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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2022 Army **Date:** May 2021

<b>Appropriation/Budget Activity</b> 2040: <i>Research, Development, Test &amp; Evaluation, Army / BA 4: Advanced Component Development &amp; Prototypes (ACD&amp;P)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>
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COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	80.909	95.367	87.198	-	87.198	-	-	-	-	-	-
CF4: <i>Robotic Combat Vehicle (RCV) NGCV-CFT</i>	-	75.326	89.281	84.450	-	84.450	-	-	-	-	-	-
FD2: <i>Soldier Robotics Systems</i>	-	2.657	3.138	-	-	-	-	-	-	-	-	-
FD9: <i>Robotics Systems</i>	-	2.926	2.948	2.748	-	2.748	-	-	-	-	-	-

**Note**

For Project FD2 Soldier Robotics Systems, the primary program funded in Fiscal Year (FY) 2021 was Enhanced Robotic Payloads which has a new FY 2022 Program of Record (POR) line under Program Element (PE) 0605053A Project BS9 Robotic Payloads.

**A. Mission Description and Budget Item Justification**

The Robotic Combat Vehicle (RCV) Prototyping effort will produce unmanned combat vehicle prototypes with the purpose of providing prototypes that Soldiers will use to develop new Concepts of Operations (CONOPS) and new requirements to support Army Modernization priorities. RCV efforts will be executed in three (3) phases focused on increasing the complexity of RCV Soldier maneuvers and expanding prototype platform capability. These efforts will inform the Army's decision to initiate Robotic Combat Vehicle program(s) of record transitioning from Technology Demonstrations through Modeling and Simulation (M&S) development, prototype testing and iterative Soldier evaluations. This will stress technologies developed within the Science and Technology (S&T) base, assist the Next Generation Combat Vehicles Cross Functional Team (NGCV CFT) with refining RCV requirements, and develop the CONOPS and Tactics, Techniques and Procedures (TTPs) for Manned / Unmanned Teaming (MUM-T) in combat relevant missions. This program supports the Next Generation Combat Vehicle Cross Functional Team.

Soldier Robotics Systems for Robotics Development (RD) improves robotic and autonomous program acquisition schedules by supporting the development of integrated and synchronized capability documents (e.g. Joint Capabilities Integration and Development System, Department Directed, etc.) and by maturing/transitioning technology. Activities include studies, assessments, and document development such as Technology Readiness Levels, Manufacturing Readiness Levels, Analysis of Alternatives/Letter of Sufficiency determinations, draft acquisition documents, and draft contract documents. Efforts include robotics and autonomous systems technology maturation/transition from S&T projects, Milestone Decision Documentation (MDD), and activities leading up to formal program initiation at Milestone B or C. The pre-acquisition activities conducted under this line intend to reduce acquisition cost, schedule, and performance risk by conducting market surveys, technical risk assessments, developing performance specifications, scopes of work, acquisition strategies, systems engineering plans, test and evaluation master plans, lifecycle sustainment plans, engaging in early test planning, and prototype development activities. This line is for robotic systems that are transported by vehicle and maneuver under their own power.

The Battery Modernization & Interface Standardization (BMIS) program was established to help bring greater power efficiency and effectiveness to the dismounted Soldier and reduce the proliferation of proprietary batteries across the Army. BMIS will develop the Army Standard Family of Batteries (SFoB), a central acquisition management authority, and reduce 38 Communications-Electronics (C-E) battery types, currently in use, to just 3. Battery standardization and policy enforcement will

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<p>support Operational Readiness at a reduced cost to the Army while maintaining configuration management, life cycle support, safety standards, and technological upgrades.</p> <p>Program Office Robotics Development (RD) improves robotic and autonomous program acquisition schedules by supporting the development of integrated and synchronized capability documents (e.g. Joint Capabilities Integration and Development System (JCIDS), Department Directed, etc.) and by maturing/transitioning technology. Activities include studies, assessments, and document development such as Technology Readiness Levels, Manufacturing Readiness Levels, Analysis of Alternatives/Letter of Sufficiency determinations, market research, draft acquisition documents, and draft contract documents. Efforts include robotics and autonomous systems technology maturation/transition from S&amp;T projects, MDD, and activities leading up to formal program initiation at Milestone B or C. The pre-acquisition activities conducted under this line intend to reduce acquisition cost, schedule, and performance risk by conducting market surveys, technical risk assessments, developing performance specifications, scopes of work, acquisition strategies, systems engineering plans, test and evaluation master plans, lifecycle sustainment plans, engaging in early test planning, and prototype development activities. This line is for large robotic systems that are transported by vehicle, maneuver under their own power, or are installed as robotic applique kits. Research Development Technology Evaluation (RDTE) funds enable support to capability development of emerging requirements. Funds prepare these capabilities for entrance into the Defense Acquisition System (i.e. Milestone decision). Program Office Robotics RDTE funding supports Leader Follower and Assault Breacher Vehicle (ABV) program transitions from Technology Demonstrations to Program of Record through Modeling and Simulation (M&amp;S) development and initial prototype testing. This will stress the autonomy systems and ultimately reduce Program of Record testing requirements, technical risks, and costs through studies and validated simulations. Funding also supports the exploration and development of Expedient Leader Follower (ExLF) Applique on additional systems (Heavy Expanded Mobility Tactical Truck (HEMTT), Family of Medium Tactical Vehicles (FMTV), and 915 truck fleets) beyond the Palletized Load System (PLS) and applique kits on existing Tactical Wheeled Vehicles. Funding supports Program management activities including inter-service support, travel, conducting Analysis of Alternatives (AoA), draft performance specifications, prototype demos, acquisition documents, payload demos, future payload maturation for Robotic Platforms and support for Enhanced Robotic Payloads (ERP) programs, Chemical Biological Radiological and Nuclear (CBRN), Common Robotic System Light Reconnaissance Robot (LRR) (CRS(LR)), and future robotic platforms.</p> <p>Funding also supports modernization of the current Ground Robotic fleets and current Army vehicles by investigating technology insertions including, but not limited to: condition based maintenance, vetronics, Robotic Architecture, autonomous operations and other emerging technologies. Funding will also support developing initial prototypes to enable refinement of Operational Requirements and early user feedback to support future sustainment and operational movement operating concepts.</p>		

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<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022 Base</b>	<b>FY 2022 OCO</b>	<b>FY 2022 Total</b>
Previous President's Budget	84.381	121.207	144.629	-	144.629
Current President's Budget	80.909	95.367	87.198	-	87.198
Total Adjustments	-3.472	-25.840	-57.431	-	-57.431
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-21.415			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-3.472	-4.425			
• Adjustments to Budget Years	-	-	-57.431	-	-57.431

**Change Summary Explanation**

The decrease in funding from FY 2021 to FY 2022 is due to a realignment of funding and change in strategy.

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2022 Army										<b>Date:</b> May 2021		
<b>Appropriation/Budget Activity</b> 2040 / 4					<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>				<b>Project (Number/Name)</b> CF4 / <i>Robotic Combat Vehicle (RCV) NGCV-CFT</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022 Base</b>	<b>FY 2022 OCO</b>	<b>FY 2022 Total</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
CF4: <i>Robotic Combat Vehicle (RCV) NGCV-CFT</i>	-	75.326	89.281	84.450	-	84.450	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

The Robotic Combat Vehicle (RCV) Prototyping effort will produce unmanned combat vehicle prototypes with the purpose of providing prototypes that Soldiers will use to develop new Concepts of Operations (CONOPS) and new requirements to support Army Modernization priorities. RCV efforts will be executed in three (3) phases focused on increasing the complexity of RCV Soldier maneuvers and expanding prototype platform capability. These efforts will inform the Army's decision to initiate Robotic Combat Vehicle program(s) of record transitioning from Technology Demonstrations through Modeling and Simulation (M&S) development, prototype testing and iterative Soldier evaluations. This will stress technologies developed within the Science and Technology (S&T) base, assist the Next Generation Combat Vehicles Cross Functional Team (NGCV CFT) with refining RCV requirements, and develop the CONOPS and Tactics, Techniques and Procedures (TTPs) for Manned / Unmanned Teaming (MUM-T) in combat relevant missions.

In order to accelerate user involvement with RCV platform capabilities, an RCV Prototyping effort will be executed through a three (3) phase activity. This project will finalize Phase 1's rapid prototype build of surrogate RCV platforms using existing robotized vehicles and conduct Soldier MUM-T evaluations at the platoon level (4 RCVs). In order to conduct larger scale MUM-T maneuvers and to continue to advance the autonomous performance of the robotic platforms, two additional platoons of RCVs (8 RCVs) will be built (Phase 2) leveraging existing contractor unmanned platforms for a total of a company set (12) RCVs. The company of RCVs will be used for Soldier experimentation building off of Phase 1 and providing additional refinement of CONOPS/TTPs.

The RCV Phase 3 prototyping will incorporate lessons learned and develop, modify and/or produce innovative, unmanned platforms. Phase 3 efforts will integrate modular mission payloads for RCVs that investigate different approaches to solving operational challenges and build on opportunities from Phases 1 and 2. The RCV platforms will integrate and mature capabilities transitioned from S&T to include the latest autonomous mobility capability, improved user control interfaces and advanced sensing and aided target detection and recognition (AiTDR). The Phase 3 RCV platform requirements will be informed by the initial platoon and company experimentation and Soldier feedback.

This program supports the Next Generation Combat Vehicle Cross Functional Team.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>
<b>Title:</b> Prototype Platforms	46.865	38.812	14.261
<b>Description:</b> RCV - Prototype Platforms effort will produce unmanned combat vehicle prototypes with the purpose of creating an experimental unit set that Soldiers will use to create new CONOPS and new requirements for unmanned combat vehicles to support Army Modernization priorities. Several variants of prototypes will be created, starting first with surrogate platforms which			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>
<p>adapt existing platforms into surrogate RCVs for early experimentation in several different weight classes. Based off of lessons learned from the surrogate vehicle builds, platforms optimized to be RCVs will be built which maximize the capability advantages that unmanned platforms can offer such as reduced platform size and weight. The platforms will be built with the purpose of going through Army Test &amp; Evaluation Center (ATEC) safety release and ultimately for Soldier evaluation through iterative User experimentation.</p> <p><b>FY 2021 Plans:</b> Phase 2 light and medium RCV prototype integration of autonomy software, sensors, and lethality systems, delivering prototypes for test and evaluation will be completed. This will transition updated AiTDR and autonomous navigation algorithms to Phase 1 and Phase 2 surrogate systems for Phase 2 experimentation. The concept and detailed design of the Phase 3 RCV prototypes will begin and as well as the fabrication and purchase of long-lead components and sub-systems including powertrain, energy storage, sensors, and lethality systems. Phase 3 prototype platforms will focus on decisive lethality mission roles, will be designed for remote operation and the integration of direct fire, missile systems and advanced sensors. Remote control software for modular mission packages including obscuration, electronic warfare, counter unmanned aerial systems, chemical-biological and other reconnaissance sensors will be matured and integrated.</p> <p><b>FY 2022 Plans:</b> Cost includes hardware kits for the RCV platforms. To include integration costs for CROWS-J, XM813, MCT-30, obscuration, amphibious kits, marsupial unmanned system, electronic warfare, counter Unmanned Aerial System (UAS), and chemical-biological sensors. This also includes physical and software design changes required from Soldier touchpoint feedback to include in SOE2.</p> <p><b>FY 2021 to FY 2022 Increase/Decrease Statement:</b> The decrease from FY 2021 to FY 2022 is due to a further breakdown of costs and a change in Phase 3.</p>				
<p><b>Title:</b> Modeling and Simulation</p> <p><b>Description:</b> RCV Modeling and Simulation effort will produce the ability to experiment in a virtual environment to conduct data collection and results that will inform the physical testing learning objectives. This will provide the initial data set to inform the operational experimentation in the RCV Campaign of Learning as well as feed initial data to the Requirements Community as they build new MUM-T, CONOPs and TTPs. As test data is collected, high fidelity simulations for unmanned operation of combat platforms will be refined in a virtual test environment to enable virtual test - fix - test cycles in a virtual developmental space.</p> <p><b>FY 2021 Plans:</b> This effort will continue the series of virtual experiments for Phase 3 RCV concepts, evaluating initial designs that factor in the mobility, lethality, and AiTDR capabilities using accurate technology models simulated in an operational environment and tested</p>		4.092	3.195	12.102

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>
with trained Soldiers to provide a RCV understanding for future BCT formations. The models will inform Soldier Operational Experiments and the TTPs employed.  <b>FY 2022 Plans:</b> Modeling and simulation costs include conducting virtual experiments and BOIP development. These costs also include systems integration labs (SIL), personnel support, virtual experimentation support to include expansion to company-level scale, concept modeling and analytics. The models will inform the Soldier Operational Experiments and the TTPs employed.  <b>FY 2021 to FY 2022 Increase/Decrease Statement:</b> The increase in costs from FY 2021 to FY 2022 includes efforts to increase the fidelity and accuracy of simulated environments and systems, as well as an increase to the number of virtual experiments.				
<b>Title:</b> Testing and Evaluation  <b>Description:</b> RCV Testing effort will perform system verification testing and system safety testing on the RCV surrogate platforms and purpose-built prototypes. This will expose unexpected issues and ensure that the RCV systems are safe for Soldier operation prior to conducting Field Experimentation.  <b>FY 2021 Plans:</b> Phase 2 platforms will conduct system verification testing and go through a full range of shakedown tests to ensure platforms are ready to begin safety testing. Shakedown testing will incorporate platform, section, platoon, and company level validation testing prior to transition to the Army Test and Evaluation Command for safety testing.  <b>FY 2022 Plans:</b> RCV system shakedown testing will finish and then all platforms will conduct safety release testing at Army Test and Evaluation Command to begin the evaluation process for a Safety Release for Soldier use of the RCV vehicles. Upon completion of safety testing at ATEC, all platforms will transition to conduct the Phase 2 Soldier Operational Experiment with Soldiers in a relevant operational environment. Test and evaluation costs include system-of-system level testing of autonomy system across platforms, ATEC safety testing, test engineering support, operational experimentation planning and training, and FSR support for shakeout and experimentation efforts. These costs also include OPTEMPO costs for facilities and fuel.  <b>FY 2021 to FY 2022 Increase/Decrease Statement:</b> The decrease in costs from FY 2021 to FY 2022 are due to the transition into the evaluation process.		5.606	16.649	12.117
<b>Title:</b> Program Management  <b>Description:</b> RCV Program Management effort will enable RCV concept development, modeling and simulation, detailed design, system integration and build, testing, and all Manned Unmanned Teaming Field Experimentation.		5.954	8.117	7.545

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>
<p><b><i>FY 2021 Plans:</i></b> Funding supports the Program Management Office (PMO) acquisition, development of the request for proposal, and initiation of milestone documentation. This funding also includes risk assessment, mitigation efforts, contract preparation, industry analysis, and feedback sessions, to include government and contractor labor, travel, supplies, equipment and facilities. This will also manage detailed design, build, integration, and evaluation of the RCV platform solutions and the execution of the Phase 2 testing and Phase 3 systems engineering, design and integration.</p> <p><b><i>FY 2022 Plans:</i></b> Program management support costs include program planning, matrix support, SETA contractors and government systems engineering. These costs include contract preparation and milestone documentation. This funding also includes risk assessment, mitigation efforts, contract preparation, industry analysis, and feedback sessions, to include government and contractor labor, travel, supplies, equipment and facilities. This will also manage Phase 2 testing and operational experimentation and Phase 3 design, build, and integration.</p> <p><b><i>FY 2021 to FY 2022 Increase/Decrease Statement:</i></b> The decreased in costs from FY 2021 to FY 2022 is due to the decrease in manpower required to manage a shift in the effort from design, build, and integration to testing and evaluation.</p>				
<p><b><i>Title:</i></b> Other Support Costs</p> <p><b><i>Description:</i></b> Other support costs include industry analysis and feedback sessions, risk assessment and mitigation efforts, and PEO shared expenses.</p> <p><b><i>FY 2021 Plans:</i></b> Other support costs include the industry analysis and feedback sessions, risk assessment and mitigation efforts, and PEO shared expenses.</p> <p><b><i>FY 2022 Plans:</i></b> Other support costs include the SSEB for development contract(s), industry analysis and feedback sessions, risk assessment and mitigation efforts, initial logistics data and product development, PEO shared expenses, and the development of the RCV(L) AoA.</p> <p><b><i>FY 2021 to FY 2022 Increase/Decrease Statement:</i></b> The increase in cost from FY 2021 to FY 2022 is due to the breakout of costs from prototype platforms for greater transparency of costs.</p>		5.163	5.785	21.820
<p><b><i>Title:</i></b> Development Engineering</p>		7.646	16.723	16.605

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>
<p><b>Description:</b> Development engineering costs include various engineering and software developments for the Robotic Combat Vehicles (RCV).</p> <p><b>FY 2021 Plans:</b> Costs include Safety engineering, actuation engineering, control improvements, perception improvements, autonomy software support, and VEA support.</p> <p><b>FY 2022 Plans:</b> Development engineering costs include government support of safety engineering program, by-wire kit development, emergency stop maturation, autonomy software support, autonomy architecture, autonomy software maturation, Warfighter Machine Interface (WMI) software maturation, architectural products and support for inter-operability profile (IOP) installation update for modular mission payloads, autonomous capability transition, perception improvements, human-robot interaction (HRI) and manned-unmanned teaming (MUM-T) control improvements. Development of system payload control software that includes targeting gimbals, unmanned aerial vehicle (UAV), marsupial unmanned ground vehicle (UGV), lethality systems and nonrecurring engineering for autonomy. Improvements to video management software and system latency reductions.</p> <p><b>FY 2021 to FY 2022 Increase/Decrease Statement:</b> The decrease in cost from FY 2021 to FY 2022 is due to the breakout of costs from prototype platforms for greater transparency of costs.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	75.326	89.281	84.450

**C. Other Program Funding Summary (\$ in Millions)**  
N/A

**Remarks**  
In FY 2022, funding in the amount of \$0.365 million for manpower was realigned to Operations and Maintenance. Program support costs have been accurately updated to reflect the realignments.

**D. Acquisition Strategy**  
The RCV program will provide unmanned combat vehicles to enable Soldiers to assess the capability of the platforms and create new CONOPS and doctrine for manned/unmanned teaming based operations. Prototyping and experimentation efforts will inform new ways to fight, identify system limitations and benefits, mature key technologies, and reduce technical risk. The RCV program will provide an analytically backed basis for future RCV requirements documents that will drive and inform RCV programs of record.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Army												Date: May 2021			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0604017A / Robotics Development				CF4 / Robotic Combat Vehicle (RCV) NGCV-CFT							
Management Services (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	MIPR	Various : Various	-	5.954	Oct 2019	8.117	Mar 2021	7.545	Mar 2022	-		7.545	Continuing	Continuing	Continuing
<b>Subtotal</b>			-	5.954		8.117		7.545		-		7.545	Continuing	Continuing	N/A
Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Engineering	TBD	TBD : TBD	-	7.646	Feb 2020	16.723	May 2021	16.605	Jun 2022	-		16.605	Continuing	Continuing	Continuing
Prototype Manufacturing	TBD	TBD : TBD	-	46.865	Jun 2020	38.812	Jun 2021	14.261	Jun 2022	-		14.261	Continuing	Continuing	Continuing
<b>Subtotal</b>			-	54.511		55.535		30.866		-		30.866	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Other Support Costs	TBD	TBD : TBD	-	5.163	Apr 2020	5.785	Jun 2021	21.820	Jun 2022	-		21.820	Continuing	Continuing	Continuing
<b>Subtotal</b>			-	5.163		5.785		21.820		-		21.820	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Modeling and Simulation	MIPR	TBD : TBD	-	4.092	Dec 2019	3.195	Dec 2020	12.102	Jun 2022	-		12.102	Continuing	Continuing	Continuing
Test and Evaluation	MIPR	TBD : TBD	-	5.606	Oct 2019	16.649	Dec 2020	12.117	Jun 2022	-		12.117	Continuing	Continuing	Continuing
<b>Subtotal</b>			-	9.698		19.844		24.219		-		24.219	Continuing	Continuing	N/A
Project Cost Totals			Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract				
<b>Project Cost Totals</b>			-	75.326	89.281	84.450	-	84.450	Continuing	Continuing	N/A				

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2022 Army							<b>Date:</b> May 2021			
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	<b>Prior Years</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022 Base</b>	<b>FY 2022 OCO</b>	<b>FY 2022 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>	

**Remarks**

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<b>Exhibit R-4, RDT&amp;E Schedule Profile: PB 2022 Army</b>		<b>Date: May 2021</b>
<b>Appropriation/Budget Activity</b> 2040 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>	<b>Project (Number/Name)</b> CF4 / <i>Robotic Combat Vehicle (RCV)</i> NGCV-CFT

Event Name	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026																																																																																			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4																																																																																
RCV Phase 2 - ATEC Safety Testing									Safety Testing																																																																																																			
RCV Phase 2 – Soldier Operational Experiment																					SOE																																																																																							
RCV Phase 3A - Soldier Operational Experiment Integration & System Improvements																													SOE Integration & System Impr.																																																																															
RCV (L) Draft Request for Proposal																																					1 Draft RFP																																																																							
RCV (L) Analysis of Alternatives																																													2 AoA																																																															
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RCV (L) Milestone C																																																																																	9 MS C																											
RCV (M) Draft Request for Proposal																																																																																									5 Draft RFP																			
RCV (M) Analysis of Alternatives																																																																																																	6 AoA											
RCV (M) AROC & CDD Validation																																																																																																									7 AROC & CDD Validation			
RCV (M) Milestone B																																																																																																												

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2022 Army		<b>Date:</b> May 2021
<b>Appropriation/Budget Activity</b> 2040 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>	<b>Project (Number/Name)</b> CF4 / <i>Robotic Combat Vehicle (RCV)</i> NGCV-CFT

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
RCV Phase 2 - ATEC Safety Testing	1	2022	2	2022
RCV Phase 2 ? Soldier Operational Experiment	3	2022	4	2022
RCV Phase 3A - Soldier Operational Experiment Integration & System Improvements	3	2022	2	2023
RCV (L) Draft Request for Proposal	2	2022	2	2022
RCV (L) Analysis of Alternatives	4	2022	4	2022
RCV (L) AROC & CDD Validation	4	2022	4	2022
RCV (L) Milestone B	2	2023	2	2023
RCV (L) Milestone C	3	2026	3	2026
RCV (M) Draft Request for Proposal	3	2023	3	2023
RCV (M) Analysis of Alternatives	1	2024	1	2024
RCV (M) AROC & CDD Validation	2	2024	2	2024
RCV (M) Milestone B	3	2024	3	2024
RCV (M) Milestone C	3	2028	3	2028

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2022 Army										<b>Date:</b> May 2021		
<b>Appropriation/Budget Activity</b> 2040 / 4					<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>				<b>Project (Number/Name)</b> FD2 / <i>Soldier Robotics Systems</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022 Base</b>	<b>FY 2022 OCO</b>	<b>FY 2022 Total</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
FD2: <i>Soldier Robotics Systems</i>	-	2.657	3.138	-	-	-	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**

For Project FD2 Soldier Robotics Systems, the primary program funded in Fiscal Year (FY) 2021 was Enhanced Robotic Payloads which has a new FY 2022 Program of Record (POR) line under Program Element (PE) 0605053A Project BS9 Robotic Payloads.

**A. Mission Description and Budget Item Justification**

Soldier Robotics Systems for Robotics Development (RD) improves robotic and autonomous program acquisition schedules by supporting the development of integrated and synchronized capability documents (e.g. Joint Capabilities Integration and Development System (JCIDS), Department Directed, Robotic & Autonomous Strategy (RAS), etc.) and by maturing/transitioning technology. Activities include studies, assessments, and document development such as Technology Readiness Levels, Manufacturing Readiness Levels, Analysis of Alternatives/Letter of Sufficiency determinations, draft acquisition documents, and draft contract documents. Efforts include robotics and autonomous systems technology maturation/transition from Science & Technology (S&T) demonstration projects, Milestone Decision Documentation (MDD), and activities leading up to formal program initiation at Milestone B or C. The pre-acquisition activities conducted under this line intend to reduce acquisition cost, schedule, and performance risk by conducting market surveys, technical risk assessments, developing performance specifications, scopes of work, acquisition strategies, systems engineering plans, test and evaluation master plans, lifecycle sustainment plans, engaging in early test planning, and prototype development activities. This line is for robotic systems that are transported by vehicle and maneuver under their own power. Funding supports modernization of the current Ground Robotic fleets by investigating technology insertions including, but not limited to: condition based maintenance, vetronics, Robotic Architecture, autonomous operations and other emerging technologies. Funding also supports developing initial prototypes to enable refinement of Operational Requirements and early user feedback to support future sustainment and operational movement operating concepts.

Funding supports modernization of the current Ground Robotic fleets by investigating technology insertions including, but not limited to: condition based maintenance, vetronics, Robotic Architecture, autonomous operations and other emerging technologies. Funding also supports developing initial prototypes to enable refinement of Operational Requirements and early user feedback to support future sustainment and operational movement operating concepts.

For Project FD2 Soldier Robotics Systems, the primary program funded in FY 2021 was Enhanced Robotic Payloads which has a new FY 2022 POR line under PE 0605053A Project BS9 Robotic Payloads.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>
<b>Title:</b> Soldier Borne Sensor (SBS) / Exoskeleton	1.450	1.475	-
<b>Description:</b> The SBS provides the small unit a "quick look" capability with improved Situational Awareness of routes, buildings, tunnels, obstacles blocking line of sight, and similar concealed threat locations. The budget activity enables payload improvements including camera enhancements, target identification algorithms, display/controller improvements and user			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2022 Army		<b>Date:</b> May 2021		
<b>Appropriation/Budget Activity</b> 2040 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>	<b>Project (Number/Name)</b> FD2 / <i>Soldier Robotics Systems</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>
<p>notifications for specific items of interest. Soldier Exoskeleton variants, ranging from Commercial-Off-The-Shelf solutions, will be capable of operating in a wide range of environments enhancing combat operations.</p> <p><b>FY 2021 Plans:</b> Will continue to provide for the transitioning and continuing development of Industry and DoD efforts to augment the warfighter strengths and human performance to reduce Soldier load into a program of record. Evaluate potential exoskeleton solutions to refine operational requirements to inform capability requirement generation, Analysis of Alternatives and technical risk assessments to engage in early Soldier evaluations/feedback to reduce acquisition cost, schedule, and performance risk. Conduct key pre-acquisition activities to include initial document development such as; draft performance specifications, draft acquisition documents and draft contract documents and early development activities.</p> <p><b>FY 2021 to FY 2022 Increase/Decrease Statement:</b> There is no funding in FY22 for this program. For Project FD2 Soldier Robotics Systems, the primary program funded in FY 2021 was Enhanced Robotic Payloads which has a new FY 2022 POR line under PE 0605053A Project BS9 Robotic Payloads.</p>				
<p><b>Title:</b> Unmanned Ground Vehicle (UGV) Soldier Robotics Development</p> <p><b>Description:</b> Soldier Robotics Development is designed to facilitate the transition of robotics and autonomous systems technology into Programs of Record. It informs the acquisition process beforehand allowing the Maneuver Center of Excellence, Sustainment Center of Excellence, Maneuver Support Center of Excellence, and the Cyber Center of Excellence the ability to make integration decisions and affordability trades while writing requirements. Robotics Development will fund Common Robotics System (Vehicle), Common Robotic System (Light Reconnaissance) Robot (LRR) (CRS(LR)), Common Robotic System (Communication Link) (CRS(CL)), Common Robotic System (Mission Command/Artificial Intelligence) (CRS(MS/AI)), Render Safe - Sets, Kits and Outfits (RS-SKO), Enhanced Robotics Payload (ERP), payload technology maturation efforts, Chemical, Biological, Radiological, and Nuclear (CBRN); small, pocket sized, airborne sensors, etc.</p> <p><b>FY 2021 Plans:</b> Funding is provided for program management matrix support to include salaries and travel, draft performance specifications, acquisition documents, prototype demonstrations, technology maturation, request for proposal documentations and conduct Analysis of Alternatives (AoA) on Enhanced Robotic Payload (ERP) programs, Chemical, Biological, Radiological, and Nuclear (CBRN), Common Robotic System (Light Reconnaissance) Robot (LRR) (CRS(LR)), and payload technology maturation efforts.</p> <p><b>FY 2021 to FY 2022 Increase/Decrease Statement:</b> There is no FY22 funding for this program. For Project FD2 Soldier Robotics Systems, the primary program funded in FY 2021 was Enhanced Robotic Payloads which has a new FY 2022 POR line under PE 0605053A Project BS9 Robotic Payloads.</p>		1.207	1.663	-
<b>Accomplishments/Planned Programs Subtotals</b>		2.657	3.138	-

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2022 Army	<b>Date:</b> May 2021
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<b>Appropriation/Budget Activity</b> 2040 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>	<b>Project (Number/Name)</b> FD2 / <i>Soldier Robotics Systems</i>
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**C. Other Program Funding Summary (\$ in Millions)**

<u>Line Item</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u> <u>Base</u>	<u>FY 2022</u> <u>OCO</u>	<u>FY 2022</u> <u>Total</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• W63798: <i>Soldier Borne Sensor (SBS)</i>	23.362	18.907	18.654	-	18.654	-	-	-	-	-	-

**Remarks**

There is no funding in FY22 for this program. For Project FD2 Soldier Robotics Systems, the primary program funded in FY 2021 was Enhanced Robotic Payloads which has a new FY 2022 POR line under PE 0605053A Project BS9 Robotic Payloads.

**D. Acquisition Strategy**

Soldier Robotics Systems will utilize a Robotics Development funding for internal systems engineering, requirements and architecture analysis, AoAs and Technology Readiness Assessments with S&T partners, technology maturation efforts, and studies and analysis in support of program initiation with industry.

Initial exoskeleton efforts will continue to assess Industry's and DoD emerging exoskeleton initiatives performance through Soldier demonstrations/feedback to inform capability requirement generation, technology maturation, studies and analysis to support acquisition activities leading to program initiation.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Army												Date: May 2021			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 4				PE 0604017A / Robotics Development				FD2 / Soldier Robotics Systems							
Management Services (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
UGV Program Management Support	MIPR	Multiple : Multiple	0.808	1.050	Oct 2019	0.380	Oct 2020	-		-		-	0.000	2.238	Continuing
SBS and Exoskeleton Program Management Support	Various	Various : Multiple	1.814	1.450	Mar 2020	1.520	Jul 2020	-		-		-	0.000	4.784	Continuing
<b>Subtotal</b>			2.622	2.500		1.900		-		-		-	0.000	7.022	N/A
Product Development (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
AoA CRS(H)	MIPR	Multiple : Various	0.258	-		-		-		-		-	0.000	0.258	-
AoA ERP	MIPR	Multiple : Various	0.506	-		-		-		-		-	0.000	0.506	-
AoA CRS(LR)	MIPR	Multiple : Various	0.049	-		-		-		-		-	0.000	0.049	-
Capability Development Studies, Demonstration (payload)	Various	Various : Multiple	-	0.157	Dec 2019	-		-		-		-	0.000	0.157	-
JCAUS IOP V4	MIPR	ARDEC : Picatinny, NJ	0.050	-		-		-		-		-	0.000	0.050	-
FY 2019 SBIR /STTR Transfer	TBD	TBD : TBD	0.048	-		-		-		-		-	0.000	0.048	-
<b>Subtotal</b>			0.911	0.157		-		-		-		-	0.000	1.068	N/A
Support (\$ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Performance Spec Dev	MIPR	Various : Multiple	-	-		0.619	Feb 2021	-		-		-	0.000	0.619	-
RFP and Acq Documentation	MIPR	Various : Multiple	-	-		0.619	Apr 2021	-		-		-	0.000	0.619	-
<b>Subtotal</b>			-	-		1.238		-		-		-	0.000	1.238	N/A



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**Exhibit R-4, RDT&E Schedule Profile: PB 2022 Army** **Date:** May 2021

<b>Appropriation/Budget Activity</b> 2040 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>	<b>Project (Number/Name)</b> FD2 / <i>Soldier Robotics Systems</i>
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Event Name	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
UGV Robotics Development (ERP, CBRN, CRS-LR, etc.)																												
UGV																												
SBS Analysis of Alternatives / Letter of Sufficiency																												
AoA/LoS																												
SBS Market Survey																												
Market Survey																												
SBS Request for Proposal (Development/Staffing)																												
RFP (Development/Staffing)																												
SBS SSEB																												
SSEB																												
SBS Studies/Analysis																												
Study/Analysis																												
Exoskeleton Industry Demonstration & Analysis																												
Industry Demonstration & Analysis																												
Exoskeleton Market Survey / Request For Information																												
Market Survey /RFI																												
Exoskeleton Capability Requirement Analysis																												
AoA, CBA, C-BA																												
Exoskeleton Materiel Development Decision																												
UGV Robotics Development ERP Risk Reduction																												
UGV RD																												

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**Exhibit R-4A, RDT&E Schedule Details:** PB 2022 Army **Date:** May 2021

<b>Appropriation/Budget Activity</b> 2040 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>	<b>Project (Number/Name)</b> FD2 / <i>Soldier Robotics Systems</i>
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
UGV Robotics Development (ERP, CBRN, CRS-LR, etc.)	1	2018	4	2024
SBS MDD	1	2018	1	2018
SBS Analysis of Alternatives / Letter of Sufficiency	1	2018	4	2023
SBS Market Survey	1	2018	4	2023
SBS Request for Proposal (Development/Staffing)	1	2018	2	2024
SBS RFP Release Decision	2	2019	2	2019
SBS SSEB	3	2019	1	2020
SBS MS B/C	4	2019	4	2019
SBS Studies/Analysis	1	2018	4	2023
Exoskeleton Industry Demonstration & Analysis	1	2020	4	2021
Exoskeleton Market Survey / Request For Information	1	2021	4	2021
Exoskeleton Capability Requirement Analysis	1	2021	4	2021
Exoskeleton Materiel Development Decision	4	2021	4	2021
UGV Robotics Development ERP Risk Reduction	1	2020	4	2023

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2022 Army										<b>Date:</b> May 2021		
<b>Appropriation/Budget Activity</b> 2040 / 4					<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>				<b>Project (Number/Name)</b> FD9 / <i>Robotics Systems</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022 Base</b>	<b>FY 2022 OCO</b>	<b>FY 2022 Total</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
FD9: <i>Robotics Systems</i>	-	2.926	2.948	2.748	-	2.748	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

Program Office Robotics Development (RD) improves robotic and autonomous program acquisition schedules by supporting the development of integrated and synchronized capability documents (e.g. JCIDS, Department Directed, etc.) and by maturing / transitioning technology. Research Development Technology Evaluation (RDTE) funds enable support to capability development of emerging requirements. Activities include studies, assessments, and document development such as Technology Readiness Levels, Manufacturing Readiness Levels, Analysis of Alternatives / Letter of Sufficiency determinations, draft acquisition documents, and draft contract documents. Efforts include robotics and autonomous systems technology maturation / transition from Science & Technology (S&T) projects and Robotic Enhancement Program (REP) initiatives, Milestone Decision Documentation (MDD), and activities leading up to formal program initiation at Milestone B or C. The pre-acquisition activities conducted under this line intend to reduce acquisition cost, schedule, and performance risk by conducting market surveys, technical risk assessments, developing performance specifications, scopes of work, acquisition strategies, systems engineering plans, test and evaluation master plans, lifecycle sustainment plans, engaging in early test planning, and prototype development activities. This line is for large robotic systems that are transported by vehicle, maneuver under their own power, or are installed as robotic applique kits.

Funding will expand Modeling and Simulation (M&S) including Continuous Autonomy Simulation Test Laboratory Environment (CASTLE) capability to test and evaluate Manned Unmanned teaming, combat scenarios or other emerging Robotics requirement needs. RD funding will utilize the M&S environment to mature and evaluate S&T for inclusion to program requirements, Engineering Change Proposals (ECPs) and/or technical insertions, utilize gaming technology in conjunction with Autonomy Software to develop Training, Tactics and Procedures (TTPs), requirements and Concepts of Operations (CONOPS). In addition, RD funds exploration and development of the Expedient Leader Follower (ExLF) Applique on additional systems (Heavy Expanded Mobility Tactical Truck (HEMTT), Family of Medium Tactical Vehicles (FMTV) and 915 truck fleets) beyond the Palletized Load System (PLS). Funding supports Program management activities including inter-service support, travel, conducting Analysis of Alternatives (AoA), draft performance specifications, prototype demos, acquisition documents, payload demos, future payload maturation for Robotic Platforms and support for Enhanced Robotic Payloads (ERP) programs, Chemical Biological Radiological and Nuclear (CBRN), Common Robotic System Light Reconnaissance Robot (LRR) (CRS(LR)), and future robotic platforms.

Funding also supports modernization of the current Ground Robotic fleets and current Army vehicles by investigating technology insertions including, but not limited to: condition based maintenance, vetronics, Robotic Architecture, autonomous operations and other emerging technologies. Funding will also support developing initial prototypes to enable refinement of Operational Requirements and early user feedback to support future sustainment and operational movement operating concepts.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>
<b>Title:</b> Emerging Robotics Systems	2.926	2.948	2.748
<b>Description:</b> Validation and verification of incremental system software capability upgrades for emerging robotic requirements through M&S Software-in-the-loop (SIL) and Hardware-in-the-loop (HIL) allowing for transition into Program of Record.			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2022 Army	<b>Date:</b> May 2021
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<b>Appropriation/Budget Activity</b> 2040 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>	<b>Project (Number/Name)</b> FD9 / <i>Robotics Systems</i>
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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>
<p><b><i>FY 2021 Plans:</i></b>  FY 2021 funding will expand Modeling and Simulation including CASTLE capabilities to test and evaluate Manned Unmanned Teaming, combat scenarios or other emerging program needs. RD funding will utilize the M&amp;S environment to mature and evaluate S&amp;T for inclusion to program requirements, Engineering Change Proposals (ECPs) and/or technical insertions and various mission payload development, utilize gaming technology in conjunction with Autonomy Software to develop Training, Tactics and Procedures (TTPs), requirements and CONOPS and continue validating simulation scenarios to expand test capability. Funding will support Rapid prototyping to inform emerging programs with a Buy, Try, Decide strategy and to include Robotic Payloads. In addition, funds support the exploration and development of Expedient Leader Follower (ExLF) Applique on additional systems (Heavy Expanded Mobility Tactical Truck (HEMTT), Family of Medium Tactical Vehicles (FMTV) and 915 truck fleets) beyond the PLS and providing an autonomous capability to existing Army vehicles. Funds will be used to support maturation of autonomy Software and autonomous Architecture for various Robotic programs.</p> <p><b><i>FY 2022 Plans:</i></b>  FY 2022 funding will expand Modeling and Simulation including CASTLE capabilities to provide a Live/Virtual component. A Live/Virtual capability will allow for testing with fewer assets, increase the live testing safety space and expand current autonomous test capabilities for RAS programs. RD funding will utilize the CASTLE environment to mature and evaluate vendor technologies, autonomy software and payload software in support of Continuous Integration and/or Development to Operations (DEV/OPS) for RAS programs and to develop interfaces and profiles to support machine learning and AI training. RD funding will support necessary infrastructure to conduct Continuous Integration, DEV/OPS and data collection/mining necessary in lieu of an existing enterprise solution. RD funding will utilize gaming technology in conjunction with Autonomy Software to develop Training, Tactics and Procedures (TTPs), requirements and CONOPS and continue validating simulation scenarios to expand test capability. Funding will support Rapid prototyping to inform emerging requirements with a Buy, Try, Decide strategy and to include Robotic payloads. Funds will be used to support maturation of autonomy Software and autonomous Architecture for various Robotic programs. Funding may also include supporting PM activities to include drafting performance specs, prototype demos, acquisition document preparation, payload demonstrations, future payload maturation for Robotic platforms. Also Request for proposal documentation on Enhanced Robotic Payload (ERP) programs, Chemical Biological Radiological and Nuclear (CBRN), Common Robotic System (Light Reconnaissance) Robot (LRR) (CRS(LR)), and future robotic platforms.</p> <p><b><i>FY 2021 to FY 2022 Increase/Decrease Statement:</i></b>  Minimal increase from FY2020 to FY2021.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	2.926	2.948	2.748

<b>C. Other Program Funding Summary (\$ in Millions)</b> N/A
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Exhibit R-2A, RDT&E Project Justification: PB 2022 Army Date: May 2021

<b>Appropriation/Budget Activity</b> 2040 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>	<b>Project (Number/Name)</b> FD9 / <i>Robotics Systems</i>
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**C. Other Program Funding Summary (\$ in Millions)**

**Remarks**

Pre-acquisition program activities funded by this line transition to a separate Program Element and Project prior to their first program acquisition Milestone (B or C).

**D. Acquisition Strategy**

Robotics Development (RD) is designed to facilitate the transition of robotics and autonomous systems technology from Science and Technology (S&T) projects into programs of record. It informs the acquisition process early in the development cycle allowing key stakeholders the ability to make integration decisions and affordability trades while writing requirements.

The Program Office builds upon the CCDC GVSC Expedient Leader Follower (ExLF) Operational Technology Demonstration (OTD) to provide a limited autonomous vehicle capability to Tactical Wheeled Vehicles including the Palletized Load System (PLS) A1, Heavy Expanded Mobility Tactical Truck (HEMTT), Family of Medium Tactical Vehicle (FMTV). Efforts include Capabilities Document input, close analysis of OTD activities that feed cost estimates, capture technical and test data, provide test support, develop Modeling and Simulation (M&S) capabilities, and develop a Software Integration Lab (SIL). Efforts may support Rapid prototyping to inform emerging requirements and other Army systems. A "buy/lease, try and inform" methodology may be used to evaluate Commercial Off the Shelf (COTS), Government Off the Shelf (GOTS) and Non-Developmental Item (NDI) robotics products that have the potential to enhance Soldier combat effectiveness. Actual operational user feedback and evaluation results obtained will inform emerging capabilities and requirements documents in support of a return on investment to support future Army decision making.

Robotic Combat Vehicle (RCV) funding supports Systems Engineering, Requirements, Cost Analysis, Joint Capabilities Technology Demonstration (JCTD) support, and technology transition plans.

Combat Capabilities Development Command (CCDC) Ground Vehicle Systems Center (GVSC) funding allows the Army to demonstrate and operationally assess an unmanned vehicle capability with operational units and users to validate the technology. The Army will build, and test prototype systems for safety release, Soldier use, and further technology maturation.

Robotic Combat Vehicle (RCV) Experimental Unit Prototyping will provide unmanned combat vehicles to enable users to assess the capability of the platforms and created new CONOPS and doctrine for manned/unmanned teaming based operations. Efforts will inform new CONOPS, identified system limitations and benefits and provide an achievable, analytically backed basis for future RCV requirements documents to drive future acquisition programs.

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Army** **Date:** May 2021

<b>Appropriation/Budget Activity</b> 2040 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>	<b>Project (Number/Name)</b> FD9 / <i>Robotics Systems</i>
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<b>Management Services (\$ in Millions)</b>				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
PM FP PdM ALUGS	Allot	PM FP : Warren, MI	3.375	0.848	Oct 2019	0.500	Oct 2019	0.500	Oct 2021	-		0.500	0.000	5.223	-
FY 2018 NDAA SEC 825 MDAP Cost Overrun	TBD	N/A : N/A	0.028	-		-		-		-		-	0.000	0.028	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	0.139		-		-		-		-	0.000	0.139	-
<b>Subtotal</b>			3.403	0.987		0.500		0.500		-		0.500	0.000	5.390	N/A

<b>Product Development (\$ in Millions)</b>				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
RCV/ACO M&S SIL	MIPR	CCDC GVSC : Warren, MI	1.100	-		-		-		-		-	0.000	1.100	-
SMET Modular Mission Payloads	TBD	TBD : TBD	1.000	-		-		-		-		-	0.000	1.000	-
Leader Follower (CCDC GVSC) Tech Demo A Kit	C/CPFF	Robotic Research : Baltimore, MD	25.944	-		-		-		-		-	0.000	25.944	-
Leader Follower (CCDC GVSC) Tech Demo B Kit	C/CPFF	Oshkosh : Oshkosh, WI	21.423	-		-		-		-		-	0.000	21.423	-
Leader Follower (CCDC GVSC) Integrated System Integrator	C/CPFF	Lockheed Martin : Dallas, TX	7.699	-		-		-		-		-	0.000	7.699	-
Leader Follower (CCDC GVSC) Warfighter Machine Interface	C/CPFF	DCS Corp : Boston, MA	6.977	-		-		-		-		-	0.000	6.977	-
RCV Risk Reduction Platform Development (CCDC GVSC)	C/CPFF	To Be Determined : To Be Determined	18.540	-		-		-		-		-	0.000	18.540	-
RD M&S SIL	MIPR	CCDC GVSC and various : Warren, MI	-	0.800	Oct 2019	0.913	Jul 2020	1.483	Oct 2021	-		1.483	0.000	3.196	-
ABV RCS Safety Requirements, Visualization tool	TBD	GVSC : Warren, MI	-	0.175	Mar 2021	-		-		-		-	0.000	0.175	-

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Army** **Date:** May 2021

<b>Appropriation/Budget Activity</b> 2040 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>	<b>Project (Number/Name)</b> FD9 / <i>Robotics Systems</i>
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<b>Product Development (\$ in Millions)</b>				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
ERP Payload Maturation	MIPR	CCDC GVSC : Warren, MI	-	-		-		0.200	Nov 2021	-		0.200	0.000	0.200	-
<b>Subtotal</b>			82.683	0.975		0.913		1.683		-		1.683	0.000	86.254	N/A

<b>Support (\$ in Millions)</b>				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
PdM SEPM Support	MIPR	Various : Multiple locations	7.282	0.964	Oct 2019	1.000	Oct 2019	0.565	Oct 2021	-		0.565	0.000	9.811	-
SMET Modular Mission Payloads	MIPR	PdM ALUGS : Warren, MI	0.550	-		-		-		-		-	0.000	0.550	-
Technology Demo support (CCDC GVSC)	MIPR	CCDC GVSC : Warren, MI	2.978	-		-		-		-		-	0.000	2.978	-
<b>Subtotal</b>			10.810	0.964		1.000		0.565		-		0.565	0.000	13.339	N/A

<b>Test and Evaluation (\$ in Millions)</b>				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Leader Follower (CCDC GVSC) Tech Demo Testing	MIPR	A TEC : Aberdeen, MD	0.700	-		-		-		-		-	0.000	0.700	-
Leader Follower (CCDC GVSC) Tech Demo Data Logger	MIPR	A TEC : Aberdeen, MD	0.700	-		-		-		-		-	0.000	0.700	-
Leader Follower (CCDC GVSC) Testing	MIPR	Army Test and Evaluation Command (ATEC) : Aberdeen Proving Ground, MD	3.933	-		-		-		-		-	0.000	3.933	-
Leader Follower (CCDC GVSC) Data Logger	MIPR	Army Test and Evaluation	0.750	-		-		-		-		-	0.000	0.750	-



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**Exhibit R-4, RDT&E Schedule Profile: PB 2022 Army** **Date:** May 2021

<b>Appropriation/Budget Activity</b> 2040 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>	<b>Project (Number/Name)</b> FD9 / <i>Robotics Systems</i>
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Event Name	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>Robotics Development</b>																												
RD (ERP, CBRN, CRS-LR, etc.)																												
RD Future Payload Maturation																												
<b>RD MODELING &amp; SIMULATION (M&amp;S)</b>																												
RD M&S																												
RD M&S Initial Capability Development																												
RD M&S Initial Development																												
RD M&S Data Source Matrix Development																												
RD M&S Data Source Matrix																												
RD M&S Developmental testing																												
RD M&S DEV testing																												
RD M&S Use Case Development																												
RD M&S Use Case Dev																												
RD M&S Validation, Verification Accreditation																												
RD Ver/Val/Accreditation																												
<b>Emerging Systems Upgrades</b>																												
<b>MMP M&amp;S Risk Reduction</b>																												
MMP - ATEC Safety Testing																												
MMP - ATEC Safety Testing																												
ABV RCS market research																												
ABV market research																												

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**Exhibit R-4A, RDT&E Schedule Details:** PB 2022 Army **Date:** May 2021

<b>Appropriation/Budget Activity</b> 2040 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604017A / <i>Robotics Development</i>	<b>Project (Number/Name)</b> FD9 / <i>Robotics Systems</i>
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Robotics Development	1	2017	4	2022
RD (ERP, CBRN, CRS-LR, etc.)	1	2022	4	2024
RD MODELING & SIMULATION (M&S)	1	2017	4	2025
RD M&S Initial Capability Development	4	2017	4	2020
RD M&S Data Source Matrix Development	1	2017	4	2025
RD M&S Developmental testing	2	2018	4	2025
RD M&S Use Case Development	1	2018	4	2025
RD M&S Validation, Verification Accreditation	4	2018	4	2025
Emerging Systems Upgrades	1	2017	4	2025
MMP M&S Risk Reduction	1	2021	4	2025
MMP Experimental Unit Prototyping - Contract Award	1	2019	1	2019
MMP - ATEC Safety Testing	4	2019	2	2020
ABV RCS market research	3	2020	1	2021