Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603462A *I Next Generation Combat Vehicle Advanced Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	0.000	160.035	-	160.035	174.428	188.506	201.083	207.420	0.000	931.472
BF2: *Autonomous Ground Resupply (AGR) Adv Tech*	-	0.000	0.000	18.772	-	18.772	19.296	0.000	0.000	0.000	0.000	38.068
BF4: *Combat Vehicle Robotics Adv Tech*	-	0.000	0.000	10.308	-	10.308	8.829	25.829	24.305	24.511	0.000	93.782
BF5: *Adv Lethality & Accuracy Sys for Med Cal Adv Tech*	-	0.000	0.000	2.000	-	2.000	0.000	0.000	0.000	0.000	0.000	2.000
BF7: *Crew Augmentation and Optimization Adv Tech*	-	0.000	0.000	3.871	-	3.871	4.415	4.416	4.341	4.292	0.000	21.335
BG1: *Sensors for Auto Oper and Survivability Adv Tech*	-	0.000	0.000	10.128	-	10.128	8.747	6.116	9.028	9.127	0.000	43.146
BG3: *Modeling and Simulation for MUMT Advanced Tech*	-	0.000	0.000	3.530	-	3.530	3.367	4.399	4.540	4.590	0.000	20.426
BG4: *Adv Mobility Experimental Prototype Adv Tech Demo*	-	0.000	0.000	9.658	-	9.658	3.907	2.930	0.000	0.000	0.000	16.495
BG5: *Extended Line of Sight (ELOS) Advanced Technology*	-	0.000	0.000	12.000	-	12.000	8.000	0.000	0.000	0.000	0.000	20.000
BG7: *Ground Systems Active Defense (GSAD) Advanced Tech*	-	0.000	0.000	23.387	-	23.387	30.203	30.425	31.189	31.954	0.000	147.158
BG9: *Obscuration Advanced Technology*	-	0.000	0.000	3.085	-	3.085	3.147	3.210	3.275	3.312	0.000	16.029
BH1: *Survivability Systems Controls Advanced Technology*	-	0.000	0.000	13.022	-	13.022	13.693	14.107	14.022	13.786	0.000	68.630
BH3: *C4ISR Modular Autonomy Advanced Technology*	-	0.000	0.000	3.926	-	3.926	3.972	4.100	4.347	4.396	0.000	20.741
BH4: *Ground Vehicle Holistic Defense Adv Tech**	-	0.000	0.000	0.000	-	0.000	0.000	14.158	15.808	15.825	0.000	45.791
BH6: *Platform Electrification and Mobility Adv Tech*	-	0.000	0.000	5.198	-	5.198	15.469	18.006	22.872	22.768	0.000	84.313

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army													Date: March 2019
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*								
BH8: *Enhanced VETRONICS Advanced Technology*	-	0.000	0.000	12.960	-	12.960	12.409	10.122	10.768	10.156	0.000	56.415
BI1: *Protection for Autonomous Systems Adv Tech*	-	0.000	0.000	4.100	-	4.100	3.705	5.282	5.371	5.431	0.000	23.889
BI3: *Sensor Protection Advanced Technology*	-	0.000	0.000	1.500	-	1.500	2.000	2.000	2.000	2.022	0.000	9.522
BI5: *Materials Application and Integration Adv Tech*	-	0.000	0.000	3.625	-	3.625	3.628	3.729	3.804	3.846	0.000	18.632
BI8: *All-Electric Combat Powertrain Advanced Technology**	-	0.000	0.000	0.000	-	0.000	1.950	2.700	6.070	12.690	0.000	23.410
BJ1: *Vehicle System Security Advanced Technology*	-	0.000	0.000	1.250	-	1.250	1.750	3.250	4.476	4.953	0.000	15.679
BJ6: *Hydrogen Based Combat System Advanced Technology*	-	0.000	0.000	4.485	-	4.485	6.299	6.686	8.116	7.712	0.000	33.298
BJ8: *Detection of Explosive Hazards Advanced Technology*	-	0.000	0.000	5.130	-	5.130	5.480	5.156	3.680	3.721	0.000	23.167
BK1: *Autonomous Mobility Adv Tech*	-	0.000	0.000	7.140	-	7.140	9.800	8.100	7.200	6.741	0.000	38.981
BK4: *Next Gen Intelligent Fire Control(NG-IFC) Adv Tech*	-	0.000	0.000	0.450	-	0.450	3.450	2.850	4.130	3.569	0.000	14.449
BK6: *Adv Direct InDirect Armament Sys (ADIDAS) Adv Tech*	-	0.000	0.000	0.510	-	0.510	0.912	10.935	11.741	12.018	0.000	36.116

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2020

Note

Projects BH6 (Platform Electrification and Mobility Adv Tech), BK1 (Autonomous Mobility Adv Tech), BK4 (Next Gen Intelligent Fire Control (NG-IFC) Adv Tech), and BK6 (Adv Direct InDirect Armament Sys (ADIDAS) Adv Tech) are new starts for Fiscal Year (FY) 2020.

Apart from these new starts, efforts in this Program Element (PE) were previously funded, with continuity of effort realigned from the following PEs:
* 0603004A (Weapons and Munitions Advanced Technology)

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603462A *I Next Generation Combat Vehicle Advanced Technology*

* 0603005A (Combat Vehicle and Automotive Advanced Technology)
* 0603270A (EW Technology)
* 0603313A (Missile and Rocket Advanced Technology)
* 0603606A (Landmine Warfare and Barrier Advanced Technology)
* 0603710A (Night Vision Advanced Technology)
* 0603734A (Military Engineering Advanced Technology)
* 0603772A (Advanced Tactical Computer Science & Sensor Technology)

A. Mission Description and Budget Item Justification

This PE executes development, and demonstration for the Army's modernization priority for the Next Generation of Combat Vehicles. This PE matures, integrates and demonstrates combat vehicle technologies that enable the Army to have a smarter, faster, more lethal, more precise, more protected, and more adaptable force. Technology development builds 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. Technologies developed, matured, and demonstrated will 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 0602145A (Next Generation Combat Vehicle Technology), PE 0602146A (Network C3I Technology), PE 0602782A (Command, Control, Communications Technology), PE 0603116A (Lethality Advanced Technology), PE 0603119A (Ground Advanced Technology), PE 0603463A (Network C3I Advanced Technology), PE 0604115A (Technology Maturation Initiatives), and PE 0708045A (End Item Industrial Preparedness Activities). Work in this PE also transitions to PE 0603645A (Armored Systems Modernization Adv Dev) and PE 0604017A (Robotics Development).

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work is performed by the U.S. Army Futures Command and the U.S. Army Engineer Research and Development Center.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army					Date: March 2019
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*			R-1 Program Element (Number/Name) PE 0603462A *I Next Generation Combat Vehicle Advanced Technology*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	160.035	-	160.035
Total Adjustments	0.000	0.000	160.035	-	160.035
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	160.035	-	160.035

Change Summary Explanation

FY 2020 funding has been realigned to this PE from other PEs within the Science & Technology portfolio in support of Army Modernization Priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*				Project (Number/Name) BF2 / *Autonomous Ground Resupply (AGR) Adv Tech*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
BF2: *Autonomous Ground Resupply (AGR) Adv Tech*	-	0.000	0.000	18.772	-	18.772	19.296	0.000	0.000	0.000	0.000	38.068

Note

In Fiscal Year (FY) 2020 this Project is realigned from:
Program Element (PE) 0603005A Combat Vehicle and Automotive Advanced Technology, Project:
* 515 Robotic Ground Systems
PE 0603734A Military Engineering Advanced Technology Development, Project:
* T08 Combat Eng Systems

A. Mission Description and Budget Item Justification

Autonomous Ground Resupply (AGR) will mature and demonstrate an improved ground supply distribution system across multiple levels of strategic and tactical sustainment operations. The effort will equip existing military ground vehicles with scalable robotic technology through the integration of modular kits, common interfaces, and a common architecture to improve inter-node supply movement. Further, the system will modernize and optimize the operations within the supply nodes to improve accountability and throughput. The objective of AGR is to integrate new and emerging technologies into the Army's sustainment system to improve throughput, accountability, and safety and provide the Warfighter with the flexibility needed to meet future needs.

The work under this Project will transition to the Leader Follower Program of Record (PoR). The architecture and safety work under this Project also lays the groundwork for the Army Modernization Priority Next Generation Combat Vehicle (NGCV).

This Project matures and demonstrates simulation tools that predict autonomous vehicle performance. This Project matures and demonstrates a real-time simulator that provides the ability to design and assess ground vehicle autonomous behaviors in adverse environmental conditions, reducing the need for field testing. These simulation technologies can be integrated across Army vehicle platforms as required.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command and the U.S. Army Engineer Research and Development Center.

Work is also coordinated with PE 0602145A (Next Generation Combat Vehicle Technology), and transitions to PE 0604017A (Robotics Development).

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BF2 / *Autonomous Ground Resupply (AGR) Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Architecture and Standards ***Description:*** This effort matures and validates the government-owned autonomous architecture for an inclusive military library of behaviors that are non-proprietary and modular format to allow for design and development of payloads across the enterprise. This architecture allows the development and implementation of the same government owned software across multiple robotic systems. This will enable interoperability and modularity within systems and will lay the foundation for an affordable and sustainable lifecycle management model. This effort is coordinated with PE 0602145A (NGCV Technology). ***FY 2020 Plans:*** Will improve the fail-safe architecture with common interfaces, software and algorithms for increased robotic capability, increased reliability, and autonomous testing methodologies and procedures. Will work within and make recommendations for improvements to the government-controlled interoperability profile (IOP) standard. Will validate that standardized interfaces are enforced between unmanned platforms, payloads, controllers, and wireless communication devices. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was previously funded in PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 515 (Robotic Ground Systems) and PE 0603734A (Military Engineering Advanced Technology Development) / Project T08 (Combat Eng Systems).	-	-	7.310
Title: Hardware and Hardware-in-the-loop/Software-in-the-loop (HIL/SIL) ***Description:*** The HIL/SIL is a test system that uses real-time, physics-based models of the vehicle (multi-body dynamics), sensor systems (optics/signal processing and positioning), platform mobility (vehicle-terrain interaction) and weather/environment to provide a ?virtual proving ground? for the AGR system. This effort is coordinated with PE PE 0602145A (NGCV Technology). ***FY 2020 Plans:*** Will evaluate new hardware and software configurations to optimize AGR solutions throughout the full range of environmental conditions that are controllable and repeatable to optimize performance. Will utilize HIL SIL capability to improve and validate hardware and software configurations in the laboratory before field experimentation, reducing costs, saving time and improving overall system performance. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was previously funded in PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 515 (Robotic Ground Systems) and PE 0603734A (Military Engineering Advanced Technology Development) / Project T08 (Combat Eng Systems).	-	-	6.212
Title: Soldier Experimentation	-	-	4.750

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BF2 / *Autonomous Ground Resupply (AGR) Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Description: In conjunction with TRADOC and Army Test and Evaluation Command (ATEC), this effort will employ unmanned systems in an operational evaluation to test the system in real word applications and environments. After the lab testing is complete and a safety test performed by ATC, then the soldier will provide the final test to determine if AGR is useful and rugged enough to enable the soldiers to increase through put on actual missions. This effort is coordinated with PE 0602145A (NGCV Technology). ***FY 2020 Plans:*** Will utilize soldier feedback to optimize utility and reliability within all AGR efforts. Will improve training and maintenance packages to enable expedient transition to the soldier. Will identify high risk and vulnerabilities of the system to increase survivability of the system from enemies to inform the Program of Record (PoR). ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was previously funded in PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 515 (Robotic Ground Systems) and PE 0603734A (Military Engineering Advanced Technology Development) / Project T08 (Combat Eng Systems).			
Title: Simulation Tools for Autonomous Ground Resupply ***Description:*** This effort matures and demonstrates a real-time, hardware-in-the-loop simulator capable of rapid design and assessment of ground vehicle autonomous behaviors and integrates autonomy solutions into this tool. This effort is coordinated with PE 0602145A (NGCV Technology). ***FY 2020 Plans:*** Will demonstrate simulation environment performance and impact to autonomous deployment cost and timeline; will support Autonomous Ground Resupply capstone demonstrations via simulation-enabled analyses methods; and will integrate additional sensors and algorithms into simulation tools. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was previously funded in PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 515 (Robotic Ground Systems) and PE 0603734A (Military Engineering Advanced Technology Development) / Project T08 (Combat Eng Systems).	-	-	0.500
Accomplishments/Planned Programs Subtotals	-	-	18.772

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BF2 / *Autonomous Ground Resupply (AGR) Adv Tech*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BF4 / *Combat Vehicle Robotics Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BF4: *Combat Vehicle Robotics Adv Tech*	-	0.000	0.000	10.308	-	10.308	8.829	25.829	24.305	24.511	0.000	93.782

Note

In Fiscal Year (FY) 2020 this Project is realigned from:
Program Element (PE) 0603005A Combat Vehicle and Automotive Advanced Technology, Project:
* 515 Robotic Ground Systems

A. Mission Description and Budget Item Justification

This Project matures and demonstrates innovative enabling 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.). Project focus areas include Platform Electronic Control and Autonomy Safety Engineering.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work is performed by the U.S. Army Futures Command.

Work is also coordinated with PE 0602145A (Next Generation Combat Vehicle Technology), and transitions to PE 0604017A (Robotics Development).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Platform Electronic Control	-	-	7.580
Description: This effort optimizes the electronic, closed loop control of by-wire vehicle systems to provide stable, reliable, and predictable control in the presence of potential malicious or unintended commands for both wheeled and tracked unmanned vehicles.			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BF4 / *Combat Vehicle Robotics Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Will optimize sensors and software algorithms that provide for robotic vehicle perception to be continuously effective across adverse operational conditions. Will mature the interface technologies that allow for field changes to vehicle payload configurations that self-align with native vehicle control scheme and mission taskings. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was previously funded in PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 515 (Robotic Ground Systems).			
Title: Autonomous Safety Engineering ***Description:*** This effort demonstrates a holistic approach to the development of Robotic and Autonomy System (RAS) Safety Standards, development of RAS Virtual Testing Procedures, and maturation of a Safety Based Design Methodology for Robotic Systems. ***FY 2020 Plans:*** Will develop the RAS Safety Standard utilizing the newly formed RAS Safety Review Board (Army) that exploits the published guidelines on best practices for isolation of safety critical software from other RAS behaviors. Will optimize process for obtaining a useable Safety Confirmation for robotic systems and reduce the overall time for developmental safety testing. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was previously funded in PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 515 (Robotic Ground Systems).	-	-	2.728
Accomplishments/Planned Programs Subtotals	-	-	10.308

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BF5 / *Adv Lethality & Accuracy Sys for Med Cal Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BF5: *Adv Lethality & Accuracy Sys for Med Cal Adv Tech*	-	0.000	0.000	2.000	-	2.000	0.000	0.000	0.000	0.000	0.000	2.000

Note

In FY 2020 this Project is realigned from PE 0603004A (Weapons and Munitions Advanced Technology) / Project 232 (Advanced Lethality & Survivability Demo).

A. Mission Description and Budget Item Justification

This Project matures and demonstrates advanced medium caliber ammunition, weapon, fire control, and Ammunition Handling Systems (AHS) optimized for remote operation. This effort demonstrates cannon super high elevation engagement, high performance stabilization, remote ammunition loading, weapon safety and reliability, improved lethality, accuracy, ability to fire a suite of ammunition from non-lethal to lethal, and escalation of force capability in one system.

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 Modernization Priority Next Generation Combat Vehicle. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

Work in this Project is related to and fully integrated with the efforts funded in Program Element PE0604115A (Technology Maturation Initiative).

Work in this Project is performed by the U.S. Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Advanced Lethality and Accuracy System for Medium Caliber Advanced Technology	-	-	2.000
Description: This effort matures and demonstrates advanced medium caliber ammunition, weapon, fire control, and AHS optimized for remote operation. This effort demonstrates cannon-super high elevation engagement, high performance stabilization, remote ammunition loading, weapon safety and reliability, improved lethality, accuracy, ability to fire a suite of ammunition from non-lethal to lethal, and escalation of force capability in one system.			
FY 2020 Plans: Will validate weapon system integration with demonstration of AHS and will complete system level performance optimization efforts of programmable air burst munition and armor piercing munition fire control solutions for stationary on stationary engagements against personnel and materiel targets. The maturation and demonstrations that will be conducted through FY20			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BF5 / *Adv Lethality & Accuracy Sys for Med Cal Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
will inform technical updates to the level 2 technical data package that will be finalized for transition to Program Executive Office (PEO) Ground Combat Systems and PEO Ammunition. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was previously funded in PE 0603004A (Weapons and Munitions Advanced Technology) / Project 232 (Advanced Lethality & Survivability Demo).			
Accomplishments/Planned Programs Subtotals	-	-	2.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BF7 / *Crew Augmentation and Optimization Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BF7: *Crew Augmentation and Optimization Adv Tech*	-	0.000	0.000	3.871	-	3.871	4.415	4.416	4.341	4.292	0.000	21.335

Note

In Fiscal Year (FY) 2020 this Project is realigned from:
Program Element (PE) 0603005A Combat Vehicle and Automotive Advanced Technology, Project:
* 441 Combat Vehicle Mobility

A. Mission Description and Budget Item Justification

This Project matures and demonstrates advanced technologies to enable crew augmentation and optimization for closed hatch operations of ground vehicle platforms in a complex multi-domain operations environment. This includes integration of intelligent technologies to improve dynamic tasking and full crew interactions, machine learning to improve decision aids, early warnings, reduce response times and shorten task durations, and machine learning to optimize tasking and function. Mature technologies are incorporated onto existing or prototype Army-owned technology demonstrators so that performance of the enabling technologies can be evaluated.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is conducted by the U.S. Army Futures Command.

Work in this PE/Project is also coordinated with work in PE 0602145A (Next Generation Combat Vehicle Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Crew Augmentation & Optimization Advanced Technology	-	-	3.871
Description: This effort focuses on optimizing crew station technologies while reducing crew sizes that will provide the same overall performance by exploiting human-interaction technologies, automation, machine intelligence and customization to permit soldiers to achieve performance beyond today's constrained ground vehicle environment. This effort is coordinated with PE 0602145A (NGCV Technology).			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BF7 / *Crew Augmentation and Optimization Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Will mature crew station technologies by increasing crew performance over existing baseline capabilities. Will integrate and demonstrate advancements in multimodal hardware, displays and controls and task augmentation to provide greater situational awareness and faster decision timelines. Will validate effectiveness in relevant field demonstration utilizing Soldier subjects. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was previously funded in PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 441 (Combat Vehicle Mobility).			
Accomplishments/Planned Programs Subtotals	-	-	3.871

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BG1 / *Sensors for Auto Oper and Survivability Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BG1: *Sensors for Auto Oper and Survivability Adv Tech*	-	0.000	0.000	10.128	-	10.128	8.747	6.116	9.028	9.127	0.000	43.146

Note

In FY 2020 this Project is realigned from:
PE 0603606A (Landmine Warfare and Barrier Advanced Technology) / Project 683 (Area Denial Sensors)
PE 0603710A (Night Vision Advanced Technology) / Project K70 (Night Vision Advanced Technology)

A. Mission Description and Budget Item Justification

This Project matures, optimizes, and demonstrates automated, advanced multi-function sensors and algorithms enabling autonomous man-unmanned combined arms maneuver in full spectrum, complex environments, for next generation manned, optionally manned, and robotic platform applications. This Project will deliver sensor payloads which provide greatly increased situational awareness (e.g. pre-shot and hostile fire detection, threat classification) in all environments for manned and unmanned ground vehicle systems.

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

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

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

Work in this Project is performed by the US Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Sensors for Autonomous Operations and Survivability Advanced Technology	-	-	10.128
Description: This effort will demonstrate aided target detection (AiTD) and aided target recognition (AiTR) for rapid search, and an automated, multi-spectral sensing capability to detect concealed threats and identify/apply countermeasures to enable decisive action and maneuver, for manned and unmanned platforms. This effort is coordinated with PE 0602145A (NGCV Technology), 0602143A (Soldier Lethality Technology), and 0603118A (Soldier Lethality Advanced Technology). ***FY 2020 Plans:*** Will validate performance of AiTD and AiTR algorithms against ground targets in cluttered environments with situational awareness and targeting sensors. Will mature sensors with multi-spectral response and increased dynamic range to enable innovative AiTR behaviors and tasking in moderately complex environments, and against asymmetric targets. Will improve			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BG1 / *Sensors for Auto Oper and Survivability Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
embedded processing techniques to provide real-time performance on space-constrained platforms. Will mature and optimize threat optics detection with targeting sensors. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was previously funded in PE 0603710A (Night Vision Advanced Technology) / Project K70 (Night Vision Advanced Technology).			
Accomplishments/Planned Programs Subtotals	-	-	10.128

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BG3 / *Modeling and Simulation for MUMT Advanced Tech*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BG3: *Modeling and Simulation for MUMT Advanced Tech*	-	0.000	0.000	3.530	-	3.530	3.367	4.399	4.540	4.590	0.000	20.426

Note

In FY 2020 this Project was realigned from PE 0603734A (Military Engineering Advanced Technology) / Project T08 (Combat Eng Systems).

A. Mission Description and Budget Item Justification

This Project matures and demonstrates Modeling and Simulation (M&S) tools/technologies to assess and improve freedom of movement for ground forces and supports vehicle developers by addressing challenges for robotic and ground vehicles. This Project matures and demonstrates a prototype warning systems for dynamic hazards in urban/complex environments. This Project also matures and demonstrates real-time mobility decision support tools, vehicle-terrain interaction 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. These M&S technologies can be integrated across Army vehicle platforms as required.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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 portfolio.

Work is performed at the U.S. Army Engineer Research and Development Center.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Mobility in Complex Urban Environments Demonstrations	-	-	3.530
Description: This effort matures and demonstrates a real-time, hardware-in-the-loop simulator capable of rapid design and assessment of ground vehicle autonomous behaviors and integrates autonomy solutions into this tool. This effort is coordinated with PE 0602145A (NGCV Technology).			
FY 2020 Plans: Will mature a fully integrated real-time hardware-in-the-loop simulator to validate autonomous vehicle maneuver configurations; will conduct field demonstrations to assess performance; will demonstrate mobility obstacle detection software to support real-time mobility decisions in urban environments; will integrate further sensor modalities into the simulator.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BG3 / *Modeling and Simulation for MUMT Advanced Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
This Project resided in PE 0603734A (Military Engineering Advanced Technology) / Project T08 (Combat Eng Systems) in FY 2019.			
Accomplishments/Planned Programs Subtotals	-	-	3.530

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BG4 / *Adv Mobility Experimental Prototype Adv Tech Demo*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BG4: *Adv Mobility Experimental Prototype Adv Tech Demo*	-	0.000	0.000	9.658	-	9.658	3.907	2.930	0.000	0.000	0.000	16.495

Note

In FY 2020 this Project is realigned from PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 441 (Combat Vehicle Mobility).

A. Mission Description and Budget Item Justification

This Project matures and fabricates advanced powertrain, power generation and running gear technologies into a combat vehicle that will reduce the percentage of no-go terrain for ground vehicles, increase the maneuver speeds across all traversable terrain, reduce fuel demands thus extending operation time between resupply, and provide onboard power generation to enable the integration of energy based capabilities such as directed energy weapons and electromagnetic armor.

Coordinated work is also being conducted under PE 0604115A (Technology Maturation Initiatives).

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

Work in this Project is conducted by the U.S. Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Advanced Mobility Experimental Prototype (AMEP) Advanced Technology	-	-	9.658
Description: This effort develops the advanced powertrain, power generation and running gear technologies required to demonstrated leap ahead combat mobility and enabling of energy based capabilities such as directed energy weapons and electromagnetic armor.			
FY 2020 Plans: Will mature powertrain, power generation and running gear components for integration into surrogate ground vehicle system. Will develop powertrain controls architecture and algorithms to improve powertrain component efficiencies.			
FY 2019 to FY 2020 Increase/Decrease Statement: This effort is a continuation of work conducted in PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 441 (Combat Vehicle Mobility) in FY 2019.			
Accomplishments/Planned Programs Subtotals	-	-	9.658

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BG4 / *Adv Mobility Experimental Prototype Adv Tech Demo*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BG5 / *Extended Line of Sight (ELOS) Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BG5: *Extended Line of Sight (ELOS) Advanced Technology*	-	0.000	0.000	12.000	-	12.000	8.000	0.000	0.000	0.000	0.000	20.000

Note

In Fiscal Year (FY) 2020 this Project is realigned from:
Program Element (PE) 0603004A Weapons and Munitions Advanced Technology, Project:
* 232 Advanced Lethality & Survivability Demo

A. Mission Description and Budget Item Justification

This Project develops a precision guided tank fire and forget 120mm munition to engage high value targets including heavy armor, the growing Anti-Tank Guided Munition (ATGM) threat (dismounted and mounted), and light armor at extended ranges (2 to 8 km (T), 2 to 12 km (O)).

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 Modernization Priority Next Generation Combat Vehicle. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Extended Line Of Sight (ELOS) Advanced Technology	-	-	12.000
Description: This effort demonstrates a 120mm Tank fired ELOS Munition that counters the growing Anti-Tank Guided Missile (ATGM) threat at extended line of sight ranges beyond current capability.			
FY 2020 Plans: Will optimize an ELOS Munition Air Frame (projectile) design to include fin stabilization element, Seeker Unit, Guidance Electronics Unit (GEU), Canard Actuation System (CAS), Warhead, GNC (Guidance, Navigation and Control) Software, Target Acquisition and Tracking (TA&T) Software, Propulsion system; will integrate these components to validate their performance through preprogram maneuver cannon fired experiments. Finalize Seeker Unit design, initiate Processor in the Loop (PIL) and Hardware in the Loop (HIL) analysis/testing.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BG5 / *Extended Line of Sight (ELOS) Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
This effort was previously funded in PE 0603004A (Weapons and Munitions Advanced Technology) / Project 232 (Advanced Lethality & Survivability Demo).			
Accomplishments/Planned Programs Subtotals	-	-	12.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BG7 / *Ground Systems Active Defense (GSAD) Advanced Tech*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BG7: *Ground Systems Active Defense (GSAD) Advanced Tech*	-	0.000	0.000	23.387	-	23.387	30.203	30.425	31.189	31.954	0.000	147.158

Note

In FY 2020 this Project is realigned from:
Program Element (PE) 0603004A Weapons and Munitions Advanced Technology, Projects:
* L97 Smoke and Obscurants Advanced Technology
PE 0603005A Combat Vehicle and Automotive Advanced Technology, Projects:
* 221 Combat Veh Survivability
PE 0603270A EW Technology, Projects:
* K16 Non-Commo ECM Tech Demo
PE 0603313A Missile and Rocket Advanced Technology, Projects:
* 263 Future MSL Tech Integr

A. Mission Description and Budget Item Justification

This Project matures and demonstrates protection and survivability technologies to increase the survivability of ground vehicles and the protection of the Soldiers who depend on them. The tasks will focus on component maturation and demonstration and transfer products for demonstration as holistic (vehicle level) solutions. The Project will mature technologies to defeat threats throughout the timeline of a threat engagement; from obscuring a target, to actively defeat a threat and through mitigating its effects after engagement. These include the active employment of smoke, physical and electronic active protection, advanced and adaptive armors, advanced and active blast mitigation systems and adaptive interior protection.

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

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

Work in this Project is performed by the U.S. Army Futures Command.

Work in this project will be coordinated with PE 0602145A (Next Generation Combat Vehicle Technology) and transitions to PE 0604852A (Suite of Vehicle Protection Systems - EMD).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Ground Systems Active Defense Development	-	-	9.254

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BG7 / *Ground Systems Active Defense (GSAD) Advanced Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Description: This effort matures and demonstrates active and adaptive component sensors and effectors which, in combination with modular Survivability Subsystem Controls (SSC) architecture, provide the ability to sense, track, respond and neutralize pacing threats prior to catastrophic terminal effects. The components/subsystems will work in tandem in an efficient manner to provide threat defeat redundancy and layered survivability to optimize protection with reduced weights. This effort matures and demonstrates modern armors that directly complement active protection technologies in order to implement sophisticated mass efficient protection mechanisms and materials investments to act as a system in order to defeat advanced threats. This effort also matures and demonstrates active blast technologies to counter underbody attacks. ***FY 2020 Plans:*** Will further develop and mature sensor and effector technologies for inclusion in suite of threat defeat capability. Will validate compliance with SSC architecture, perform environmental and durability testing of developed components to mature the technology, and provide demonstration of pacing threat defeat in representative environment. Will optimize and mature subsystem packaging and integration methods for both active protection components as well as base vehicle armor protection for the defeat of residual fragments that result from countermeasure engagements. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** PE 0603462A (NGCV Advanced Technology) / Project BG7 (Ground System Active Defense Advanced Technology) was previously PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 221 Combat Veh Survivability), PE 0603270A (EW Technology) / Project K16 (Non-Commo ECM Tech Demo), PE 0603313A (Missile and Rocket Advanced Technology) / Project 263 (Future MSL Tech Integr), and PE 0603004A (Weapons and Munitions Advanced Technology) / Project L97 (Smoke and Obscurants Advanced Technology) in FY 2019. Funding has been realigned in FY 2020 to reflect the new financial restructure.			
Title: Obscuration Technologies for Active Protection Systems ***Description:*** Research, develop, test, evaluate, and demonstrate obscurant soft-kill vehicle protection technologies to defeat the observer/gunner, anti-tank guided missiles (ATGMs), and other guided threats. Design and evaluate systems that are Modular Active Protection System (MAPS) compliant. ***FY 2020 Plans:*** Will conduct prototype field experiments and characterization of the Improved Rapid Obscuration System that provides short range coverage for indirect defeat (obscuring the gunner?s view). ***FY 2019 to FY 2020 Increase/Decrease Statement:*** PE 0603462A (NGCV Advanced Technology) / Project BG7 (Ground System Active Defense Advanced Technology) was previously PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 221 Combat Veh Survivability),	-	-	0.850

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BG7 / *Ground Systems Active Defense (GSAD) Advanced Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
PE 0603270A (EW Technology)/ Project K16 (Non-Commo ECM Tech Demo), PE 0603313A (Missile and Rocket Advanced Technology) / Project 263 (Future MSL Tech Integr), and PE 0603004A (Weapons and Munitions Advanced Technology) / Project L97 (Smoke and Obscurants Advanced Technology) in FY 2019. Funding has been realigned in FY 2020 to reflect the financial restructure.			
Title: Active Protection Technologies ***Description:*** This effort demonstrates protection for light armored combat vehicles from anti-armor threat weapons such as rocket-propelled grenades (RPG), anti-tank guided missiles (ATGM), and recoilless rifle projectiles (RR) that cannot be defeated by other means. ***FY 2020 Plans:*** Will continue maturation and adaptation of a hard-kill countermeasure and fire control sensor to provide protection for Next Generation Combat Vehicles from guided missile, recoilless rifle, and rocket propelled grenade attacks. Will validate the lethal mechanism design through laboratory testing. Design and develop countermeasure and fire control subsystems that are MAPS compliant. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** PE 0603462A (NGCV Advanced Technology) / Project BG7 (Ground System Active Defense Advanced Technology) was previously PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 221 Combat Veh Survivability), PE 0603270A (EW Technology) / Project K16 (Non-Commo ECM Tech Demo), PE 0603313A (Missile and Rocket Advanced Technology) / Project 263 (Future MSL Tech Integr), and PE 0603004A (Weapons and Munitions Advanced Technology) / Project L97 (Smoke and Obscurants Advanced Technology) in FY 2019. Funding has been realigned in FY 2020 to reflect the new financial restructure.	-	-	3.570
Title: Advanced Radar and Soft-Kill (A-RASK) suite ***Description:*** This effort matures next generation vehicle radar technologies and holistic electronic warning and soft-kill countermeasure techniques to support a layered modular active protection suite and ensure the survivability of ground combat platforms in all-weather day or night conditions with 360 degree situational awareness and threat defeat. ***FY 2020 Plans:*** For Combat Operations Battlefield Radar: Will conduct capability/tradeoff analysis based on demonstrated technology to mature active protection systems for 360 degree situational awareness. Will improve resource management and processing algorithms that supports multi-mission capabilities. Improve radar simulation models to support HWIL evaluation of emerging threats and future sensor improvements and technologies.	-	-	9.713

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BG7 / *Ground Systems Active Defense (GSAD) Advanced Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
For Advanced Soft Kill Countermeasures (ASKCM): Will mature the soft-kill countermeasure system and hardware components and integrate techniques to address multiple types of anti-tank threats by optimizing hardware performance. Begin demonstrations of ASKCM capabilities to validate system performance against multiple threat classes, launch profiles and distances. Soft Kill Techniques and Effects: Will mature methodologies for countermeasure sources to be characterized, assessed and optimized against the priority threats of interest. Will demonstrate countermeasure capabilities against a variety of threats and guidance types. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** PE 0603462A (NGCV Advanced Technology) / Project BG7 (Ground System Active Defense Advanced Technology) was previously PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 221 Combat Veh Survivability), PE 0603270A (EW Technology) / Project K16 (Non-Commo ECM Tech Demo), PE 0603313A (Missile and Rocket Advanced Technology) / Project 263 (Future MSL Tech Integr), and PE 0603004A (Weapons and Munitions Advanced Technology) / Project L97 (Smoke and Obscurants Advanced Technology) in FY 2019. Funding has been realigned in FY 2020 to reflect the financial restructure.			
Accomplishments/Planned Programs Subtotals	-	-	23.387

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BG9 / *Obscuration Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BG9: *Obscuration Advanced Technology*	-	0.000	0.000	3.085	-	3.085	3.147	3.210	3.275	3.312	0.000	16.029

Note

In FY 2020 this Project is realigned from PE 0603004A (Weapons and Munitions Advanced Technology) / Project L97 (Smoke and Obscurants Advanced Technology).

A. Mission Description and Budget Item Justification

The Project matures and demonstrates obscurant technologies with potential to enhance personnel and platform survivability by degrading threat force surveillance sensors and defeating the enemy's target acquisition devices, missile guidance, and directed energy weapons. Dissemination systems for new and improved obscurants are developed with the goal of providing efficient and safe screening of deployed forces.

Work in this Project is related to, and fully coordinated with PE 0602145A (Next Generation Combat Vehicle Technology).

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

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

Work is performed by the U.S. Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Advanced Obscuration	-	-	3.085
Description: This effort investigates, designs and demonstrates the dissemination of new and advanced obscurants. This effort will support PE 0603462 Project (Ground Systems Active Defense Advanced Technology). ***FY 2020 Plans:*** Will continue to mature particulate infrared and bispectral obscurant dissemination in the screening obscuration module. Investigate obscurant cloud interaction for vehicle protection applications. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was previously performed in PE 0603004A (Weapons and Munitions Advanced technology) / Project L97 (Smoke and Obscurants Advanced Technology).			
Accomplishments/Planned Programs Subtotals	-	-	3.085

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BG9 / *Obscuration Advanced Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BH1 / *Survivability Systems Controls Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BH1: *Survivability Systems Controls Advanced Technology*	-	0.000	0.000	13.022	-	13.022	13.693	14.107	14.022	13.786	0.000	68.630

Note

In FY 2020 this Project is realigned from PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 221 (Combat Veh Survivability).

A. Mission Description and Budget Item Justification

This Project advances the design and capability of the Modular Active Protection System (MAPS) framework and controller to enable integrating emerging survivability technologies into safe and secure configurations and demonstrating them in a representative operational environment. The effort will verify compliance of component sensors and effectors with the modular active protection architecture. This effort ultimately feeds demonstrations of active defense subsystems for demonstration as holistic (vehicle level) solutions. This Project is a key enabler for insertion of current and future active survivability technologies onto ground platforms in order to combat current and emerging threats.

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 Modernization Priority Next Generation Combat Vehicle.

All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

This work is performed by the U.S. Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Survivability System Control	-	-	13.022
Description: This effort focuses on maturing and demonstrating a common and open survivability architecture and core implementation to ensure its operational effectiveness. Specifically, this effort includes extending the MAPS architecture across a broader set of active survivability capabilities and increasing the portfolio of Modular APS Framework (MAF) compliant technologies. In addition, this project will enhance the government-developed controller subsystem for performance and integration effectiveness with high speed digital signal processing and embedded systems/firmware/software which will be required due to the expanded active defense suite of sensors (e.g., electro-optic, infrared, radio frequency, magnetic, acoustic), sensor fusion, and explore synthesizing sensor data beyond situational awareness to situational understanding with context that can greatly enhance operational effectiveness and vehicle survivability. The activities under this effort provide incremental growth			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BH1 / *Survivability Systems Controls Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
for broader threat spectrum defeat relevant to vehicle protection systems and will be aligned to capability gaps for transition to the acquisition community. ***FY 2020 Plans:*** Will build upon foundation of the MAPS controller and artifacts by analyzing latest stakeholder requirements and conducting functional analysis in preparation for an update to the MAF. Will optimize and enhance the Modular APS (MAPS) controller subsystem to begin accepting new technologies identified through design analysis activities. Will continue to advance modeling and simulation (M&S) and verification capabilities in the system integration lab. Will maintain configuration management of delivered MAPS-compliant systems. Will certify and demonstrate survivability components for MAPS-compliant active defense subsystems through use of hardware-in-the-loop and M&S. Will assess available artificial intelligence algorithms and technology that can synthesize sensor input data to paint contextual threat picture for optimized response. Will explore adaptability for tactical fleet integration with focus on SWAP constraints and affordability. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort is a continuation of work performed in PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 221 (Combat Veh Survivability), and has been realigned in FY 2020 to reflect the Army?s new Science and Technology financial structure.			
Accomplishments/Planned Programs Subtotals	-	-	13.022

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BH3 / *C4ISR Modular Autonomy Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BH3: *C4ISR Modular Autonomy Advanced Technology*	-	0.000	0.000	3.926	-	3.926	3.972	4.100	4.347	4.396	0.000	20.741

Note

In FY 2020 this Project is realigned from PE 0603772A (Advanced Tactical Computer Science & Sensor Technology) / Project 101 (Tactical Command and Control).

A. Mission Description and Budget Item Justification

This Project matures and develops software and algorithms to integrate ground and aerial Robotics and Autonomous Systems (RAS) with mission command information systems enabling commanders to more effectively plan, monitor and incorporate RAS into unit formations and missions, and assist the development of doctrine.

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 Modernization Priority Next Generation Combat Vehicle. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

Work in this Project is performed by the U.S. Army Futures Command.

Work in this PE complements PE 0602145A (Next Generation Combat Vehicle Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Command of Autonomous Teams (COAT)	-	-	3.926
Description: This effort designs, fabricates, evaluates, and integrates RAS and Manned Unmanned Teaming (MUM-T) concepts with mission command information systems and doctrine allowing commanders? the ability to plan, monitor and incorporate RAS into formations while reducing Soldier burden. This work will provide an integrated mission planning and execution capability for NGCV, and allow RAS platforms to be quickly incorporated into mission formations and complete complex tactical tasks.			
FY 2020 Plans: Will implement the computational situation awareness engine, which consumes the data feeds from RAS and produces a model of the mission to display to the user; will complete interfaces to the mission model that allows soldiers to create alerts based on mission data and priority; will complete implementation of tactical service language that allows soldiers to define behaviors for RAS platforms in the mission model.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BH3 / *C4ISR Modular Autonomy Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
This effort was previously funded in PE 0603772A (Advanced Tactical Computer Science & Sensor Technology) / Project 101 (Tactical Command and Control).			
Accomplishments/Planned Programs Subtotals	-	-	3.926

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BH6 / *Platform Electrification and Mobility Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BH6: *Platform Electrification and Mobility Adv Tech*	-	0.000	0.000	5.198	-	5.198	15.469	18.006	22.872	22.768	0.000	84.313

Note

This Project is a new start in FY 2020.

A. Mission Description and Budget Item Justification

This Project matures, integrates and demonstrates technologies to electrify both manned and unmanned Next Generation Combat Vehicle platforms. Electrification of these platforms will enable advanced onboard electrified payloads such as directed energy weapons, reduce battlefield fuel consumption, and provide new capabilities such as burst acceleration, extended silent mobility and silent watch. The effort will mature, integrate and demonstrate technologies to increase electric power such as a high voltage/temperature generator and high power/ temperature power electronics as well as technologies to reduce power demands including composite rubber band track and adaptive hydro-strut suspension.

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 Modernization Priority Next Generation Combat Vehicle.

Work is performed by the U.S. Army Futures Command.

This work complements PE 0602145A (Next Generation Combat Vehicle Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: NGCV Platform Electrification & Mobility Advanced Technology	-	-	5.198
Description: This effort develops and demonstrates scalable electrification architecture, electronics and mobility components required to electrify both manned and unmanned Next Generation Combat Vehicle platforms. ***FY 2020 Plans:*** Will develop electrified mobility demonstrator design. Will develop composite rubber track and hydro strut suspension with track tensioner required to lower power demands for the electrified mobility demonstrator. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This Project is a new start in FY 2020.			
Accomplishments/Planned Programs Subtotals	-	-	5.198

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BH6 / *Platform Electrification and Mobility Adv Tech*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BH8 / *Enhanced VETRONICS Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BH8: *Enhanced VETRONICS Advanced Technology*	-	0.000	0.000	12.960	-	12.960	12.409	10.122	10.768	10.156	0.000	56.415

Note

In FY 2020 this Project is realigned from PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 497 (Combat Vehicle Electro).

A. Mission Description and Budget Item Justification

This Project matures, integrates, and demonstrates vehicle electronics hardware such as computers, sensors, communications systems, displays, and vehicle command/control/driving mechanisms as well as vehicle software to enhance crew performance, increase vehicle fuel efficiency, reduced Size, Weight, and Power (SWaP) burdens and reduce vehicle maintenance costs. This Project also advances open system architectures (power and data) for military ground vehicles to enable common interfaces, standards and hardware implementations. The overall vehicle system architecture is known as the Vehicle Integration for Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance / Electronic Warfare (C4ISR/EW) Interoperability (VICTORY), that provides an open architecture to allow platforms to accept future technologies without the need for significant re-design as new technologies are developed and integrated. Additionally this Project matures autonomy architectures that enable the ease of integration of autonomous subsystem technologies into future and existing tactical and combat vehicle architectures. Technical challenges include: software and algorithm development for increased levels of automation for both manned and unmanned systems, secure vehicle data networks, interoperability of intra-vehicle and inter-vehicle systems, and implementation of advanced user interfaces. Overcoming these technical challenges enables improved and increased span of collaborative vehicle operations, efficient workload management, commander's decision aids, embedded simulation for battlefield visualization and fully integrated virtual test/evaluation.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project is performed by the U.S. Army Futures Command.

Work is also coordinated with PE 0602145A (Next Generation Combat Vehicle Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Enhanced ? Vehicle Electronics (E-Vetronics)	-	-	12.960
Description: This effort addresses technical and integration challenges in the areas of vehicle architecture and systems integration. Specifically, this effort focuses on maturing and demonstrating a common ground vehicle open architecture with distributed display processing architecture, adaptable and flexible computing and Input/output (I/O), advanced video network			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BH8 / *Enhanced VETRONICS Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
distribution, advancements in slip ring technology, tactical situational awareness (SA), cooperative engagement and mission package integration through open architecture components and software. These efforts will enable future vehicle capabilities, reduce dependencies on proprietary solutions, and support increased market competition through open architecture components and software. ***FY 2020 Plans:*** Will mature open systems architecture defining capabilities for flexible computing, I/O, advanced video network distribution, advancements in slip ring technology, tactical SA, cooperative engagement. Will define the standards and performance for flexible computing and I/O component. Defines the open system standards for integrating tactical SA capabilities into ground vehicles. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This Project is a continuation of work conducted in PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 497 (Combat Vehicle Electro) in FY 2019.			
Accomplishments/Planned Programs Subtotals	-	-	12.960

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*				Project (Number/Name) BI1 / *Protection for Autonomous Systems Adv Tech*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
BI1: *Protection for Autonomous Systems Adv Tech*	-	0.000	0.000	4.100	-	4.100	3.705	5.282	5.371	5.431	0.000	23.889

Note

In FY 2020 this Project is realigned from:
PE 0603004A (Weapons and Munitions Advanced Technology) / Project 232 (Advanced Lethality & Survivability Demo)
PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 221 (Combat Veh Survivability).

A. Mission Description and Budget Item Justification

This Project matures, integrates, and demonstrates protection and survivability components such as novel ballistic and sensor protection to address both current and emerging advanced threats to autonomous ground vehicles. This Project integrates complimentary survivability technologies to enable advanced protection suites, providing greater survivability and protection against emerging threats. This Project develops a holistic set of protection technologies that specifically target the autonomous subsystems integrated on a robotic platform.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

In FY 2020 this Project will develop efforts that were successfully funded in PE 0602601A (Combat Vehicle and Automotive Technology) / Project C05 (Armor Applied Research) during FY 2019.

Work in this Project supports the Army Science and Technology Next Generation Combat Vehicle Portfolio.

Work is performed by the U.S. Army Futures Command.

Work in this Project complements PE 0602145A (Next Generation Combat Vehicle Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Protection for Autonomous Systems	-	-	2.800
Description: This effort focuses on maturing and demonstrating novel ballistic protection and sensor protection concepts to ensure autonomous ground vehicles can continue their mission in contested environments.			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BI1 / *Protection for Autonomous Systems Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Will determine potential vulnerabilities to an autonomous ground combat vehicle through modeling and simulation using physics-based tools. Will develop capabilities to validate vulnerabilities in a laboratory environment. Will matures protection technologies for autonomous sensors. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort develops successful Applied Research funded in FY 2019 under PE 0602601A (Combat Vehicle and Automotive Technology) / Project C05 (Armor Applied Research).			
Title: Vehicle Anti-Personnel Protection Armament System ***Description:*** This effort matures and demonstrates capabilities to provide protection of manned and unmanned platforms against threats, non-combatants, civilian belligerents, and other potentially hostile actors. ***FY 2020 Plans:*** Will optimize and improve developmental technologies such as kinetic energy weapons/munitions and millimeter Wave energy sources for employment on unmanned platforms to deliver effects (repel, suppress, move) that enable freedom of platform movement and maneuver. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort develops successful Applied Research funded in FY 2019 under PE 0602601A (Combat Vehicle and Automotive Technology) / Project C05 (Armor Applied Research).	-	-	1.300
Accomplishments/Planned Programs Subtotals	-	-	4.100

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BI3 / *Sensor Protection Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BI3: *Sensor Protection Advanced Technology*	-	0.000	0.000	1.500	-	1.500	2.000	2.000	2.000	2.022	0.000	9.522

Note

In Fiscal Year (FY) 2020 this Project is realigned from:
Program Element (PE) 0603710A Night Vision Advanced Technology, Project:
* K70 Night Vision Advanced Technology

A. Mission Description and Budget Item Justification

This Project matures and demonstrates novel sensor protection capabilities which dramatically reduce the susceptibility of our thermal electro-optic/infrared (EO/IR) sensors to ever increasing threats on the battlefield. This effort enables continuation of the mission despite potential threat laser engagements. Low cost modular solutions will be demonstrated that can be applied across current and planned EO/IR targeting, surveillance, and situational awareness sensor systems against existing and emerging threats in support of combined arms maneuver.

Work in this Project supports the Army Modernization Priority Next Generation Combat Vehicle, Soldier Lethality, and Future Vertical Lift modernization priorities.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

Work in this Project is performed by the U.S. Army Futures Command.

Work in this Project is coordinated with PE 0602145A (NGCV Technology), 0602143A (Soldier Lethality Technology), and 0603118A (Soldier Lethality Advanced Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Sensor Protection Advanced Technology	-	-	1.500
Description: This effort will mature and demonstrate sensor protection and signature reduction capabilities which better ensure sensors are difficult to detect, dazzle, and damage by current and future laser threats. This effort is coordinated with PE 0602145A (NGCV Technology), 0602143A (Soldier Lethality Technology), and 0603118A (Soldier Lethality Advanced Technology).			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BI3 / *Sensor Protection Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Will mature novel approaches for protecting optics from energetic threats on multiple types of vehicle platforms and soldier sensors. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was previously funded in PE 0603710A (Night Vision Advanced Technology) / Project K70 (Night Vision Advanced Technology).			
Accomplishments/Planned Programs Subtotals	-	-	1.500

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BI5 / *Materials Application and Integration Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BI5: *Materials Application and Integration Adv Tech*	-	0.000	0.000	3.625	-	3.625	3.628	3.729	3.804	3.846	0.000	18.632

Note

In FY 2020 this Project is realigned from PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 221 (Combat Veh Survivability).

A. Mission Description and Budget Item Justification

This Project matures, integrates, and demonstrates lightweight novel materials, and new manufacturing processes and methodologies. These materials and technologies will enable the Army to address critical areas within survivability, mobility, and transportability.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work is performed by the U.S. Army Futures Command.

Work in this Project is coordinated with PE 0602145A (Next Generation Combat Vehicle Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: System Design Optimization for Lightweighting	-	-	3.625
Description: This effort matures technologies, tools, and advanced manufacturing techniques in support of the Army?s mission to increase mobility, protection, and transportability while reducing weight. This effort focuses on maturing and demonstrating technologies to decrease ground vehicle weight while optimizing performances and enabling the Army trade space for enhanced capabilities. The technologies being demonstrated are in the fields of material maturation, design optimization, operational metrics, joining technologies, and additive manufacturing. This effort is coordinated with PE 0602145A (NGCV Technology).			
FY 2020 Plans: Will mature and demonstrate advanced materials for weight optimization. Will demonstrate an optimization design which will result in meeting/exceeding required performance while reducing weight and increasing system robustness. Will validate the operational metrics on a combat platform established for light weighting to include freedom of movement, freedom and maneuver, and enhanced transportability and supportability. Will demonstrate the integration of a hybrid joint design of dissimilar materials.			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BI5 / *Materials Application and Integration Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Exploit the capabilities of Additive Manufacturing by demonstrating performance requirements on a combat platform that are enabled by the unique geometries and design options that are not possible with traditional manufacturing techniques. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was previously funded in PE 0603005 (Combat Vehicle and Automotive Advanced Technology) / Project 221 (Combat Veh Survivability) in FY19. Funding has been realigned to reflect the new financial structure.			
Accomplishments/Planned Programs Subtotals	-	-	3.625

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BJ1 / *Vehicle System Security Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BJ1: *Vehicle System Security Advanced Technology*	-	0.000	0.000	1.250	-	1.250	1.750	3.250	4.476	4.953	0.000	15.679

Note

In FY 2020 this Project is realigned from PE 0603005A (Combat Vehicle and Automotive Technology) / Project 441 (Combat Vehicle Mobility).

A. Mission Description and Budget Item Justification

This Project matures and demonstrates 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 mature cybersecurity technologies at the platform level to defeat cybersecurity threats and maintain assured vehicle functionality and freedom of maneuver in the cyber warfighting domain.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work in this Project will be coordinated with and transitioned to Projects identified by the RDECOM Cyber Community of Practice (CCoP).

Work is performed by the U.S. Army Futures Command.

This Project is coordinated with PE 0602145A (Next Generation Combat Vehicle Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Vehicle System Security Advanced Technology	-	-	1.250
Description: This effort matures and demonstrates technologies required to maintain operating tempo and overmatch capability during offensive digital attacks to military ground vehicle systems. Additionally, the effort will maintain critical vehicle functionality in peer and near-peer cyber-contested environments. The effort will also mature and demonstrate technologies to mitigate risk of future and emerging cyber vulnerabilities by designing highly assured systems with cybersecurity designed from the beginning.			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BJ1 / *Vehicle System Security Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Will demonstrate quantifiable security & resiliency metrics to inform digital protection requirements for future capabilities. Will develop and mature embedded cyber-resilient technologies to protect against offensive and malicious attacks. Will mature and demonstrate resilient runtime technologies for real-time threat detection and operation in near-peer cyber-contested environments. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort develops successful Applied Research previously performed in PE 0602601A (Combat Vehicle and Automotive Technology) / Project H77 (National Automotive Center) in FY 2019. Research of this type would previously have transitioned to PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 441 (Combat Vehicle Mobility). Under the new S&T financial structure, this type of work will now transition to Project BJ1.			
Accomplishments/Planned Programs Subtotals	-	-	1.250

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BJ6 / *Hydrogen Based Combat System Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BJ6: *Hydrogen Based Combat System Advanced Technology*	-	0.000	0.000	4.485	-	4.485	6.299	6.686	8.116	7.712	0.000	33.298

Note

In FY 2020 this Project is realigned from PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 441 (Combat Vehicle Mobility).

A. Mission Description and Budget Item Justification

This Project matures, integrates and demonstrates the technologies required to enable combat systems to be powered by fuel cells to enable increased operational endurance, silent operations and improved mobility. This effort demonstrates the integration of multiple fuel cell stacks to achieve necessary power levels for tracked combat systems. The efforts in this Project analyze hydrogen generation and distribution approaches to validate operational relevance of hydrogen on the battlefield. This effort also develops and demonstrates in a relevant environment the required hydrogen generation technologies in order to quantify reliability, durability and efficiency.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

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

Work is performed by the U.S. Army Futures Command.

This Project is coordinated with PE 0602145A (Next Generation Combat Vehicle Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Hydrogen Based Combat System Advanced Technology	-	-	4.485
Description: This effort matures, integrates and demonstrates the technologies required to enable combat systems to be powered by fuel cells.			
FY 2020 Plans: Will conduct performance evaluation of both reusable solid hydrogen storage tanks and liquid hydrogen for battlefield operations. Will demonstrate the physical integration of multiple fuel cell stacks into a larger module to reduce volume and increase power density.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BJ6 / *Hydrogen Based Combat System Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
This effort develops successful fuel cell Applied Research previously performed in PE 0602601A (Combat Vehicle and Automotive Technology) / Project H77 (National Automotive Center) in FY 2019. This type of work would typically transition from H77 to PE 0603005A (Combat Vehicle and Automotive Advanced Technology) / Project 441 (Combat Vehicle Mobility). Under the new S&T financial structure, this type of work will transition to Project BJ6.			
Accomplishments/Planned Programs Subtotals	-	-	4.485

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BJ8 / *Detection of Explosive Hazards Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BJ8: *Detection of Explosive Hazards Advanced Technology*	-	0.000	0.000	5.130	-	5.130	5.480	5.156	3.680	3.721	0.000	23.167

Note

In FY 2020 this Project is realigned from PE 0603606A (Landmine Warfare and Barrier Advanced Technology) / Project 608 (Countermine & Bar Dev).

A. Mission Description and Budget Item Justification

This Project matures, optimizes and demonstrates leap ahead capabilities for manned and unmanned detection and neutralization of peer, near peer and other threat mines, minefields and improvised explosive devices in all environments.

Work in this Project supports Army Modernization Priorities Next Generation Combat Vehicle, and Soldier Lethality modernization priorities.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. All FY 2020 adjustments align program financial structure to Army Modernization Priorities in support of the National Defense Strategy.

Work in this Project is performed by the U.S. Army Futures Command.

This Project is coordinated with PE 0602145A (Next Generation Combat Vehicle Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Detection of Explosive Hazards Advanced Technology	-	-	5.130
Description: This effort matures and demonstrates an integrated, standoff, modular sensor processing capability that will enable remote, rapid autonomous detection of mines, other explosive hazards (EHs) and indicators of emplacement from manned and unmanned ground vehicles and unmanned aerial systems (UASs). This effort is coordinated with PE 0602145A (NGCV Technology), and 0602143A (Soldier Lethality Technology), and 0603118A (Soldier Lethality Advanced Technology).			
FY 2020 Plans: Will mature an EH detection payload for a manned or unmanned ground vehicle and validate performance in multiple environments. Will mature EH threat detection payload for small fixed wing and rotary wing UASs.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BJ8 / *Detection of Explosive Hazards Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
This effort was previously funded in PE 0603606A (Landmine Warfare and Barrier Advanced Technology) / Project 608 (Countermine & Bar Dev).			
Accomplishments/Planned Programs Subtotals	-	-	5.130

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BK1 / *Autonomous Mobility Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BK1: *Autonomous Mobility Adv Tech*	-	0.000	0.000	7.140	-	7.140	9.800	8.100	7.200	6.741	0.000	38.981

Note

This Project is a new start in Fiscal Year (FY) 2020.

A. Mission Description and Budget Item Justification

This Project matures and demonstrates 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 will involve both simulation and live collection. Simulation will provide a baseline to correctly collect, clean, and analyze data that meets the need for improving algorithms for both formation control and unmanned aerial vehicle map input for unmanned ground vehicle mobility. Live data will start with Surrogate platforms in local areas. This will allow proper collection techniques, tools, and data to maximize embedded autonomy using Machine Learning and other Artificial Intelligent methods before utilizing live data collection. The Project will use AI/ML techniques to mature and demonstrate intelligent formation control to be used on maintained roads and in complex terrain without the need for GPS. Data will be collected from mounted platforms utilizing special internal and external sensors to improve algorithms for exact positioning, undistributed formation control, and increased speeds of unmanned platforms. Also, the Project will use AI/ML techniques to optimize intelligent autonomous ground platform planning through the use of UAV mapped areas. Data collected from air vehicle will be converted to maneuverable information for unmanned ground platform with the identification of enemy positions, go/no-go areas, terrain classification, and optimal suggested paths.

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

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 U.S. Army Futures Command.

This Project is coordinated with PE 0602145A (Next Generation Combat Vehicle Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Machine Learning Data Collection	-	-	2.940
Description: This effort matures and demonstrates techniques and technologies for mass data collection to be used towards Army research in mobility with AI/ML efforts.			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BK1 / *Autonomous Mobility Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Will mature data collection system to include multiple sensing modalities and proper computation requirements. Will develop and conduct collection plans leveraging both simulation and live data collection across multiple vehicles. Will develop and conduct test and validation plans to understand proper data to collect from training exercises. Will develop collection, analysis, and validation tools. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This Project is a new start in FY 2020.			
Title: Formation Control ***Description:*** This effort uses AI/ML techniques to develop intelligent formation control to be used on maintained roads and in complex terrain without the need for GPS. 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. ***FY 2020 Plans:*** Will develop and mature simulation tools that will be used to research coordination and collaboration between vehicles and show usability of collected data from above. Will develop algorithms to determine position/orientation of vehicle within formation utilizing AI/ML that has been trained with Army relevant platform data. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This Project is a new start in FY 2020.	-	-	4.200
Accomplishments/Planned Programs Subtotals	-	-	7.140

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BK4 / *Next Gen Intelligent Fire Control(NG-IFC) Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BK4: *Next Gen Intelligent Fire Control(NG-IFC) Adv Tech*	-	0.000	0.000	0.450	-	0.450	3.450	2.850	4.130	3.569	0.000	14.449

Note

This Project is a new start in Fiscal Year (FY) 2020.

A. Mission Description and Budget Item Justification

This Project will mature and deliver armament specific hardware, algorithms and architectures to support the Next Generation Combat Vehicle 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.

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

Work in this Project is performed by the U.S. Army Futures Command.

Work in this Project is related to and fully integrated with the efforts funded in PE 0602145A (Next Generation Combat Vehicle Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Next Generation Intelligent Fire Control	-	-	0.450
Description: This effort will deliver armament specific hardware, algorithms and architectures to support the Next Generation Combat Vehicle with the necessary fire control on future manned and unmanned platforms. ***FY 2020 Plans:*** Will optimize the fire control auto-tracking algorithms capability for advanced weapons systems. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This Project is a new start in FY 2020.			
Accomplishments/Planned Programs Subtotals	-	-	0.450

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BK4 / *Next Gen Intelligent Fire Control(NG-IFC) Adv Tech*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	Project (Number/Name) BK6 / *Adv Direct InDirect Armament Sys (ADIDAS) Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
BK6: *Adv Direct InDirect Armament Sys (ADIDAS) Adv Tech*	-	0.000	0.000	0.510	-	0.510	0.912	10.935	11.741	12.018	0.000	36.116

Note

This Project is a new start in Fiscal Year (FY) 2020.

A. Mission Description and Budget Item Justification

This Project matures and demonstrates technologies for large caliber direct fire light-weight armament systems that will exceed the current capability of 120mm direct fire cannons and be optimized for future operational environment with cross-domain engagement capability. Specifically this effort integrates and demonstrates technologies for rapid fire on-the-move at all elevations (direct & indirect), compact ammunition design with advanced ignition, advanced recoil mitigation to reduce impulse and allow integration onto lighter platforms, automated ammunition handling and reloading. This Project supports open architecture to enable supervised autonomy and remote operation and integrates intelligent fire control to address multi-domain targets from 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.

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

Work in this Project is performed by the U.S. Army Futures Command.

Work in this Project is related to and fully integrated with the efforts funded in Program Element (PE) 0602145A (Next Generation Combat Vehicle Technology) and PE 0604115A (Technology Maturation Initiative).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Advanced Direct In-Direct Armament System (ADIDAS)	-	-	0.510
Description: This effort matures and demonstrates technologies for large caliber direct fire light-weight armament systems that will exceed the current capability of 120mm direct fire cannons and be optimized for future operational environment with cross-domain engagement capability.			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603462A / *Next Generation Combat Vehicle Advanced Technology*	**Project (Number/Name)** BK6 / *Adv Direct InDirect Armament Sys (ADIDAS) Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Will optimize the armament system configurations for high elevations and advanced recoil mitigation to reduce impulse. Will mature system level designs through modeling and simulation. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This Project is a new start in FY 2020.			
Accomplishments/Planned Programs Subtotals	-	-	0.510

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A