralized, distributed, and decentralized agent environments. Develop scheduling routines to enable flexibility and efficiency under tactical environments and constraints. ***FY 2024 Plans:*** Will explore automated data and model optimization and reduction methods for advanced intelligence, surveillance, reconnaissance (ISR) algorithms to be executed on low size, weight, and power (SWaP) computing devices; investigate combined optimization of heterogeneous datasets and measure performance and increase efficiency through implementing scalable task scheduling methods on networked edge devices; develop methods that are applied in centralized, distributed, and decentralized agent environments and schedule routines to enable processing in tactical environments and under associated constraints. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects the planned lifecycle of this effort.	1.719	1.888	1.943
Title: Machine Learning with Constrained Resources ***Description:*** This effort will research new ML and reinforcement learning methods to address issues of statistically mismatched and incomplete information which must be annotated, collected, classified, and used for rapid decisions by joint intelligent agent-Human teams. In addition, multi-modal human interaction approaches will be investigated to ensure effective Soldier interactions and understanding of intent. The goal of this research is to enable joint human-intelligent agent decision making, optimizing the strengths of each in the decision process and creating an adaptive, agile team. This work applies research conducted in PE 0611102A (Defense Research Sciences) / AA6 (Robotics and Mobile Energy) and AA9 (Information and Networking). ***FY 2023 Plans:*** Mature algorithms for prototype platforms that allow trained models to be transferred between autonomous ground vehicles operating in different environments. Conduct experimentation to measure the ability of automated controller tuning techniques to improve autonomous navigation and coordination techniques to be executed across small teams of platforms. Implement	3.988	4.434	4.570

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BF8 / *Artificial Intelligence & Machine Learning Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
techniques for network load balancing, task sharing, and computational offloading in adversarial settings for resource constrained devices at the tactical edge. Investigate artificial intelligence-based moving target defense security functionalities for software-defined networks (SDNs) and investigate the integration with signature detection systems. ***FY 2024 Plans:*** Will conduct experiments to assess the ability of novel navigation techniques to effectively plan routes in environments that include partially observable elements, such as obscured terrain features; investigate rule-based algorithms and data-driven machine learning methods for interpreting multi-source information to capture meaning, support cross-domain event detection, and enable effective automated text generation for knowledge and information management tasks; investigate computer vision algorithm and machine learning methods that can quantify uncertainty, rank, and prioritize visual information in ways that are consistent with human judgment; develop computational models of human behavior to predict soldier attention and biases in different contexts, detect camouflaged, obscured, or non-obvious objects, and detect rare and novel cases using contextual information. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects the planned lifecycle of this effort.			
Title: Intelligence for High Operational Tempo Maneuver ***Description:*** Applied research on intelligence for cognitive learning and control architectures to enable efficient and full use of embodied physical capabilities and create the machine intelligence required of autonomous systems to understand physical limitations. Investigates the means through which robotic physical performance attributes (e.g. speed, agility) will be coupled with artificial intelligence to enable resilient maneuver in high operational tempo missions in complex environments. ***FY 2023 Plans:*** Design and develop novel models and algorithms that support biologically inspired robotics capable of efficient maneuver over or through complex terrain at high operational tempos; continue research on architectures and models that provide predictable performance appropriate for tactical multi-agent teaming. ***FY 2024 Plans:*** Will continue to explore how novel models and algorithms function with design features of biologically inspired robotics to advance the efficiency of maneuver over or through complex terrain at high operational tempos; mature architectures and models that provide predictable performance appropriate for tactical multi-agent teaming. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects the planned lifecycle of this effort.	1.462	1.603	1.652
Title: Operational Assessment of Artificial Intelligence Developmental Systems	1.000	1.021	1.040

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BF8 / *Artificial Intelligence & Machine Learning Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Description: This effort supports the Combatant Commander's needs by performing operational assessments of AI-intense developmental weapon systems. ***FY 2023 Plans:*** Continue to optimize results from ongoing studies to support Combatant Commander identified needs. ***FY 2024 Plans:*** Will continue to optimize results from ongoing studies to support Combatant Commander identified needs. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects the planned lifecycle of this effort.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.295	-
Accomplishments/Planned Programs Subtotals	13.261	19.906	20.329

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BF9 / *Sensors for Autonomous Operations and Surv Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BF9: *Sensors for Autonomous Operations and Surv Tech*	-	34.174	22.666	25.327	-	25.327	24.722	24.890	25.639	25.919	0.000	183.337

A. Mission Description and Budget Item Justification

This Project designs and develops modular and adaptive sensor components, novel embedded processing approaches, innovative threat cueing solutions and novel multi-function sensor payloads integrated with novel signal image processing techniques tools to provide improved manned and unmanned ground vehicle situational understanding that enables aided target recognition (AiTR) and autonomous navigation in all environments.

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 supports the Army Next Generation Combat Vehicle (NGCV), Soldier Lethality (SL), and Future Vertical Lift (FVL) Modernization priorities.

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

This research is coordinated with PE 0603462A (Next Generation Combat Vehicle Advanced Technology), 0603118A (Soldier Lethality Advanced Technology), 0602143A (Soldier Lethality Technology), 0602148A (Future Vertical Lift Technology) and 0603465A (Future Vertical Lift Advanced Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Advanced Sensors with Embedded Processing	25.334	17.991	16.339
Description: Designs and develops advanced, automated multi-spectral and multi-function sensor components, and image processing techniques with improved performance in all environments and against all threats to include low-contrast targets in camouflage or in degraded conditions to enable combined arms maneuvers in complex environments for NGCV via manned, optionally manned, and robotic platform applications.			
FY 2023 Plans: Validate integration of on-chip non-uniformity correction for electro-optical / infrared (EO/IR) sensor components into the Digital Readout Integrated Circuit (DROIC). Investigate on-chip signal processing to enable vast improvements in SWAP-C and System-On-Chip (SOC) capabilities. Investigate cooled, long wavelength infrared (LWIR) asynchronous laser pulse detection DROICs for utilization with LWIR avalanche photodiode detectors to enable covert threat and target ranging. Mature low-power processing threat warning component approaches and fuse contextual scene information to detect incoming threats. Validate far target location techniques and investigate optimal sensor configurations for target detectability and background reduction of cluttered scenes. Evaluate novel sensor modalities for multi-function imaging through battlefield obscurants. Research adaptive sensor components which can autonomously adjust imaging from visible through LWIR wavebands based on real-time conditions.			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BF9 / *Sensors for Autonomous Operations and Surv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Validate sensor performance and new exploitable target signatures to better detect targets in adverse conditions. Conduct experiments with polarized EO/IR sensors in multiple locations to validate sensor performance across environments, times-of-day/night, weather conditions, and targets. ***FY 2024 Plans:*** Will validate feasibility of on-chip compression capabilities on digital readout integrate circuits (DROICs) to enable lower data rates for high-resolution sensing, enabling more information content for down-stream processors; design and develop DROIC architectures for uncooled longwave infrared (LWIR) microbolometer detectors at new, smaller pixel pitches to enable size, weight, power, and cost (SWAP-C) and resolution improvements; continue developing cooled DROICs for integration with avalanche photodiode (APD) detectors at smaller pixel pitches for increased resolution to enable covert threat and target ranging; begin development of an extensible core software module, using a selected reasoning approach, to fuse contextual scene information or additional metadata to reduce false alarms of transitioned target detection algorithms; mature targeting and navigation sensors capable of operating on-the-move while providing far-target location and target tracking; mature and demonstrate modular sensor assemblies optimized for use in detection of threats at increased ranges; begin design of at-sensor processing hardware components to improve performance and SWAP-C of image processing and inferencing; investigate whether emerging neuromorphic processing architectures could be utilized to enable more complex processing at the sensor; determine how on-sensor processing can best conform with Modular Open System Approaches (MOSA) to reduce lifecycle costs. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding decrease represents the realignment to task Sensors, Electronics and Processing Approaches for Threat Overmatch within this project			
Title: Multi-Mission Payload ***Description:*** Investigates, designs and develops sensor payloads for ground vehicle based unmanned aerial system to detect line of sight, and beyond line of sight threats and complex obstacles such as personnel and vehicles in all environments. ***FY 2023 Plans:*** Validate performance of high resolution polarized sensor components for vehicular, dismounted Soldier, and UAS mountable configurations enabling wider field of view terrain coverage, smaller threat object detectability, and extended range leading to more advantageous UAS flight paths. Determine approaches for exploiting scene features and target signatures to enable detection of targets in varying environmental conditions using concealment penetrating radar. ***FY 2023 to FY 2024 Increase/Decrease Statement:***	3.167	2.403	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BF9 / *Sensors for Autonomous Operations and Surv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Funding decrease represents completion of this effort and the realignment of funds to task Sensors, Electronics and Processing Approaches for Threat Overmatch within this project.			
Title: Automated Threat Cueing ***Description:*** Investigates, matures and validates novel image processing and threat recognition and detection methods to enable automated search and detection of open and concealed threats for cueing and target hand-off to maintain overmatch via speed in cluttered environments. ***FY 2023 Plans:*** Mature processing approaches utilizing multi/hyperspectral and polarized EO/IR sensors as well as position sensors to improve on-the-move target detection and tracking. Mature image formation and processing approaches for target detection in low clutter environments using small UAS mounted compact ground and concealment radar antennas. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding decrease represents the realignment to task Sensors, Electronics and Processing Approaches for Threat Overmatch within this project	5.673	2.272	-
Title: Sensors, Electronics and Processing Approaches for Threat Overmatch ***Description:*** This effort design, develops, matures and validates novel sensor components, sensor payloads and image processing approaches to enable enhanced detection of line of sight and beyond line of sight threats and complex obstacles in all environments via manned, optionally manned and robotic platforms. It will enable cueing and target hand-off to maintain overmatch while on-the-move, at speed, in cluttered environments. ***FY 2024 Plans:*** Will complete validation of sensor performance and exploitable target signatures to improve target detection performance in adverse conditions; complete experiments and validate the use of polarized electro-optic/infrared (EO/IR) sensors to suppress clutter and improve detection performance across environments, times-of-day/night, weather conditions, and targets; investigate and mature small form-factor multispectral sensors and assess performance improvements for targets obscured by vegetation or camouflage; complete data collections and an assessment of the effectiveness of using high resolution polarized sensor components for dismounted soldier and unmanned aerial system (UAS) applications to reduce the effects of clutter while providing a wider field of view, improved ability to detect smaller targets, and at greater range; investigate and mature approaches and processing techniques to exploit scene features and target signatures to enable improved detection of targets in varying environmental conditions using concealment penetrating radar; validate processing approaches and methods using additional data from multispectral and high definition polarized EO/IR sensor components and position sensing information to improve	-	-	8.988

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BF9 / *Sensors for Autonomous Operations and Surv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
target detection and tracking from a moving platform; validate image formation and processing techniques to help assess target detection performance using compact ground and concealment radar antennas mounted on a small UAS. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** This is a new effort in FY 2024 with funds realigned from Advanced Sensors with Embedded Processing, Multi Mission Payload, and Automated Threat Cueing within this project. This is not a new start.			
Accomplishments/Planned Programs Subtotals	34.174	22.666	25.327

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BG2 / *Modeling and Simulation for MUMT Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BG2: *Modeling and Simulation for MUMT Technology*	-	6.473	5.591	5.526	-	5.526	4.591	4.267	4.419	4.043	0.000	34.910

A. Mission Description and Budget Item Justification

This Project develops Modeling and Simulation (M&S) tools and technologies to assess and improve freedom of movement for ground forces and supports vehicle developers by addressing challenges for robotic and ground vehicles. Through investigation and design, this project develops obstacle detection and classification algorithms for dynamic mobility hazards in urban and complex environments. This project develops tools to evaluate system performance reducing the need for physical testing including: real-time mobility decision support tools, vehicle-terrain interactive models for autonomous convoy operations, simulation tools for vehicle mobility in highly altered terrain, and M&S tools for predicting the performance of autonomous vehicles in a wide variety of weather and terrain conditions. These M&S technologies can be integrated across Army vehicle platforms as required.

Work in this Project complements Program Element (PE) 0603462A (Next Generation Combat Vehicle Advanced Technology) / Project BG3 (Modeling and Simulation for MUMT Advanced Tech).

The work cited 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 Engineer Research and Development Center.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Simulation Tools for Combat Vehicle Robotics (CoVeR)	6.228	3.345	-
Description: This effort develops M&S capabilities to evaluate hardware and software technologies enabling battlefield autonomy in complex environments and adaptive learning algorithms for predicting mobility performance in challenging environments. ***FY 2023 Plans:*** Validate high-fidelity M&S tools to support development of autonomous systems operating in mission-relevant environments; and mature tagged dataset of real and synthetic images for training autonomous algorithms through M&S. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding decrease reflects planned lifecycle conclusion of this effort with transition of technologies to Program Executive Office Ground Combat Systems.			
Title: Autonomous Vehicle/Terrain Interactions	-	2.246	5.526

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BG2 / *Modeling and Simulation for MUMT Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Description: This effort develops M&S capabilities to evaluate autonomous vehicle formation performance on mission-relevant terrain and climates (i.e. soft soil, gap crossing, obstacle override, cold regions, etc.). This effort develops algorithms for improved manned/unmanned and air/ground teaming for off-road tactical behaviors. ***FY 2023 Plans:*** Develop complex obstacle detection and mobility predictions at tactically relevant speeds (high speed in complex terrain). Develop M&S enabled analytical tools for operational effectiveness assessments. ***FY 2024 Plans:*** Will develop advanced vehicle terrain interface for vehicle platforms operating in highly altered terrain and enhance Virtual Autonomous Navigation Environment (VANE) M&S tool for evaluating ground vehicle formations in various operational environments, such as degraded sensor performance environments. Will develop methods to support the identification of vulnerabilities directly related to vehicle maneuver in various operational environments. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects the planned lifecycle initiation of this effort to develop, refine, and integrate core mobility algorithms for the vehicle terrain interface and enhancements to the VANE M&S tool for formations.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638	0.245	-	-
Accomplishments/Planned Programs Subtotals	6.473	5.591	5.526

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

N/A

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BG6 / *Advanced Concepts for Active Defense Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BG6: *Advanced Concepts for Active Defense Technology*	-	29.415	33.656	32.668	-	32.668	33.005	37.824	34.056	25.215	0.000	225.839

A. Mission Description and Budget Item Justification

This Project funds research for advanced materials and mechanisms to defeat the most common and most dangerous threats that are expected to be encountered by our ground forces in the near, mid and far term. Work conducted in this Project will result in concepts for Adaptive and Cooperative Protection of ground combat vehicles. Additionally, research will focus on subcomponent/component models to predict performance of early concepts and the means to evaluate effectiveness on ground platforms. The Project will balance developments of active threat defeat measures with the necessary advanced passive and active components to provide solutions which will help meet the requirements of current and next generation ground tactical and combat vehicles.

This Project is coordinated with and transitions to Projects in PE 0603462A (Next Generation Combat Vehicle Advanced Technology) and builds upon weapon target interaction research in PE 0602144A (Ground Technology) and PE 0601102A (Defense Research Sciences) / Project AA7 (Mechanics and Ballistics).

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 supports the Next Generation Combat Vehicle (NGCV) Army Modernization Priority .

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

This research is done in coordination with PE 0603462A (Next Generation Combat Vehicle Advanced Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Multi-Threat Armor Technologies	7.763	8.413	8.245
Description: This effort develops multi-threat hybrid armor technologies incorporating both active and passive mechanisms for ground vehicle systems that are effective against future conventional weapons and evolving improvised threats including kinetic and chemical energy as well as blast threats.			
FY 2023 Plans: Conduct experiments on a kinetic energy projectile defeat technology to counter multiple threats; continue to mature a multi-hit projectile defeat mechanism; conduct virtual experimentation studies to provide armor performance conceptualization, improvements, optimization, and mechanistic understanding to guide experimental programs.			
FY 2024 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BG6 / *Advanced Concepts for Active Defense Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Will validate armor protection mechanism for Medium Caliber (Med-Cal), Explosively Formed Projectiles (EFP), and Shaped Charged Jet (SCJ) threats, as well as Active Protection System (APS) residual effects; design and develop lab-scale solutions for more efficient, cost-effective tools and methodologies to provide data to improve vehicle protection technologies; conduct virtual experiments to assess complex warhead-penetrator orientations; finalize the development of vehicle spall protection requirements for shaped charge threats for both manned and unmanned systems. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding decrease reflects the planned lifecycle of this effort.			
Title: Adaptive and Cooperative Protection ***Description:*** This effort pursues a holistic approach toward achieving significant weight reduction and protection from future threats by utilizing real-time information, combined with threat knowledge, to provide ever-increasing protection. This approach includes integrating individual vehicle capabilities of armor, underbody blast protection, active protection systems, and advanced soft kill methods into one layered solution to maximize survivability and minimize weight for combat and tactical vehicles. This effort will investigate modern protective technologies that implement complex kinematic mechanisms in order to bend, break and disperse threat projectiles before they can injure crew or disable vehicles. ***FY 2023 Plans:*** Assess a laser-based soft kill system; transition an optical threat warner to PE 0603462A (Next Generation Combat Vehicle Advanced Technology) / Project BG7 (Ground Systems Active Defense (GSAD) Advanced Tech) for maturation; mature an adaptive reactive armor mechanism to defeat Anti-Tank Guided Munitions and Rocket-Propelled Grenades; mature a collaborative multi-platform defense mechanism. ***FY 2024 Plans:*** Will validate a collaborative multi-platform defense mechanism; explore the use of novel armor mechanisms to provide hemispherical protection against a variety of rocket propelled grenade (RPG) and Anti-Tank Guided Munitions (ATGM) threats; mature a statistical computational model for adaptive protection systems; explore alternate lasers for ATGM soft-kill active protection system. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase supports the planned lifecycle of this effort.	5.836	6.520	6.793
Title: Emerging Overmatch Technologies ***Description:*** This effort designs, develops, and conduct experiments to validate the lethality and protection concepts that re-establish overmatch for the next generation of manned and unmanned combat platforms. It will tightly couple scientific research within a campaign of learning to form technology concepts for battlefield domination against current and future threats. This	2.183	2.405	2.459

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BG6 / *Advanced Concepts for Active Defense Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
research will heavily leverage other efforts within PE 0602145A (Next Generation Combat Vehicle Advanced Technology) and PE 0603462A (Next Generation Combat Vehicle Advanced Technology). ***FY 2023 Plans:*** Design, develop, and conduct experiments to validate technologies, coupled with autonomous behaviors, that illustrate concepts for autonomous ground combat, focused on lethality and protection; validate cooperative protection and intelligent lethal saturation in both simulation and physical experiments using a team of at least three drones and two unmanned ground vehicles; generate and analyze effectiveness of concepts. ***FY 2024 Plans:*** Will continue to develop technology to enable concepts of cooperative protection and collaborative lethality, emphasizing autonomous distributed task assignment across a team of robotic and autonomous systems acting in opposition to numerous surrogate threat systems; perform experiments on both simulation and physical systems in pseudo-tactical scenarios. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase supports planned lifecycle of this effort.			
Title: Survivability/Lethality/Vulnerability Analysis Tools and Methodology ***Description:*** This effort devises state-of-the-art survivability/lethality/vulnerability methodologies to dynamically model the interaction of conventional ballistic threats against future weapon systems. ***FY 2023 Plans:*** Mature capabilities to analyze and model the vulnerabilities of autonomous unmanned ground vehicle systems and teaming with other manned and unmanned systems; develop methodology for assessing capabilities of active and adaptive armor mechanisms and protection systems against combined threats; continue to mature multi-hit modeling capability in support of next generation combat vehicle protection; will mature active protection system soft kill and hard kill analysis capability for vehicle protection systems; continue to design, develop and validate multi-discipline analysis capability and transition methodologies to computational models; perform limited validation assessment of computational capabilities for the next generation combat vehicle smart munitions in electronic warfare congested environments. ***FY 2024 Plans:*** Will research and conduct analysis of autonomous unmanned ground vehicle systems and teamed manned and unmanned systems against multi-domain threats in a common framework while applying time-dependent failures from consumables like fuel/electric; complete development of communications linkage map between vehicle system, assistive automation, artificial intelligence, and the Soldier; expand survivability/lethality/vulnerability methodologies and proof-of-concept analyses of vehicle protection system technologies against multi-discipline threats and attacks in a common framework; conduct experiments to	4.976	5.440	5.734

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BG6 / *Advanced Concepts for Active Defense Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
inform improved methodology, analytical techniques, and modeling capability to assess lethality of next generation combat vehicle fragmenting and high explosive munitions. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects planned lifecycle of the effort.			
Title: Ground Systems Active Defense Technology Research ***Description:*** This effort contributes to the Army's ground vehicle survivability by developing technologies which electronically or physically defeat an incoming threat before it contacts the vehicle. These technologies involve sensors and effectors interacting with an incoming threat to disrupt or destroy in while it is in flight or before it is even fired at a vehicle. This effort designs and develops modern armors that directly complement and are optimized to work with active defense technologies in order to implement sophisticated mass efficient mechanisms and leverage investments in materials to act as a system for the defeat of advanced threats and active protection system residuals. This effort designs and develops active blast mitigation technologies to counter the effects of underbody attacks to ground vehicles. This effort will also design and develop the required advanced structures required to accommodate active blast mitigation technologies into vehicles. The design of the structure and active defense technology is critical to an effective blast survivability solution. ***FY 2023 Plans:*** Build upon prior work to down-select the most promising technology concepts for defeat of emerging threats with complex defeat mechanisms, mature designs of selected technologies into components, and conduct component-level ballistic/blast experiments to validate threat defeat performance at bench-scale. Leverage U.S. Army Combat Capabilities Development Command (DEVCOM) Ground Vehicle System Center (GVSC) modelling and simulation capability to identify system-level integration considerations in preparation for packaging and integration. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** In FY 2024, funding realigned to Collaborative Defense within this Project.	5.570	6.631	-
Title: Advanced Threat APS Radar Technology ***Description:*** This effort develops ground combat vehicle survivability technologies including radar techniques to support hard-kill countermeasures as a part of an integrated survivability suite for ground combat platforms in all-weather, day or night conditions with 360 degree situational awareness and Kinetic Energy threat defeat. ***FY 2023 Plans:***	3.087	3.374	2.209

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BG6 / *Advanced Concepts for Active Defense Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Perform signature characterization of experimental prototype radar candidate technologies, investigate signature management techniques, and evaluate radiated sensor signatures during live fire tests against kinetic energy threats. Provide hard-kill active protection system impact analysis for addressing additional future armor piercing threats. ***FY 2024 Plans:*** Will finalize studies to provide signature management improvements and optimization; develop resource management techniques to counter threats while maintaining radar search modes; assess sensor resource management techniques and algorithm performance via experiments. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding decrease represents focus on the development and assessment of resource management techniques necessary to support future, more costly multi-hit projectile defeat mechanisms.			
Title: Detection Avoidance Applique Technology Research ***FY 2023 Plans:*** Investigate multiple passive signature management technologies and conduct experiments to characterize performance in spectrums of interest for new and existing ground combat vehicles. Leverage modeling and simulation capabilities to define experimental plan. ***FY 2024 Plans:*** Will build upon FY 2023 effort by down-selecting component technologies based on experimental results; design and develop a technology concept for ground vehicles that integrates multiple signature management component technologies into a system in order to create a holistic solution to avoid detection across spectrums of interest; conduct system-level modeling and simulation to refine the concept. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** The funding increase supports additional modeling and simulation efforts required to refine the holistic system concept.	-	0.616	0.728
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.257	-
Title: Collaborative Defense	-	-	6.500

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BG6 / *Advanced Concepts for Active Defense Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Description: This effort expands the capability to protect ground vehicles by conducting research into technologies that can enable the sharing of protection resources across multiple platforms in real time to expand the zone of protection on the battlefield beyond a single vehicle and its protection system. These technologies include sensors to identify and track incoming threats, radios/networks to allow local communication of threat detection and tracking information, and effectors that disrupt or destroy threats before terminal engagement with the platform. This effort will study various system-level approaches to integrating these aforementioned technologies to enable collaboration across multiple platforms, including integration factors such as size, weight, power consumption, and cost impacts to the platform. This effort will validate performance of the system in the laboratory environment. ***FY 2024 Plans:*** Will research technology approaches for the application of a distributed, autonomous countermeasure for ground vehicle formations; conduct component and system-level modeling of collaborative countermeasure concepts to explore feasibility; conduct experiments into vehicle-to-vehicle threat sensing and response; investigate feasibility of system-level concepts for integration with the Army's modular active protection system architecture. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** This is a new effort in FY 2024 with funding realigned from Ground Systems Active Defense Technology Research within this Project in order to shift focus to research technologies that enable the sharing of protection resources across multiple platforms.			
Accomplishments/Planned Programs Subtotals	29.415	33.656	32.668

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BG8 / *Obscuration Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BG8: *Obscuration Technology*	-	2.482	2.722	-	-	-	-	-	-	-	0.000	5.204

Note

In FY24, funding administratively realigned to Program Element 0602144 Project N15 Development of Obscurants

A. Mission Description and Budget Item Justification

This Project investigates and evaluates obscurant technologies that degrade threat force surveillance sensors and defeat the enemy's target acquisition devices, missile guidance, and directed energy weapons. This Project focuses on advanced infra-red and multi-spectral obscurant materials that provide effective, affordable, and efficient screening of deployed forces, while being safe and environmentally acceptable.

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 supports the Next Generation Combat Vehicle (NGCV) Army Modernization Priority.

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

Research in this Project is related to and fully coordinated with PE 0603462A (Next Generation Combat Vehicle Advanced Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Obscuration Enabling Technologies	2.482	2.722	-
Description: This effort investigates new materials and compounds to enable safe, effective screening of personnel and equipment across the electromagnetic spectrum. This effort also provides vulnerability assessments against enemy threat systems. ***FY 2023 Plans:*** Mature risk factor mitigation technologies for bi-spectral materials that show promise to replace lower performing fielded bi-spectral obscurants. Investigate improvements to advanced microwave obscuring materials. Collaborate with subject matter experts from universities, private industry, other Military Services, and other government agencies to develop unique approaches to fabricate a spectrally selective obscurant for ground platform use. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** This effort is realigned in FY 2024 to Program Element 0602144 Project DG1 Development of Obscurants.			
Accomplishments/Planned Programs Subtotals	2.482	2.722	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BG8 / *Obscuration Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army												Date: March 2023
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*				Project (Number/Name) BH5 / *Platform Electrification and Mobility Tech*			
COST ($ in Millions)	**Prior Years**	**FY 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**Cost To Complete**	**Total Cost**
BH5: *Platform Electrification and Mobility Tech*	-	13.278	14.226	13.763	-	13.763	17.168	19.957	15.514	14.398	0.000	108.304

A. Mission Description and Budget Item Justification

This Project researches and develops advanced power and energy technologies for combat ground vehicles that are necessary for parallel hybrid, series hybrid and all-electric vehicle systems.

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 effort is performed by the United States (US) Army Futures Command.

Work in this Project supports the Army Modernization Priority Next Generation Combat Vehicle (NGCV).

Work in this Project is coordinated with PE 0603462A (Next Generation Combat Vehicle Advanced Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Scalable Electrification & Control Architecture	1.378	1.977	1.999
Description: This effort designs and develops the power distribution and control components to implement a common, scalable, electrified vehicle power architecture to enable advanced lethality and protection capabilities, fast vehicle charging from the grid, and silent mobility on combat platforms across light to heavy weight classes. This power architecture enables the hybrid electric, fuel cell electric, and all-electric powertrains. ***FY 2023 Plans:*** Conduct experiments to optimize the design of the high voltage power converter enabling directed energy weapons, high voltage batteries, and fuel cells. ***FY 2024 Plans:*** Will validate the high voltage power converter developed in FY 2023, allowing integration of high voltage batteries and range extending technologies. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects planned lifecycle of this effort			
Title: Platform Electrification Research	7.952	10.519	6.374

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BH5 / *Platform Electrification and Mobility Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Description: This effort designs and develops the electric power generation, energy storage and electrified components and sub-systems required to electrify combat vehicles across light to heavy weight classes. ***FY 2023 Plans:*** Validate the component level performance of the electric generator, electric drive motors, and final drive components of a modular electrification architecture. Conduct experiments to quantify cell level performance of novel battery chemistry. Design and develop a small integrated multi-cell module for high voltage storage system. Develop concepts for plug-in hybrid combat vehicle technology focused on advanced batteries and compact electric sprocket drive systems. Develop concepts for high speed battlefield charging capability for hybrid and battery electric vehicles to enable charging at a comparable rate to refueling. ***FY 2024 Plans:*** Will mature design of the high-power density in-hub electric sprocket module; mature designs for electrified cooling components; mature battery cell concept for extreme high-energy storage system; perform component optimization and maturation for multi-cell module for high voltage energy storage system. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding decrease reflects planned lifecycle of this effort as electric drive motor work concluded.			
Title: Advanced Mobility Research ***Description:*** This effort develops a lightweight composite running gear system for medium combat vehicle applications which offers significantly reduced system weight, maintenance, noise and vibration over conventional running gear systems. Advanced composite tracks coupled with low cost, low complexity suspension systems improve operational capability via increased mobility.	1.979	-	-
Title: Robotic Combat Vehicle Silent Watch and Mobility Range Extension ***Description:*** This effort designs and develops the Jet Propellant 8 (JP8) reformer based silent watch and mobility extension subsystem required to electrify robotic combat vehicles. The Army's robotic combat vehicles are expected to have increased silent watch and silent mobility requirements that are not met by current technologies. ***FY 2023 Plans:*** Mature components for JP8 reformer with metal supported solid oxide fuel cell. ***FY 2024 Plans:*** Will validate the component level performance of JP8 fuel reformer based silent watch and mobility extension subsystem; explore higher power density technologies for range extension subsystem. ***FY 2023 to FY 2024 Increase/Decrease Statement:***	1.969	1.710	3.340

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BH5 / *Platform Electrification and Mobility Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Funding increase to investigate higher power range extension systems that will be required for the Army to field unmanned ground systems.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.020	-
Title: Battlefield Electric Vehicle Recharge Technology ***Description:*** This effort develops technologies to enable highly mobile Electric Vehicle (EV) rechargers that are essential to allow highly electrified tactical and combat platforms to be fielded by the Army to enable capabilities such as persistent silent mobility.? Effort includes highly mobile power generation and wireless power transfer to the tactical and combat platforms. ***FY 2024 Plans:*** Will design components of a wireless recharge system. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** This is a new effort in FY 2024.	-	-	2.050
Accomplishments/Planned Programs Subtotals	13.278	14.226	13.763

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BI2 / *Sensor Protection Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BI2: *Sensor Protection Technology*	-	5.615	6.229	5.532	-	5.532	5.955	8.462	7.734	7.819	0.000	47.346

A. Mission Description and Budget Item Justification

This Project investigates, designs, and develops techniques for masking friendly force capabilities and intentions. The Project pursues technologies to reduce the susceptibility of sensor systems to detection and targeting by threat forces, as well as to inform the development of next generation signature reduction schemas. This Project also designs, investigates, fabricates, evaluates and characterizes advanced sensor protection technologies, components, and concepts that will enable the future soldier to see and operate through a laser directed energy weapon attack. Both active and passive protection technologies will be investigated to protect Army sensors that operate in the visible, short-wave infrared, mid-wave infrared, and long-wave infrared spectra from battlefield laser threats. Areas of research include passive optical limiters such as nonlinear organic dyes, semiconductors, and meta-materials, as well as fast active switches and tunable filters. Technologies investigated include novel optics designs combined with signal processing, spectral filtering, and threat sensing algorithms.

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 supports the Army Science and Technology Next Generation Combat Vehicle, Soldier Lethality, and Future Vertical Lift modernization priorities.

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

Work in this Project is coordinated with Program Element (PE) 0603462A (Next Generation Combat Vehicle Advanced Technology), PE 0603118A (Soldier Lethality Advanced Technology), PE 0603465A (Future Vertical Lift Advanced Technology), and PE 0602143A (Soldier Lethality Technology)

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Sensor Protection Technology	5.615	6.100	5.532
Description: This effort will design and develop component technology to improve protection of sensors and sensor electronics from threats via techniques to harden optics, reduce sensor optical cross sections, novel coating approaches, filter improvements, and emerging signature reduction schemas.			
FY 2023 Plans: Validate out-of-band longwave infrared (LWIR) window coatings against commercially available threats and begin to investigate coating performance against ultra-short pulsed lasers. Conduct experiments validating the protection approaches of emerging			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BI2 / *Sensor Protection Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
high performance uncooled LWIR camera systems. Determine capability gaps, and design and simulate mitigation techniques. Validate effectiveness of visible filter materials against newly identified threats. ***FY 2024 Plans:*** Will validate the interactions and effects of ultra-short pulsed lasers (USPL) on current higher performance sensors and optical materials; develop new USPL protection techniques for high performance cooled electro-optical / infrared sensorsystems; investigate enhanced laser identification techniques to improve the speed and accuracy of protective responses; investigate and report on emerging spectrally agile filter approaches for the visible and infrared (speed, transmission, and blocking ability) for protection. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding decrease represents threat mitigation investigations and reporting activities versus validation of techniques to mitigate reported threats.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.129	-
Accomplishments/Planned Programs Subtotals	5.615	6.229	5.532

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BI4 / *Materials Application and Integration Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BI4: *Materials Application and Integration Tech*	-	7.369	7.722	7.505	-	7.505	7.508	7.047	7.051	7.128	0.000	51.330

A. Mission Description and Budget Item Justification

This Project designs, develops, fabricates and evaluates a variety of materials (e.g. metals, ceramics, polymers and composites) to enable more survivable, lighter weight vehicle armor, chemical and biological protection, armaments and electronics for the next generation combat vehicle. Research focuses on unique and /or novel materials properties, developing physics-based models, materials characterization techniques, non-destructive testing methods and advanced fabrication/processing methodologies to transition candidate solutions for maturity, scale-up, and integration into systems.

This Project also continues the Advanced Vehicle Power Technology Alliance between the Department of Energy and the Department of the Army with a focus on materials, providing an emphasis on developing advanced technologies that enable military ground vehicles to become significantly more energy efficient. The Alliance is chartered to accelerate the conceptualization and transition into deployment of inventive and creative energy-saving concepts that the Nation needs to achieve energy security. This Project matures and integrates lightweight materials and joining technologies in support of lighter military vehicles which are more fuel-efficient and expeditionary with superior mobility and protection of both vehicles and occupants.

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 supports the Next Generation Combat Vehicle Army Modernization Priority.

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

Work in this Project leverages research from Program Element (PE) 0601102A (Defense Research Sciences) / Project AA7 (Mechanics and Ballistics) and 0602144A (Ground Technology) / Project BL1 (Materials and Manufacturing Research Technology). This work is also coordinated with PE 0603462A (Next Generation Combat Vehicle Advanced Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Novel Armor Materials and Processes for Vehicle Protection	7.369	7.651	7.505
Description: Develop novel metal alloys and associated processes through the scale-up and exploitation of revolutionary new metal alloys, which have demonstrated capabilities to overcome traditional engineering trade-offs (e.g., strength and ductility) with exceptional high temperature stability.			
FY 2023 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BI4 / *Materials Application and Integration Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Design and develop novel aluminum-magnesium alloys based on microstructurally-informed models that meet Army objectives for ballistic performance without requiring additional processing. Conduct experiments to expand the range of thickness for which high toughness, low cost, high hard steel armor alloy is weldable for structural applications and transition the new material for evaluation in vehicle trials and assessments. If the welded steel meets performance requirements, investigate performance of composition-optimized oxide dispersion strengthened plates manufactured using nanocrystalline powders and transition to full-scale ballistic assessments. if strengthened plates meet performance requirements, systematically investigate integration of shape changing molecules and dynamic bonding molecules into adhesively bonded multilayer composite structures for reducing damage under high rate impact. Design and develop scalable chemical agent resistant coatings (CARC) that provide enhanced camouflage reflectance and chemical agent resistivity. ***FY 2024 Plans:*** Will develop lightweight, low cost transparent glass/polymer laminates with optical transmissivity at wavelengths suitable for personnel and sensor protection; conduct experiments to maximize the thickness for weldable high toughness, low cost, high hard steel armor alloy for structural and armor applications for vehicle assessment; develop service temperature-time-mechanical property map for aluminum alloys to understand service properties of platform alloys and inform selection and development of alternative materials; design and develop scalable extreme environmental coatings that provide enhanced camouflage reflectance and chemical agent resistivity; develop capabilities for characterizing and modeling performance of dissimilar material joints (welded, solid state joined, adhesively joined) under extreme loading conditions. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding decrease supports planned lifecycle of this effort.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.071	-
Accomplishments/Planned Programs Subtotals	7.369	7.722	7.505

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BI4 / *Materials Application and Integration Tech*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BI9 / *Vehicle System Security Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BI9: *Vehicle System Security Technology*	-	2.273	-	-	-	-	-	-	-	-	0.000	2.273

A. Mission Description and Budget Item Justification

This Project develops ground vehicle cyber protection and resilience technologies to increase the cybersecurity of ground vehicles and ensure their continued operation in near-peer cyber contested environments. This Project will develop cybersecurity technologies at the vehicle platform level to defeat cybersecurity threats and maintain assured vehicle functionality and freedom of maneuver in the cyber warfighting domain. This effort is critical to address the continuous expanding vulnerability of military platforms to cyber threats due to their increasing reliance on computers, networks, data, digitization, and communications 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 supports the Next Generation Combat Vehicle (NGCV) Army Modernization Priority.

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

Work in this Project is coordinated with PE 0603462A (Next Generation Combat Vehicle Advanced Technology) and 0602213A (C3I Applied Cyber).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Vehicle System Security Technology	2.273	-	-
Description: This effort develops cybersecurity technologies to defeat cybersecurity threats and maintain assured vehicle functionality and freedom of maneuver in the cyber warfighting domain. This effort develops technologies required to maintain operating tempo and overmatch capability during offensive digital attacks to ground vehicle systems. Additionally, the technologies developed will maintain critical vehicle functionality in peer and near-peer cyber-contested environments through robust cyber-defensive protections. The effort will also develop cyber-defensive technologies to mitigate risk of future and emerging enemy cyberattack vectors by designing highly assured systems with cybersecurity designed from the beginning.			
Accomplishments/Planned Programs Subtotals	2.273	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BI9 / *Vehicle System Security Technology*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BJ2 / *Tactical and Navigation Lasers Sensors Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BJ2: *Tactical and Navigation Lasers Sensors Technology*	-	5.168	5.673	5.790	-	5.790	5.851	5.854	5.857	5.921	0.000	40.114

A. Mission Description and Budget Item Justification

This Project designs and develops novel laser sensor technologies which provide improved maneuver, lethality, and survivability capabilities via manned and autonomous navigation, adversary sensor threat detection, and target detection and designation in all environments. It will deliver novel laser technologies which will provide low size, weight, and power (SWaP) laser sources for optical augmentation detection systems; and compact Laser Detection And Ranging (LADAR) sources for situational awareness and air and ground vehicle operations and navigation in all environments. This Project is a critical enabler for autonomous operations in environments where other imaging technologies are not sufficient.

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 supports the Next Generation Combat Vehicle (NGCV), Soldier Lethality, and Future Vertical Lift (FVL)Army Modernization Priorities.

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

This Project is coordinated with PE 0603462A (Next Generation Combat Vehicle Advanced Technology), 0603118A (Soldier Lethality Advanced Technology), 0603465A (Future Vertical Lift Advanced Technology), and 0602143A (Soldier Lethality Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Tactical and Navigation Lasers Sensors Technology	5.168	5.596	5.790
Description: This effort designs and develops novel low SWaP, compact, high peak power pulsed laser sources and receivers for optical augmentation detection systems; and compact LADAR sources for situational awareness and manned and unmanned air and ground vehicle operations and navigation in all environments. Effort delivers component technologies needed to support future Army autonomous, covert targeting approaches.			
FY 2023 Plans: Develop approaches to decrease the pulse duration of advanced longwave infrared (LWIR) lasers through maturation of the laser configuration and non-linear crystals for use in LWIR optical parametric oscillators. Mature LWIR laser sources combined with pulse-detecting LWIR detector arrays such as avalanche photodiodes to increase detection range and improve range resolution. Design LWIR based three-dimensional (3-D) ranging components.			
FY 2024 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BJ2 / *Tactical and Navigation Lasers Sensors Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Will investigate pixel pitch optimization of high-sensitivity laser detectors for enhanced resolution capabilities of the arrays; investigate dark current optimization of the high-sensitivity laser detectors through detector short loops to increase detection ranges when coupled with the short-pulse laser sources; begin development of a physics-based optical link error budget and laser detector model to guide development and predict future system performance. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.077	-
Accomplishments/Planned Programs Subtotals	5.168	5.673	5.790

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BJ9 / *Autonomous Mobility Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BJ9: *Autonomous Mobility Tech*	-	3.671	-	-	-	-	-	-	-	-	0.000	3.671

Note

In FY (Fiscal Year) 2023, funding in this project was realigned to: PE 0603462A (Next Generation Combat Vehicle Advanced Technology) Project BK1 (Autonomous Mobility Adv Tech)

A. Mission Description and Budget Item Justification

This Project designs and develops Artificial Intelligence and Machine Learning (AI/ML) technologies to increase autonomy and mobility to perform teamed operations with manned and unmanned air and ground vehicles in a military relevant environment through data collection on relevant platforms. Data collection investigates the usage of both live and simulation-based data. Simulation will provide a baseline to collect, clean, and analyze data that meets the need for developing algorithms to enable both intelligent formation control and Unmanned Aerial Systems (UAS) map input for unmanned ground vehicle Mobility. This Project will allow proper collection techniques, tools, and data to maximize embedded autonomy using ML and other AI methods before utilizing live data collection. The Project will use AI/ML techniques to develop intelligent formation control to be used on maintained roads and in complex terrain without the need for Global Positioning System. Data will be collected from mounted platforms utilizing special internal and external sensors to develop algorithms for exact positioning, undistributed formation control, and increased speeds of unmanned platforms. Also, the Project will use AI/ML techniques to develop intelligent autonomous ground platform planning through the use of UAS mapped areas. Data collected from the UAS will be converted to maneuverable information for manned ground platform with the identification of enemy positions, go/no-go areas, terrain classification, and optimal suggested paths.

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

Research in this Project supports the Next Generation Combat Vehicle (NGCV) Army Modernization Priority.

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

Research in this Project is coordinated with Program Element (PE) 0603462A (Next Generation Combat Vehicles Advanced Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Formation Control - Novel Technique Investigation	3.671	-	-
Description: This effort focuses on performing the applied research needed to investigate cutting edge ML techniques to be used for advanced collaborative movement. Areas of investigation here look to advance the utility of ML mobility beyond the current, widely utilized algorithms to allow for more natural coordination of autonomous vehicles and Soldiers.			
Accomplishments/Planned Programs Subtotals	3.671	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BJ9 / *Autonomous Mobility Tech*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BK2 / *Virtual Prototyping Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BK2: *Virtual Prototyping Technology*	-	7.871	9.622	9.910	-	9.910	9.934	10.648	10.656	10.772	0.000	69.413

A. Mission Description and Budget Item Justification

This Project matures an integrated Virtual Prototyping capability that investigates Next Generation Combat Vehicle (NGCV) technology integration into a range of novel ground vehicle design concepts that will be analyzed and evaluated through modeling, simulation, and virtual experimentation to provide engineering data and operational feedback to inform NGCV requirements to strengthen and accelerate acquisition decisions. This Project designs and analyzes novel NGCV system level ground vehicle concepts by integrating advanced mobility, survivability, lethality, sensing and electrical/electronic technologies to address emerging and future advanced threats. This Project provides system level ground vehicle design concepts and performance analysis, assesses cost and performance trades, and provides real-time soldier feedback on technology performance for the Army's NGCVs. Technologies to be evaluated include high efficiency advanced powertrains, power generation, vehicle electrification, active protection systems, active blast, advanced lethality and robotic control and autonomy technologies. The NGCV Virtual Prototypes include Virtual Soldier Operational Experiments (VSOE) with System Integration Labs (SILs) to give warfighters an understanding into how behaviors and tactics change given emerging Operation concepts based on new technologies and capabilities. Future integration of VSOEs with software and hardware SILs with realistic interfaces and utilizing mixed reality technology will provide higher fidelity Soldier evaluations, without the time and cost associated with physical prototypes. The Virtual Prototyping results provide critical inputs to the Army's NGCV program by providing independent technical and operational performance results for the Army's next generation of ground combat vehicles while reducing risk and accelerating transition to physical prototypes.

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

Research in this Project supports the NGCV Army Modernization Priority.

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

Research in this Project is coordinated with Program Element (PE) 0603462A (Next Generation Combat Vehicle Advanced Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Virtual Prototyping	7.871	9.622	9.910
Description: This effort utilizes virtual prototyping to address technical and integration challenges in the areas of mobility, survivability, lethality, vehicle architecture, and systems integration for the Army's next generation of ground combat vehicles. Specifically, this effort focuses on developing integrated design concepts, performance analysis, identifying and assessing trade space, and conducting virtual operational experiments for the NGCV. The combination of technical performance and operational feedback provides insights that will inform designs and reduce development and testing time.			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BK2 / *Virtual Prototyping Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2023 Plans: Continue modeling and simulation to virtually design, develop, and assess new NGCV manned and unmanned systems that include projected lethality, mobility, sensing, and protection technologies. Analyze these technologies integrated into multiple tank and Robotic Combat Vehicle (RCV) design approaches using multiple methods that include trade analysis tools that provide tradespace exploration, understanding, and traceability of NGCV requirements. Continue to use knowledge and analyses to provide focus and targets for science and technology investments as well as inform NGCV acquisition planning and requirements development. Virtual Prototyping will also implement a public private partnership with industry to generate and advance tank design concepts to expand the knowledge of enabling technologies, obtain innovative design approaches, and provide additional data analyses for multiple NGCV efforts. Conduct Soldier-in-the-loop virtual experiments and develop System Integration Labs to assess the government and industry concepts for Military Utility, mission performance, Soldier preference, and explore Soldier derived tank TTPs for the new technologies and capabilities. ***FY 2024 Plans:*** Will continue modeling and simulation to virtually design, develop, and assess new Next Generation Combat Vehicle (NGCV) manned and unmanned systems that include projected lethality, mobility, sensing, protection, and autonomous vehicle technologies. Will integrate technologies into multiple combat vehicle concepts with a focus on Robotic Combat Vehicle (RCV) design approaches that are then analyzed for performance, cost, and traceability of NGCV requirements. Inform S&T and NGCV plans with knowledge and analyses. Will conduct Soldier-in-the-loop virtual experiments and build an initial virtual soldier operational exercise capability including system integration labs with realistic hardware/software interfaces and mixed reality technology to provide higher fidelity Soldier evaluations. Will assess ground vehicle concepts for military utility, mission performance, Soldier preference, and to explore Soldier derived Tactics, Techniques, and Procedures (TTPs). ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned lifecycle of this effort.			
Accomplishments/Planned Programs Subtotals	7.871	9.622	9.910

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BK3 / *Next Gen Intelligent Fire Control (NG-IFC) Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BK3: *Next Gen Intelligent Fire Control (NG-IFC) Tech*	-	0.926	-	-	-	-	-	-	-	-	0.000	0.926

A. Mission Description and Budget Item Justification

This Project will develop armament specific hardware, algorithms and architectures to support Next Generation Combat Vehicle (NGCV) with the necessary fire control on future manned and unmanned platforms.

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

Research in this Project supports the NGCV Army Modernization Priority.

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

Research in this Project is related to and fully integrated with the efforts funded in PE 0603462A (Next Generation Combat Vehicle Advanced Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Next Generation Intelligent Fire Control Technology ***Description:*** This effort investigates image sets for computer vision algorithms, target acquisition validation schemes and experimentation of large caliber armament systems.	0.926	-	-
Accomplishments/Planned Programs Subtotals	0.926	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BK5 / *Adv Direct In-Direct Armament Sys (ADIDAS) Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BK5: *Adv Direct In-Direct Armament Sys (ADIDAS) Tech*	-	8.845	13.526	11.043	-	11.043	11.812	8.582	7.078	7.128	0.000	68.014

A. Mission Description and Budget Item Justification

This Project matures and conducts experiments on component technologies for large caliber direct fire light-weight armament systems that will exceed the current capability of 120mm direct fire and be optimized for future operational environment with cross-domain engagement capability. This Project also researches large caliber direct fire munitions to project overwhelming lethality while ensuring maneuver forces remains mobile and sustainable during close-combat engagements at extended ranges.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority.

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

Research in this Project is related to and fully integrated with the efforts funded in PE 0603462A (Next Generation Combat Vehicle Advanced Technology) and PE 0602141A (Lethality Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Advanced Lethality - Kinetic Energy (AL-KE)	1.390	1.613	-
Description: This effort designs and develops component technologies for large caliber direct fire light-weight armament systems that will exceed the current 120mm direct fire cannon performance for future operational environments, including dense urban, with multi -domain engagement capability. The component technologies that support rapid fire on-the-move (direct & indirect) engagements include: compact ammunition design with advanced ignition, reduced gun impulse on platform through advanced recoil mitigation techniques, fire control and automated ammunition handling and reloading. ***FY 2023 Plans:*** Investigate direct fire kinetic energy cartridge technologies and novel kinetic energy lethal mechanisms to defeat future threat(s). Conduct experiments to improve accuracy and decrease engagement time at extended ranges; will mature sensor fusion, real time processing, and penetrator diversion techniques. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** This effort completes in FY 2023.			
Title: NGCV Penetrator Technology for Decisive Lethality	2.974	3.340	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BK5 / *Adv Direct In-Direct Armament Sys (ADIDAS) Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Description: This effort develops energy-efficient lethal mechanism technologies for next-generation warheads and projectiles for large-caliber ammunition launched from direct fire weapon systems that maximize the lethality against an array of targets and provide tactical advantage at extended ranges for next generation threats. The results of this research will provide the basis for the lethality required for the next generation of combat vehicles and enable the development of the next generation of ammunition to ensure lethal overmatch throughout the operational environment. ***FY 2023 Plans:*** Investigate improvements in threat armor technology designed to protect against US systems. Investigate attributes of promising penetrator concepts and identify suitable projectile technology to enable decisive lethality. Refine attributes of high energy armaments and explore integration challenges. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** In FY 2024, funding for this effort is realigned to the Decisive Lethality effort (within this project).			
Title: Advanced Lethality Armament System- Large Caliber (ALAS-LC) ***Description:*** Investigate increased lethality solutions for next generation large caliber direct fire armament systems that will ensure battlefield dominance of US ground forces. Design reduced recoil armament systems capable of increased rate of fire enabled by a compact autoloader with performance that exceeds current state of the art 120mm direct fire cannons for current and future Army platforms. ***FY 2023 Plans:*** Design and develop large caliber system and component technologies to increase direct fire lethal overmatch capabilities for current and future combat platforms. Investigate system modeling and simulation techniques for assessing complex armament system component technologies including: fire control, weapon, and munition technologies. Develop concepts to inform Army large caliber lethality. ***FY 2024 Plans:*** Will develop modeling and simulation to assess armament system component technologies for future large caliber direct fire systems. Will validate models of large caliber system and component technologies to increase direct fire lethal overmatch. Will design and develop concepts for component hardware and software to reduce recoil and increase rate of fire of next generation large caliber direct fire armament systems. ***FY 2023 to FY 2024 Increase/Decrease Statement:***	4.481	8.100	4.564

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BK5 / *Adv Direct In-Direct Armament Sys (ADIDAS) Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Funding change reflects planned lifecycle of this effort as validation of models of component technologies will be completed in FY24 and realigned to PE0603462A BK4 Next Gen Intelligent Fire Control Adv Tech.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.473	-
Title: Decisive Lethality ***Description:*** This effort develops energy-efficient lethal mechanism technologies for the next-generation of large-caliber ammunition launched from direct fire weapon systems to maximize the lethality against an array of targets and provide tactical advantage at extended ranges against current and future threats. This includes research and development to produce a compact, high energy density propelling charge, engineered aerodynamics for improved accuracy, a novel kinetic penetrator with next generation lethal mechanism, and the ability to defeat advanced and smart armors. ***FY 2024 Plans:*** Will investigate robust penetrators for greater lethality; explore the development of compact, high-energy propellant charges for direct fire which provide increased energy as well as advanced ignition technologies; conduct research into accuracy improvements needed for future large-caliber weapon systems; investigate approaches to survive, counter, and defeat smart armor technologies such as active protection system. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** This is a new effort in FY 2024 with funding realigned from the NGCV Penetrator Technology for Decisive Lethality effort within this project and from PE 0602144A Project CG7 Ground Protection Concepts and Technologies.	-	-	6.479
Accomplishments/Planned Programs Subtotals	8.845	13.526	11.043

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BK5 / *Adv Direct In-Direct Armament Sys (ADIDAS) Tech*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) BP5 / *Ground Vehicle Technology (CA)*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BP5: *Ground Vehicle Technology (CA)*	-	73.800	103.500	-	-	-	-	-	-	-	0.000	177.300

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Ground Vehicle Technology.

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023
Congressional Add: Program Increase - Silicon Carbide Electronics ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Silicon Carbide Electronics ***FY 2023 Plans:*** Congressional Interest Item funding provided for Silicon Carbide Electronics	5.500	6.000
Congressional Add: Program Increase - Highly Electrified Vehicles ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Highly Electrified Vehicles ***FY 2023 Plans:*** Congressional Interest Item funding provided for Highly Electrified Vehicles	5.000	3.000
Congressional Add: Program Increase - Prototyping Energy Smart Autonomous Ground Systems ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Prototyping Energy Smart Autonomous Ground Systems ***FY 2023 Plans:*** Congressional Interest Item funding provided for Prototyping Energy Smart Autonomous Ground Systems	10.000	10.000
Congressional Add: Advanced Materials Development for Survivability ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Advanced Materials Development for Survivability ***FY 2023 Plans:*** Congressional Interest Item funding provided for Materials Development for Survivability	5.000	10.000
Congressional Add: Advanced Optics Program ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Advanced Optics Program	4.300	-
Congressional Add: Program Increase - Digital Design and Simulated Testing	4.000	5.000

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BP5 / *Ground Vehicle Technology (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023
FY 2022 Accomplishments: Congressional Interest Item funding provided for Digital Design and Simulated Testing ***FY 2023 Plans:*** Congressional Interest Item funding provided for Digital Design and Simulated Testing		
Congressional Add: Program Increase - Fast-Refueling Fuel Cell Engines ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Fast-Refueling Fuel Cell Engines ***FY 2023 Plans:*** Congressional Interest Item funding provided for Fast-Refueling Fuel Cell Engines	7.000	7.000
Congressional Add: Program Increase - Hydrogen Technologies ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Hydrogen Technologies ***FY 2023 Plans:*** Congressional Interest Item funding provided for Hydrogen Technologies	10.000	15.000
Congressional Add: Program Increase - Machine Learning Optimized Power Electronics ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Machine Learning Optimized Power Electronics ***FY 2023 Plans:*** Congressional Interest Item funding provided for Machine Learning Optimized Power Electronics	3.000	3.000
Congressional Add: Systems Engineering for Autonomous Ground Vehicles ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Systems Engineering for Autonomous Ground Vehicles	9.000	-
Congressional Add: Vehicle Equivalency Framework Utilizing Multiple Additive Manufacturing Platforms ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Vehicle Equivalency Framework Utilizing Multiple Additive Manufacturing Platforms	5.000	-
Congressional Add: Virtual Experimentation of Autonomous and Non-Autonomous Combat Vehicles ***FY 2022 Accomplishments:*** Congressional Interest Item funding provided for Virtual Experimentation of Autonomous and Non-Autonomous Combat Vehicles	3.000	-
Congressional Add: Program Increase - Zero Emission Combat Vehicles	3.000	3.000

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BP5 / *Ground Vehicle Technology (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023
FY 2022 Accomplishments: Congressional Interest Item funding provided for Zero Emission Combat Vehicles ***FY 2023 Plans:*** Congressional Interest Item funding provided for Zero Emission Combat Vehicles		
Congressional Add: Program Increase - ADVANCED MANUFACTURING FOR COMBAT LOGISTICS SUPPORT ***FY 2023 Plans:*** Congressional Interest Item funding provided for ADVANCED MANUFACTURING FOR COMBAT LOGISTICS SUPPORT	-	2.000
Congressional Add: Program Increase - ENTERPRISE AND CROSS-FUNCTIONAL LVC FOR ACCELERATED DEVELOPMENT ***FY 2023 Plans:*** Congressional Interest Item funding provided for ENTERPRISE AND CROSS-FUNCTIONAL LVC FOR ACCELERATED DEVELOPMENT	-	8.000
Congressional Add: Program Increase - MOBILITY MATERIALS RESEARCH ***FY 2023 Plans:*** Congressional Interest Item funding provided for MOBILITY MATERIALS RESEARCH	-	5.000
Congressional Add: Program Increase - MODULAR ELECTRIC MOTORS ***FY 2023 Plans:*** Congressional Interest Item funding provided for MODULAR ELECTRIC MOTORS	-	5.500
Congressional Add: Program Increase - SMALL UNIT TECHNOLOGY ADVANCEMENTS ***FY 2023 Plans:*** Congressional Interest Item funding provided for SMALL UNIT TECHNOLOGY ADVANCEMENTS	-	10.000
Congressional Add: Program Increase - SOLID OXIDE FUEL CELL DEVELOPMENT ***FY 2023 Plans:*** Congressional Interest Item funding provided for SOLID OXIDE FUEL CELL DEVELOPMENT	-	5.000
Congressional Add: Program Increase - STRUCTURAL THERMOPLASTICS ***FY 2023 Plans:*** Congressional Interest Item funding provided for STRUCTURAL THERMOPLASTICS	-	6.000
Congressional Adds Subtotals	73.800	103.500

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** BP5 / *Ground Vehicle Technology (CA)*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602145A / *Next Generation Combat Vehicle Technology*	Project (Number/Name) CU5 / *Platform Agnostic Armaments Applied Technology*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CU5: *Platform Agnostic Armaments Applied Technology*	-	-	1.031	-	-	-	-	-	-	-	0.000	1.031

Note

In FY 2024 this effort is administratively realigned to PE 0602141 Project N18 Platform Agnostic Armaments Applied Tech

A. Mission Description and Budget Item Justification

This Project investigates technologies that holistically maximize armament performance, minimize target engagement timelines, reduce crew workloads, enhance responsiveness and enable collaborative lethal effectiveness on target across distributed platforms & missions. This project researches cross caliber weapon, munition & fire-control technologies to enhance Remote Weapon Systems (RWS) responsiveness and single or combined platform lethality in Multi-Domain Operations (MDO) environments.

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

Research in this Project supports the Next Generation Combat Vehicle Army Modernization Priority.

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Platform Agnostic Armaments Technology	-	0.993	-
Description: This effort designs and develops technologies that enables platform performance by increasing range without degrading accuracy, reducing size, weight, and power and impact to lighter platforms, enhancing weapon, munitions, fire control, and agnostic remote weapon automation tech to reduce the kill chain timeline. This effort enables Army Modernization and Multi-Domain Operations (MDOs) in support of the Army's future and planned vehicles. ***FY 2023 Plans:*** Investigate critical enabling technologies to increase range, accuracy, and lethal effectiveness for distributed remote armament systems; determine methods to reduce engagement time while decreasing size, weight, and power usage, as well as increasing performance and safety of remote weapon systems. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding is administratively realigned to PE 0602141A Project CIA Applied Armaments Tech for Distributed Lethality.			
Title: SBIR/STTR Transfer	-	0.038	-

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602145A / *Next Generation Combat Vehicle Technology*	**Project (Number/Name)** CU5 / *Platform Agnostic Armaments Applied Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2023 Plans: Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638			
Accomplishments/Planned Programs Subtotals	-	1.031	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A