Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army											Date: April 2022	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*							
COST ($ in Millions)	**Prior Years**	**FY 2021**	**FY 2022**	**FY 2023 Base**	**FY 2023 OCO**	**FY 2023 Total**	**FY 2024**	**FY 2025**	**FY 2026**	**FY 2027**	**Cost To Complete**	**Total Cost**
Total Program Element	-	92.401	80.525	26.594	-	26.594	3.088	3.093	3.094	3.124	0.000	211.919
CF4: *Robotic Combat Vehicle (RCV) NGCV-CFT*	-	89.281	77.777	26.594	-	26.594	-	-	-	-	0.000	193.652
FD2: *Soldier Robotics Systems*	-	1.872	-	-	-	-	-	-	-	-	0.000	1.872
FD9: *Robotics Systems*	-	1.248	2.748	-	-	-	3.088	3.093	3.094	3.124	0.000	16.395

A. Mission Description and Budget Item Justification

Robotic Combat Vehicle (RCV) funding in this program element directly aligns with the Next Generation Combat Vehicle (NGCV) Army Modernization Priority.

The Robotic Combat Vehicle (RCV) development program will produce unmanned ground combat vehicle prototypes to aid Concepts of Operations (CONOPS) and Tactics, Techniques, and Procedures (TTP) development, integrate and secure advanced autonomy and artificial intelligence algorithms, and inform follow-on production and fielding decisions. RCV will transition from Manned Unmanned Teaming (MUM-T) experimentation to deliberate hardware and software focused development programs to include a RCV Light (L) Middle-Tier Acquisition (MTA) Rapid Prototyping program as well as a Software Acquisition Pathway (SWP) program.

RCV Experimentation includes initial hardware and software integration as well as Soldier Operational Experiments (SOE) to train, test, and evaluate the ability of Soldiers to perform missions using Mission Enabling Technology-Demonstrators (METDs) and Robotic Combat Vehicles (RCVs). Information gathered from the SOEs will be used to further inform MUM-T and which RCV(L) capabilities to develop.

To solicit early Soldier feedback, the RCV(L) MTA Rapid Prototyping effort will be accomplished through two complimentary lines of effort (LOE) - Surrogate Prototypes (SP) and Full System Prototypes (FSP).

The RCV(L) Surrogate Prototypes (SP) LOE utilizes updated RCV experimental prototypes and new build SPs in an iterative design-upgrade-test approach that includes integration of a Minimum Viable Capability Release (MVCR) and follow-on Capability Releases (CR) from the RCV Software Acquisition Pathway (SWP) effort. The SP LOE includes three design-upgrade-test cycles, each culminating in a Knowledge Point (KP) to review program process and determine SP capabilities ready for incorporation into the FSP LOE.

The RCV(L) Full System Prototypes (FSP) LOE will leverage mature capabilities from previous RCV experimentation and SP development efforts and integrate additional embedded software, perception sensors, user control interfaces, and communication links that will permit autonomous movement, tele-op movement, and increased battlefield situational awareness.

The Robotic Combat Vehicle (RCV) Software Acquisition Pathway (SWP) focuses on embedded software development and sustainment activities including RCV autonomy software, control station software, and payload control software. The RCV SWP will provide software capabilities to the Surrogate Prototypes (SP) and Full

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
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System Prototype (FSP) LOEs for integration. The RCV SWP will incorporate Soldier and integrator feedback into product roadmaps to guide the development and maturation of critical software capabilities.

The total cost of the RCV(L) MTA Rapid Prototyping program is $452.77 million (then-year dollars) RDT&E from FY 2022 to FY 2026. The RCV(L) MTA Rapid Prototyping program is fully funded across the Future Years Defense Program.

Program Office Robotics Development (RD) improves robotic and autonomous program acquisition schedules and facilitating quicker delivery of emerging technology to warfighters by supporting the development of integrated and synchronized capability documents (e.g. JCIDS, Department Directed, etc.) and by maturing / transitioning robotics 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 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 pre-MS B activities Obstacle Avoidance and Digital Modeling (OA&DM) activities.

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. Funds will be utilized for infrastructure to support cloud based tools for development and deployment of Autonomy and Artificial Intelligence/ Machine Learning (AI/ML) software.

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Army	Date: April 2022
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604017A *I Robotics Development*

B. Program Change Summary ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	95.367	87.198	0.000	-	0.000
Current President's Budget	92.401	80.525	26.594	-	26.594
Total Adjustments	-2.966	-6.673	26.594	-	26.594
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-26.486			
• Congressional Rescissions	-	-			
• Congressional Adds	-	20.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-2.966	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	26.594	-	26.594
• FFRDC Transfer	-	-0.187	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Project: CF4: *Robotic Combat Vehicle (RCV) NGCV-CFT*		
Congressional Add: *RCV Medium*	-	20.000
Congressional Add Subtotals for Project: CF4	-	20.000
Congressional Add Totals for all Projects	-	20.000

Change Summary Explanation

FY 2023 funding increase reflects the fact that the FY 2022 President's Budget request did not include out-year funding.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
CF4: *Robotic Combat Vehicle (RCV) NGCV-CFT*	-	89.281	77.777	26.594	-	26.594	-	-	-	-	0.000	193.652
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Robotic Combat Vehicle (RCV) development effort will produce unmanned ground combat vehicle prototypes to aid Concepts of Operations (CONOPS) and Tactics, Techniques, and Procedures (TTP) development, integrate and secure advanced autonomy and artificial intelligence algorithms, and inform follow-on production and fielding decisions. RCV will transition from Manned Unmanned Teaming (MUM-T) experimentation to deliberate hardware and software focused development programs to include a RCV Light (L) Middle-Tier Acquisition (MTA) Rapid Prototyping program as well as a Software Acquisition Pathway (SWP) program.

RCV Experimentation includes initial hardware and software integration as well as Soldier Operational Experiments (SOE) to train, test, and evaluate the ability of Soldiers to perform missions using Mission Enabling Technology-Demonstrators (METDs) and Robotic Combat Vehicles (RCVs). Information gathered from the SOEs will be used to further inform MUM-T and which RCV(L) capabilities to develop.

To solicit early Soldier feedback, the RCV(L) MTA Rapid Prototyping effort will be accomplished through two complimentary lines of effort (LOE) - Surrogate Prototypes (SP) and Full System Prototypes (FSP).

The RCV(L) Surrogate Prototypes (SP) LOE utilizes updated RCV experimental prototypes and new build SPs in an iterative design-upgrade-test approach that includes integration of a Minimum Viable Capability Release (MVCR) and follow-on Capability Releases (CR) from the RCV Software Acquisition Pathway (SWP). The SP LOE includes three design-upgrade-test cycles that include FORSCOM operational pilots to collect Soldier feedback and demonstrate improved capabilities related to autonomous software, system safety, and cyber and spectrum resiliency. Each design-upgrade-test cycle will culminate in a Knowledge Point (KP) to review program process and determine SP capabilities ready for incorporation into the FSP LOE. The SP LOE will also serve to validate user requirements and assist in finalization of the RCV(L) Capabilities Development Document (CDD).

The RCV(L) Full System Prototypes (FSP) LOE will leverage mature capabilities from previous RCV experimentation and SP development efforts and integrate additional embedded software, perception sensors, user control interfaces, and communication links that will permit autonomous movement, tele-op movement, and increased battlefield situational awareness. The FSP acquisition strategy includes a full and open competition that will select up to five vendors to deliver bid samples to inform down select to a single vendor for prototype build. Developmental testing of prototypes will include safety, Reliability, Availability and Maintainability (RAM), lethality, survivability, and Electromagnetic Environmental Effects (E3) testing. Additionally, Operational Testing (OT) in the form of Limited User Tests (LUT) will be executed to evaluate system suitability and effectiveness.

The Robotic Combat Vehicle (RCV) Software Acquisition Pathway (SWP) focuses on embedded software development and sustainment activities including RCV autonomy software, control station software, and payload control software. A system integration laboratory (SIL) will be used in conjunction with RCV systems to verify

and validate software capabilities in both virtual and live test environments. The RCV SWP will provide software capabilities to the Surrogate Prototypes (SP) and Full System Prototype (FSP) LOEs for integration. The RCV SWP will incorporate Soldier and integrator feedback into product roadmaps to guide the development and maturation of critical software capabilities.

This program directly aligns with the Next Generation Combat Vehicle (NGCV) Army Modernization Priority.

The total cost of the RCV(L) MTA Rapid Prototyping program is $452.77 million (then-year dollars) RDT&E from FY 2022 to FY 2026. The RCV(L) MTA Rapid Prototyping program is fully funded across the Future Years Defense Program.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Development Engineering	14.815	23.869	-
Description: RCV Experimentation Development Engineering encompasses initial hardware and software design and integration of RCV technologies, to include network, autonomy, sensors, aided target recognition, hostile fire detection and location, and pre-shot detection. RCV Experimentation Development Engineering also includes development or capabilities informed by Soldier feedback during Soldier Operational Experiments (SOE). RCV Experimentation Development Engineering is performed by the U.S. Army Combat Capabilities Development Command (DEVCOM) Ground Vehicle Systems Center (GVSC), DEVCOM Armaments Center (AC), DEVCOM Command, Control, Communication, Computers, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) Center, and RCV contractors. ***FY 2022 Plans:*** Design and integration of RCV technologies into Experimental Prototypes, to include 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 updates for modular mission payloads, autonomous capability transition, perception improvements, human-robot interaction (HRI) and manned-unmanned teaming (MUM-T) control improvements. Additionally, RCV Experimentation Development efforts includes video management software development, system latency reduction, and development of system payload control software, to include targeting gimbals, unmanned aerial vehicle (UAV), marsupial unmanned ground vehicle (UGV), and lethality systems. RCV technologies will be assessed during the FY2022 Soldier Operational Experiment (SOE) II. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The decrease in funding from FY 2022 to FY 2023 is due to a completion of RCV Experimental Prototype development efforts in FY 2022.			
Title: Prototype Platforms	35.134	-	-
Description: Build of RCV Prototypes for use in Soldier Operational Experiments (SOE) that will create new CONOPS and refine requirements for unmanned combat vehicles. Additionally, includes build of RCV Surrogate Prototypes (SP) that consider			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
lessons learned from previous RCV Experimentation efforts, and will be utilized during RCV Light (RCV(L)) Surrogate Prototyping FORSCOM Operational Pilots.			
Title: Testing and Evaluation ***Description:*** Test and Evaluation includes Experimental Prototype and Surrogate Prototype (SP) shakedown testing, safety and performance testing at Government test sites, and the spares parts and technical support to execute Soldier Operational Experiments (SOE) using Experimental Prototypes. The SOEs will solicit Solder feedback, inform new doctrine for manned/ unmanned teaming based operations, validate user requirements, and aid in determination of capabilities ready for incorporation into future RCV designs and software releases. ***FY 2022 Plans:*** FY2022 efforts include Experimental Prototype and initial Surrogate Prototype safety and performance testing, to include test planning, inspection, human factors assessments, automotive performance, electromagnetic environmental effects (E3), network and software safety, fire control, and weapons firing. FY 2022 Test and Evaluation also includes Experimental Prototype and Surrogate Prototype shakedown testing, and execution of SOE II at Ft. Hood, TX. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The decrease in funding from FY 2022 to FY 2023 is due to a change in strategy and transition to budget activity 5. Surrogate Prototype Test and Evaluation efforts continue in program element 0604641A / Tactical Unmanned Ground Vehicle (TUGV), CF5 / Robotic Combat Vehicle (BA5) NGCV-CFT.	23.995	11.396	-
Title: Modeling and Simulation ***Description:*** 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 Tactics, Techniques, and Procedures (TTP). 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. ***FY 2022 Plans:*** Conduct of virtual experiments and Basis Of Issue Plan (BOIP) development to inform the Soldier Operational Experiments and TTP development. ***FY 2022 to FY 2023 Increase/Decrease Statement:***	0.027	0.835	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
The decrease in funding from FY 2022 to FY 2023 is due to a change in strategy and transition to budget activity 5. The program funding continues in program element 0604641A / Tactical Unmanned Ground Vehicle (TUGV), CF5 / Robotic Combat Vehicle (BA5) NGCV-CFT.			
Title: Other Support Costs ***Description:*** Other support costs include industry analysis and feedback sessions, risk assessment and mitigation efforts, and PEO shared expenses.	7.326	-	-
Title: Surrogate Prototype (SP) - Product Development ***Description:*** Engineering design and development of the Surrogate Prototypes (SPs), to include integration of software capability updates from the Software Acquisition Pathway (SWP) line of effort. SP Product development also includes the design and integration of improvements for safety, cybersecurity, perception sensors, and reliability to support the Soldier user experiments and modeling and simulation (M&S) efforts. Additionally, SP Product Development provides engineering support to prototype build, in addition to on-site Field Service Representative (FSR) support and new equipment training (NET) for all phases of SP testing. ***FY 2022 Plans:*** FY 2023 SP Product Development includes Ground Vehicle Systems Center (GVSC), QinetiQ, and Textron engineering design efforts for user interfaces and crew augmentation, autonomy integration, safety and perception upgrades, and hybrid and bi-wire kits to be incorporated into the SP configuration for assessment in future United States Army Forces Command (FOSCOM) Operational Pilots. Additionally, FY 2023 SP Product Development includes GVSC engineering support to the initial FORSCOM Operational Pilot and OEM technical support and spare parts for SP testing. ***FY 2023 Plans:*** FY 2023 SP Product Development includes Ground Vehicle Systems Center (GVSC), QinetiQ, and Textron engineering design efforts for user interfaces and crew augmentation, autonomy integration, safety and perception upgrades, and hybrid and bi-wire kits. Additionally, FY 2023 SP Product Development includes GVSC engineering support to an initial United States Army Forces Command (FORSCOM) Pilot, and OEM technical support and spare parts for Government testing. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Increase in FY 2023 is due to Field Service Representative (FSR) support, New Equipment Training (NET), and spare parts procurement necessary to execute the initial FORSCOM operational pilot.	-	3.830	24.284
Title: Software Acquisition Pathway (SWP) - Software Engineering Development	-	6.827	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Description: Software Acquisition Pathway (SWP) Software Engineering Development focuses on embedded software development and sustainment activities including Robotic Combat Vehicle (RCV) autonomy software, control station software, payload control software, and cybersecurity hardening. SWP Software Engineering Development will deliver annual software capability releases (CR) to both the Surrogate Prototype (SP) and Full System Prototype (FSP) lines of effort. Developed software will also be delivered to the SWP systems integration laboratory (SIL) for live and virtual software testing. ***FY 2022 Plans:*** FY 2023 efforts will focus on transitioning software development and information technology (IT) operations into cloud-based Continuous Deployment (CD) pipelines for Autonomous Movement, Payload Control, and User Interface software. Additionally, FY 2022 software engineering efforts will initiate development of a Minimum Viable Capability Release (MVCR) for integration and assessment during future Surrogate Prototype FORSCOM Operation Pilots. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The decrease in funding from FY 2022 to FY 2023 is due to a change in strategy and transition to budget activity 5. The program funding continues in program element 604641A / Tactical Unmanned Ground Vehicle (TUGV), CF5 / Robotic Combat Vehicle (BA5) NGCV-CFT.			
Title: Program Management ***Description:*** Government project management to RCV development programs. Includes salaries, travel, training, supplies, facilities, and equipment. ***FY 2022 Plans:*** Government engineering, financial management, acquisition planning, risk assessment and mitigation, contract management, and operations support necessary to manage Experimentation development and SOE execution, Surrogate Prototyping shakedown and testing, and initial Software Acquisition Pathway development efforts. Includes salaries, training, travel, supplies, facilities, and equipment. ***FY 2023 Plans:*** Government engineering, financial management, acquisition planning, risk assessment and mitigation, contract management, and operations support necessary to manage Surrogate Prototyping efforts. Includes salaries, training, travel, supplies, facilities, and equipment. ***FY 2022 to FY 2023 Increase/Decrease Statement:***	7.984	8.904	2.310

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
The decrease in FY 2023 is due to transition of Program Management for RCV(L) Surrogate Prototypes (SP) build, RCV(L) Full Systems Prototypes (FSP), Software Acquisition Pathway (SWP) efforts to program element 0604641A / Tactical Unmanned Ground Vehicle (TUGV), CF5 / Robotic Combat Vehicle (BA5) NGCV-CFT.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC 638	-	2.116	-
Accomplishments/Planned Programs Subtotals	89.281	57.777	26.594

	FY 2021	FY 2022
Congressional Add: RCV Medium ***FY 2022 Plans:*** RCV Medium build, development engineering, and testing.	-	20.000
Congressional Adds Subtotals	-	20.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• 0604641A: *Tactical Unmanned Ground Vehicle (TUGV)*	-	-	115.986	-	115.986	145.128	145.188	145.228	146.641	0.000	698.171

Remarks

Robotic Combat Vehicle Light (RCV(L)) development and RCV Software Acquisition Pathway (SWP) efforts are continued in program element 0604641A / Tactical Unmanned Ground Vehicle (TUGV), CF5 / Robotic Combat Vehicle (BA5) NGCV-CFT.

D. Acquisition Strategy

RCV development includes an RCV(L) Middle-Tier Acquisition (MTA) Rapid Prototyping program as well as a Software Acquisition Pathway (SWP) program.

RCV(L) Acquisition Strategy:

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
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On 10 February 2022, the Army Acquisition Executive (AAE) approved the execution of RCV(L) Rapid Prototyping effort under authorities granted by under authorities granted under Section 804 of the 2016 NDAA (PL 114-92). The RCV(L) MTA Rapid Prototyping effort will be accomplished in two complementary lines of effort (LOE), Surrogate Prototypes (SP) and Full System Prototypes (FSP).

The SP LOE will utilize an existing Other Transaction Authority (OTA) contact with QinetiQ North America to both update existing RCV experimental prototypes to Surrogate Prototype configuration as well as procure new build Surrogate Prototypes. The Surrogate Prototypes will support three design-upgrade-test cycles that include FORSCOM operational pilots to collect Soldier feedback and demonstrate improved capabilities related to autonomous software, system safety, and cyber and spectrum resiliency. Each design-upgrade-test cycle will culminate in a Knowledge Point (KP) to review program process and determine SP capabilities ready for incorporation into the FSP LOE.

The FSP acquisition strategy includes a full and open competition that will select up to five vendors to deliver bid samples to inform down select to a single vendor for prototype build. Developmental testing of FSPs will include safety, Reliability, Availability and Maintainability (RAM), lethality, survivability, and Electromagnetic Environmental Effects (E3) testing. Additionally, Operational Testing (OT) in the form of Limited User Tests (LUT) will be executed to evaluate system suitability and effectiveness.

Upon successful completion of the RCV(L) Rapid Prototyping effort, an MTA Outcome Determination (OD) will determine if the program will transition to a MTA Rapid Fielding effort aimed at fielding RCV(L) FSPs to selected unit(s) for Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, Facilities, and Policies (DOTMLPF-P) analysis and integration of Manned-Unmanned Teaming (MUM-T) operations.

Software Acquisition Pathway (SWP) Acquisition Strategy:
The SWP Acquisition Decision Memorandum (ADM), signed 3 August 2021, directs the use of the draft Cross Functional Team (CFT) Next Generation Combat Vehicle (NGCV) Robotic and Optionally Manned Autonomous (ROMA) Capabilities Needs Statement (CNS) as the base user capabilities document from which to derive capabilities for the RCV SWP. The RCV SWP will provide government furnished software to RCV SP and FSP efforts. The RCV SWP will implement a Government - Contractor hybrid development approach to mature, integrate, and secure software capabilities from the science and technology base. The RCV SWP will incorporate software contracting best practices to support the transition of software capabilities into secure code base required for the resilient operation of RCVs in contested environments.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	MIPR	Various : Various	5.954	7.984	Mar 2021	8.904	Oct 2021	2.310	Nov 2022	-		2.310	0.000	25.152	-
SBIR/STTR Transer	TBD	Various : Vairous	-	-		2.116		-		-		-	0.000	2.116	-
		Subtotal	5.954	7.984		11.020		2.310		-		2.310	0.000	27.268	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Engineering	Various	GVSC; Various : Warren, MI; Various	7.646	14.815	May 2021	34.526	Dec 2021	24.284	Nov 2022	-		24.284	0.000	81.271	-
Prototype Platforms	TBD	TBD : TBD	46.865	35.134	Jun 2021	-		-		-		-	0.000	81.999	-
RCV Medium	TBD	TBD : TBD	-	-		20.000		-		-		-	0.000	20.000	-
		Subtotal	54.511	49.949		54.526		24.284		-		24.284	0.000	183.270	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Other Support Costs	TBD	TBD : TBD	5.163	7.326	Jun 2021	-		-		-		-	0.000	12.489	-
		Subtotal	5.163	7.326		-		-		-		-	0.000	12.489	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Modeling and Simulation	MIPR	TBD : TBD	4.092	0.027	Dec 2020	0.835	Jan 2022	-		-		-	0.000	4.954	-
Testing and Evaluation	MIPR	TBD : TBD	5.606	23.995	Dec 2020	11.396	Dec 2021	-		-		-	0.000	40.997	-
		Subtotal	9.698	24.022		12.231		-		-		-	0.000	45.951	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*	

	Prior Years	FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	75.326	89.281		77.777		26.594		-		26.594	0.000	268.978	N/A

Remarks

FY 2023 funding for Development Engineering support Surrogate Prototype Product Development efforts.

FY 2023 Program Management efforts include Government engineering, financial management, acquisition planning, risk assessment and mitigation, contract management, and operations support necessary necessary to manage Surrogate Prototype Product Development.

Exhibit R-4, RDT&E Schedule Profile: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

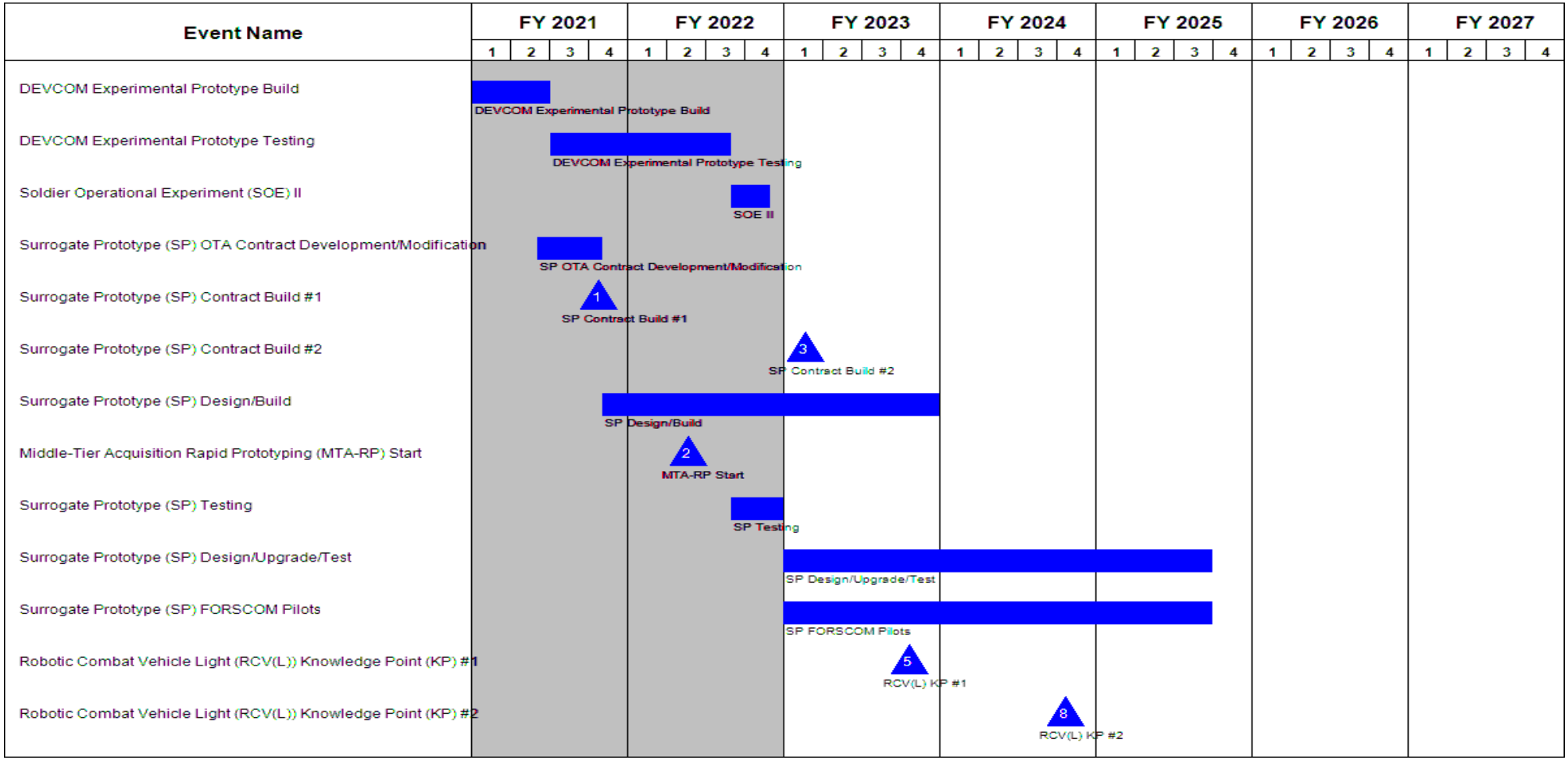

Exhibit R-4, RDT&E Schedule Profile: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

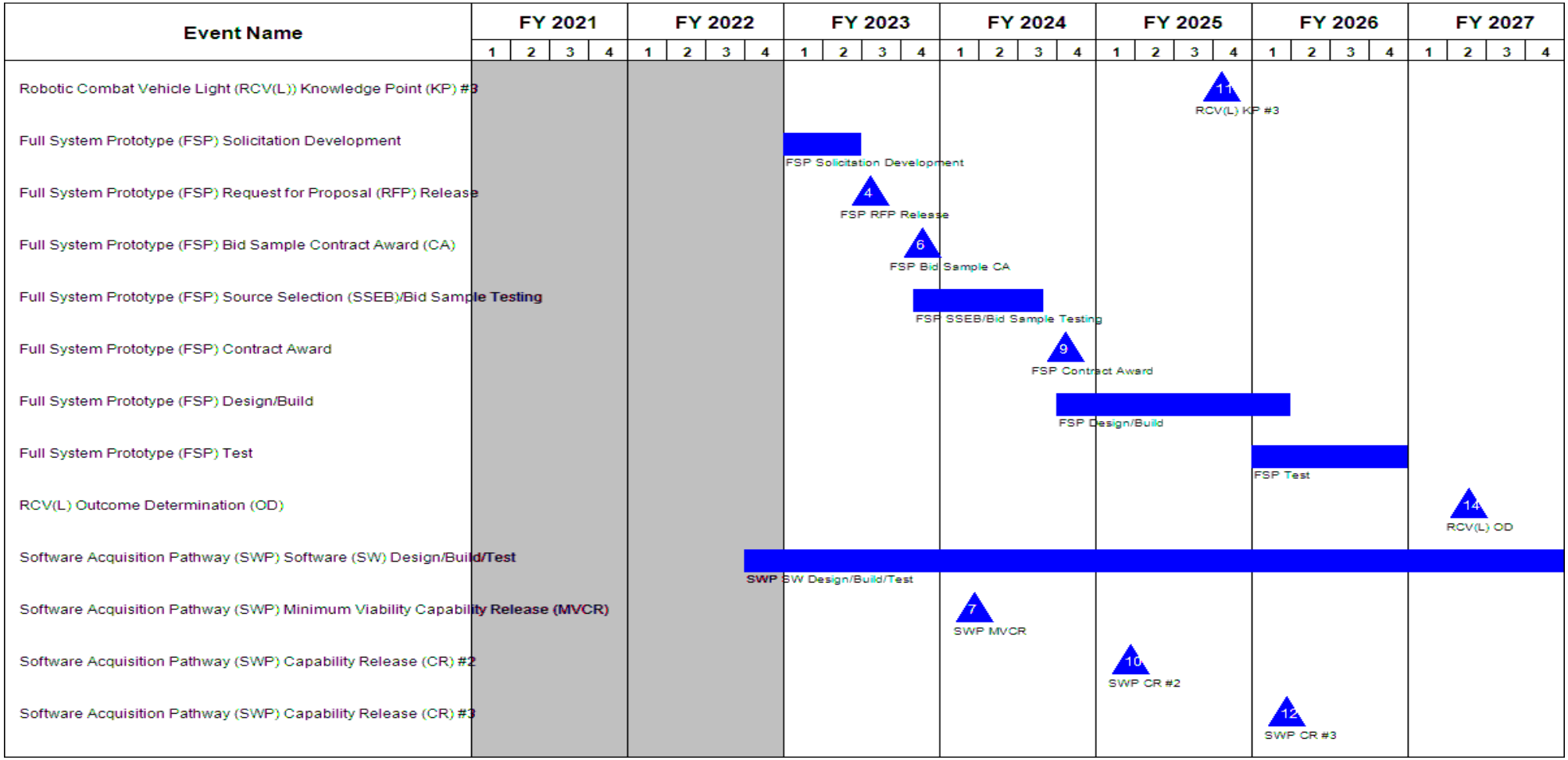

Exhibit R-4, RDT&E Schedule Profile: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

Event Name	FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			
	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
Software Acquisition Pathway (SWP) Capability Release (CR) #4																									13 SWP CR #4			

Exhibit R-4A, RDT&E Schedule Details: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
DEVCOM Experimental Prototype Build	1	2021	2	2021
DEVCOM Experimental Prototype Testing	3	2021	3	2022
Soldier Operational Experiment (SOE) II	3	2022	4	2022
Surrogate Prototype (SP) OTA Contract Development/Modification	2	2021	4	2021
Surrogate Prototype (SP) Contract Build #1	4	2021	4	2021
Surrogate Prototype (SP) Contract Build #2	1	2023	1	2023
Surrogate Prototype (SP) Design/Build	4	2021	4	2023
Middle-Tier Acquisition Rapid Prototyping (MTA-RP) Start	2	2022	2	2022
Surrogate Prototype (SP) Testing	3	2022	4	2022
Surrogate Prototype (SP) Design/Upgrade/Test	1	2023	3	2025
Surrogate Prototype (SP) FORSCOM Pilots	1	2023	3	2025
Robotic Combat Vehicle Light (RCV(L)) Knowledge Point (KP) #1	4	2023	4	2023
Robotic Combat Vehicle Light (RCV(L)) Knowledge Point (KP) #2	4	2024	4	2024
Robotic Combat Vehicle Light (RCV(L)) Knowledge Point (KP) #3	4	2025	4	2025
Full System Prototype (FSP) Solicitation Development	1	2023	2	2023
Full System Prototype (FSP) Request for Proposal (RFP) Release	3	2023	3	2023
Full System Prototype (FSP) Bid Sample Contract Award (CA)	4	2023	4	2023
Full System Prototype (FSP) Source Selection (SSEB)/Bid Sample Testing	4	2023	3	2024
Full System Prototype (FSP) Contract Award	4	2024	4	2024
Full System Prototype (FSP) Design/Build	4	2024	1	2026
Full System Prototype (FSP) Test	1	2026	4	2026
RCV(L) Outcome Determination (OD)	2	2027	2	2027

Exhibit R-4A, RDT&E Schedule Details: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** CF4 / *Robotic Combat Vehicle (RCV) NGCV-CFT*

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Software Acquisition Pathway (SWP) Software (SW) Design/Build/Test	4	2022	4	2027
Software Acquisition Pathway (SWP) Minimum Viability Capability Release (MVCR)	1	2024	1	2024
Software Acquisition Pathway (SWP) Capability Release (CR) #2	1	2025	1	2025
Software Acquisition Pathway (SWP) Capability Release (CR) #3	1	2026	1	2026
Software Acquisition Pathway (SWP) Capability Release (CR) #4	1	2027	1	2027

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD2 / *Soldier Robotics Systems*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
FD2: *Soldier Robotics Systems*	-	1.872	-	-	-	-	-	-	-	-	0.000	1.872
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Soldier Borne Sensor (SBS) / Exoskeleton ***Description:*** 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 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.	0.136	-	-
Title: Unmanned Ground Vehicle (UGV) Soldier Robotics Development ***Description:*** 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	1.736	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD2 / *Soldier Robotics Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
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.			
Accomplishments/Planned Programs Subtotals	1.872	-	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• W63798: *Soldier Borne Sensor (SBS)*	18.907	18.654	20.376	-	20.376	23.005	22.372	-	-	Continuing	Continuing

Remarks

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.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD2 / *Soldier Robotics Systems*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UGV Program Management Support	MIPR	Multiple : Multiple	1.858	0.484	Oct 2020	-		-		-		-	0.000	2.342	Continuing
SBS and Exoskeleton Program Management Support	Various	Various : Multiple	3.264	0.136	Jul 2020	-		-		-		-	0.000	3.400	Continuing
		Subtotal	5.122	0.620		-		-		-		-	0.000	5.742	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total 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	-		-		-		-		-	0.000	0.157	-
JCAUS IOP V4	MIPR	ARDEC : Picatinny, NJ	0.050	-		-		-		-		-	0.000	0.050	-
SBIR /STTR Transfer	TBD	TBD : TBD	0.048	0.064		-		-		-		-	0.000	0.112	-
		Subtotal	1.068	0.064		-		-		-		-	0.000	1.132	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Performance Spec Dev	MIPR	Various : Multiple	-	0.563	Feb 2021	-		-		-		-	0.000	0.563	-
RFP and Acq Documentation	MIPR	Various : Multiple	-	0.625	Apr 2021	-		-		-		-	0.000	0.625	-
		Subtotal	-	1.188		-		-		-		-	0.000	1.188	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD2 / *Soldier Robotics Systems*	

	Prior Years	FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	6.190	1.872		-		-		-		-	0.000	8.062	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD2 / *Soldier Robotics Systems*

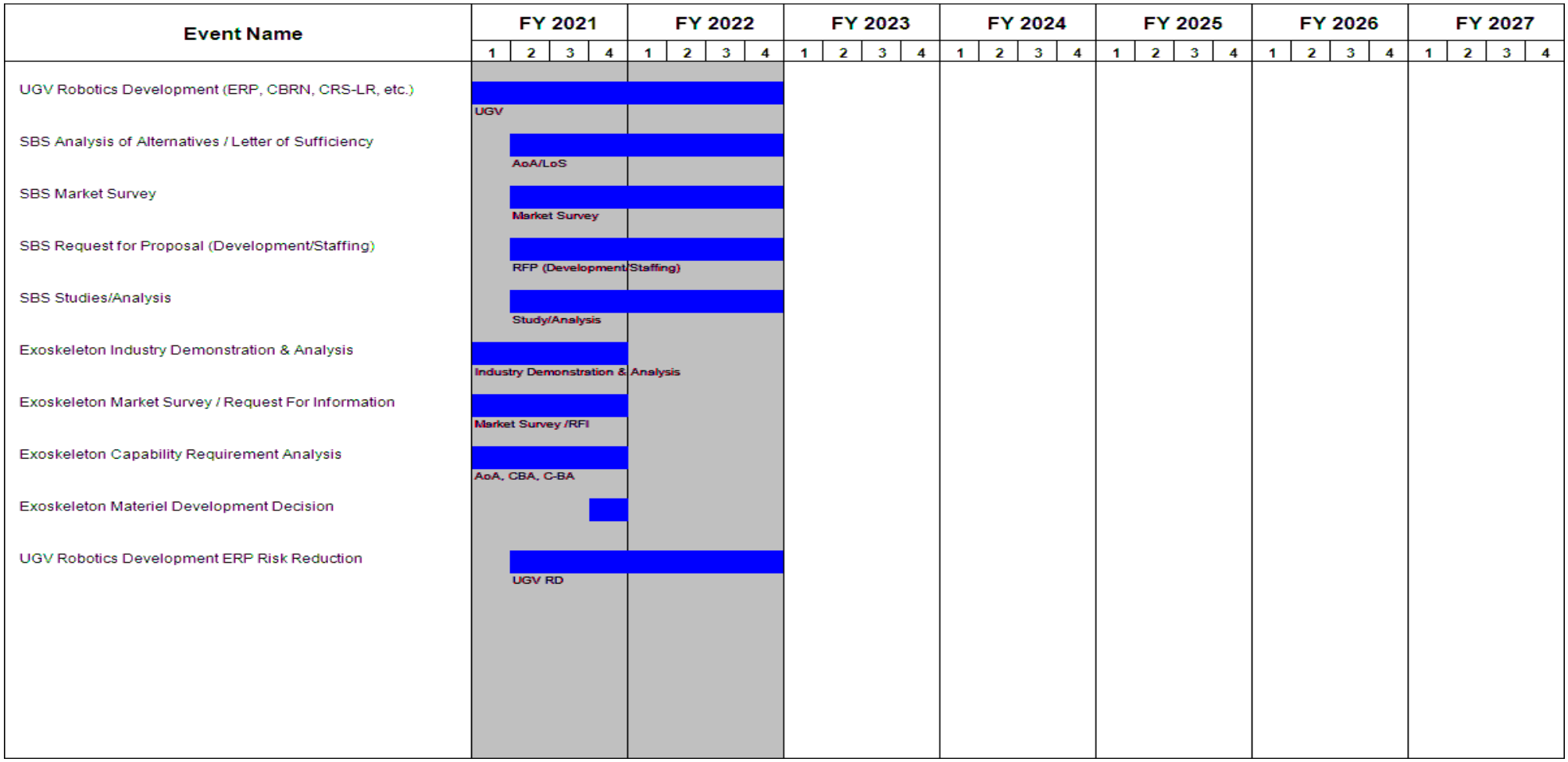

Exhibit R-4A, RDT&E Schedule Details: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD2 / *Soldier Robotics Systems*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
UGV Robotics Development (ERP, CBRN, CRS-LR, etc.)	1	2018	4	2022
SBS MDD	1	2018	1	2018
SBS Analysis of Alternatives / Letter of Sufficiency	1	2018	4	2022
SBS Market Survey	1	2018	4	2022
SBS Request for Proposal (Development/Staffing)	1	2018	4	2022
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	2022
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	2022

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD9 / *Robotics Systems*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
FD9: *Robotics Systems*	-	1.248	2.748	-	-	-	3.088	3.093	3.094	3.124	0.000	16.395
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Program Office Robotics Development (RD) improves robotic and autonomous program acquisition schedules and facilitating quicker delivery of emerging technology to warfighters by supporting the development of integrated and synchronized capability documents (e.g. JCIDS, Department Directed, etc.) and by maturing / transitioning robotics 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 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 pre-MS B activities Obstacle Avoidance and Digital Modeling (OA&DM) activities.

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. Funds will be utilized for infrastructure to support cloud based tools for development and deployment of Autonomy and Artificial Intelligence/ Machine Learning (AI/ML) software, tools to support auto testing of Autonomy Software in a DEVSECOPS process and transition of prior program software modules to the Robotic Technology Kernel (RTK) and Robotic Operating System (ROS) library for future reuse.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Emerging Robotics Systems	1.248	2.648	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD9 / *Robotics Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Description: 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. ***FY 2022 Plans:*** 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. SBIR/STTR transfer ($100,003.00). ***FY 2022 to FY 2023 Increase/Decrease Statement:*** 0604017 FD9 has no funding request in FY 2023.			
Title: RD SBIR/STTR transfer ***Description:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2022 Plans:*** Funding transferred in accordance with Title 15 USC 638 ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC 638	-	0.100	-
Accomplishments/Planned Programs Subtotals	1.248	2.748	-

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD9 / *Robotics Systems*

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.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD9 / *Robotics Systems*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PM FP PdM RAS	MIPR	PM FP : Warren, MI	4.223	-		0.500	Oct 2021	-		-		-	0.000	4.723	-
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	-
SBIR/STTR Transfer	TBD	TBD : TBS	-	-		0.100	Apr 2022	-		-		-	0.000	0.100	-
		Subtotal	4.390	-		0.600		-		-		-	0.000	4.990	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
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	0.466	Jul 2020	1.383	Oct 2021	-		-		-	0.000	2.649	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD9 / *Robotics Systems*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ABV RCS Safety Requirements, Visualization tool	TBD	GVSC : Warren, MI	0.175	-		-		-		-		-	0.000	0.175	-
ERP Payload Maturation	MIPR	CCDC GVSC : Warren, MI	-	-		0.200	Nov 2021	-		-		-	0.000	0.200	-
		Subtotal	83.658	0.466		1.583		-		-		-	0.000	85.707	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PdM SEPM Support	MIPR	Various : Multiple locations	8.246	0.647	Apr 2021	0.565	Oct 2021	-		-		-	0.000	9.458	-
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	-
		Subtotal	11.774	0.647		0.565		-		-		-	0.000	12.986	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Leader Follower (CCDC GVSC) Tech Demo Testing	MIPR	ATEC : Aberdeen, MD	0.700	-		-		-		-		-	0.000	0.700	-
Leader Follower (CCDC GVSC) Tech Demo Data Logger	MIPR	ATEC : Aberdeen, MD	0.700	-		-		-		-		-	0.000	0.700	-
Leader Follower (CCDC GVSC) Testing	MIPR	Army Test and Evaluation Command (ATEC) :	3.933	-		-		-		-		-	0.000	3.933	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Army			Date: April 2022
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604017A / *Robotics Development*	Project (Number/Name) FD9 / *Robotics Systems*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Aberdeen Proving Ground, MD													
Leader Follower (CCDC GVSC) Data Logger	MIPR	Army Test and Evaluation Command (ATEC) : Aberdeen Proving Ground, MD	0.750	-		-		-		-		-	0.000	0.750	-
PdM RD ATEC support	MIPR	ATEC : Aberdeen, MD	0.150	-		-		-		-		-	0.000	0.150	-
IOP testing	MIPR	GVSC : Warren, MI	-	0.135	Feb 2021	-		-		-		-	0.000	0.135	-
		Subtotal	6.233	0.135		-		-		-		-	0.000	6.368	N/A

	Prior Years	FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	106.055	1.248		2.748		-		-		-	0.000	110.051	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD9 / *Robotics Systems*

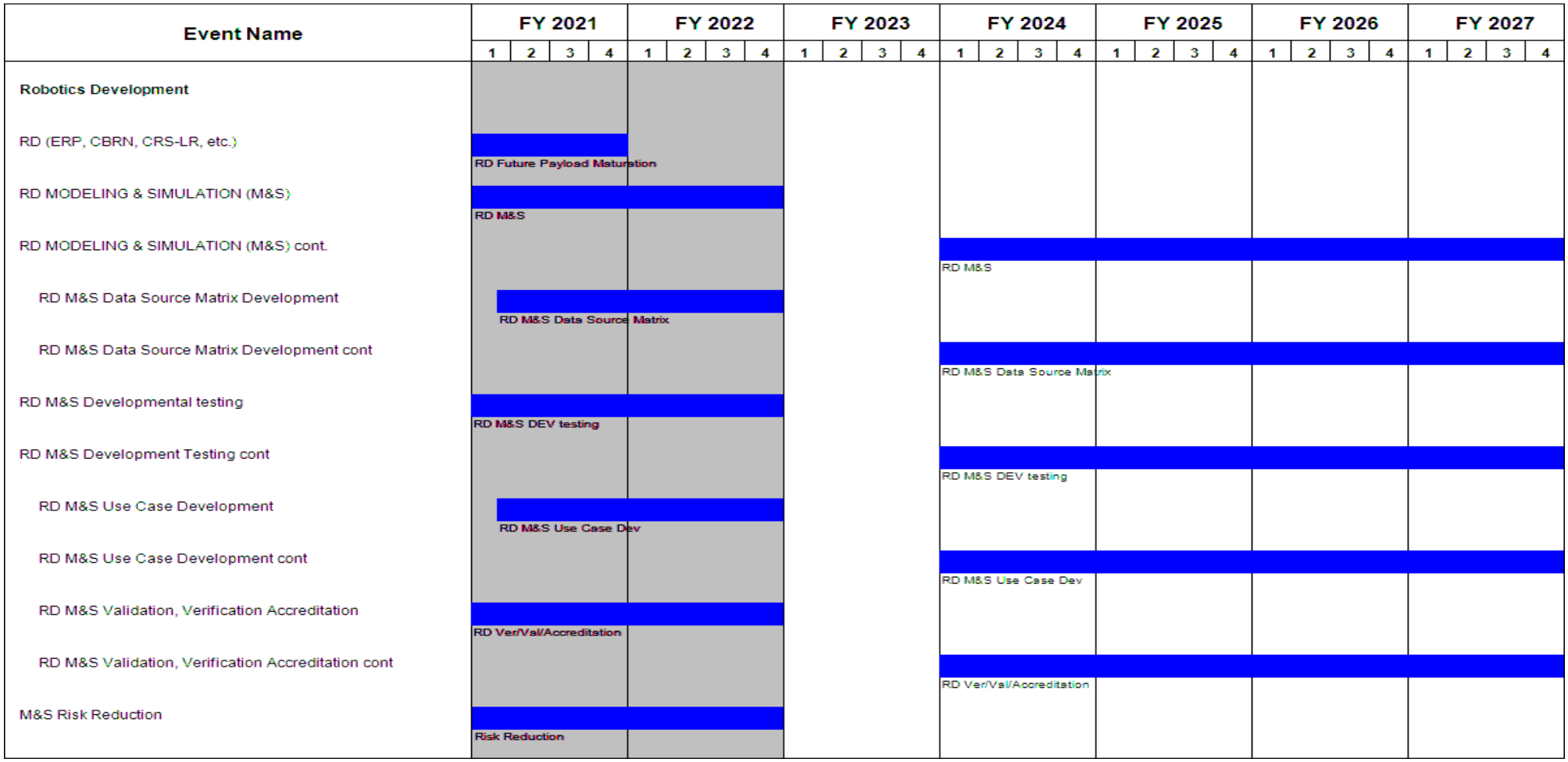

Exhibit R-4, RDT&E Schedule Profile: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD9 / *Robotics Systems*

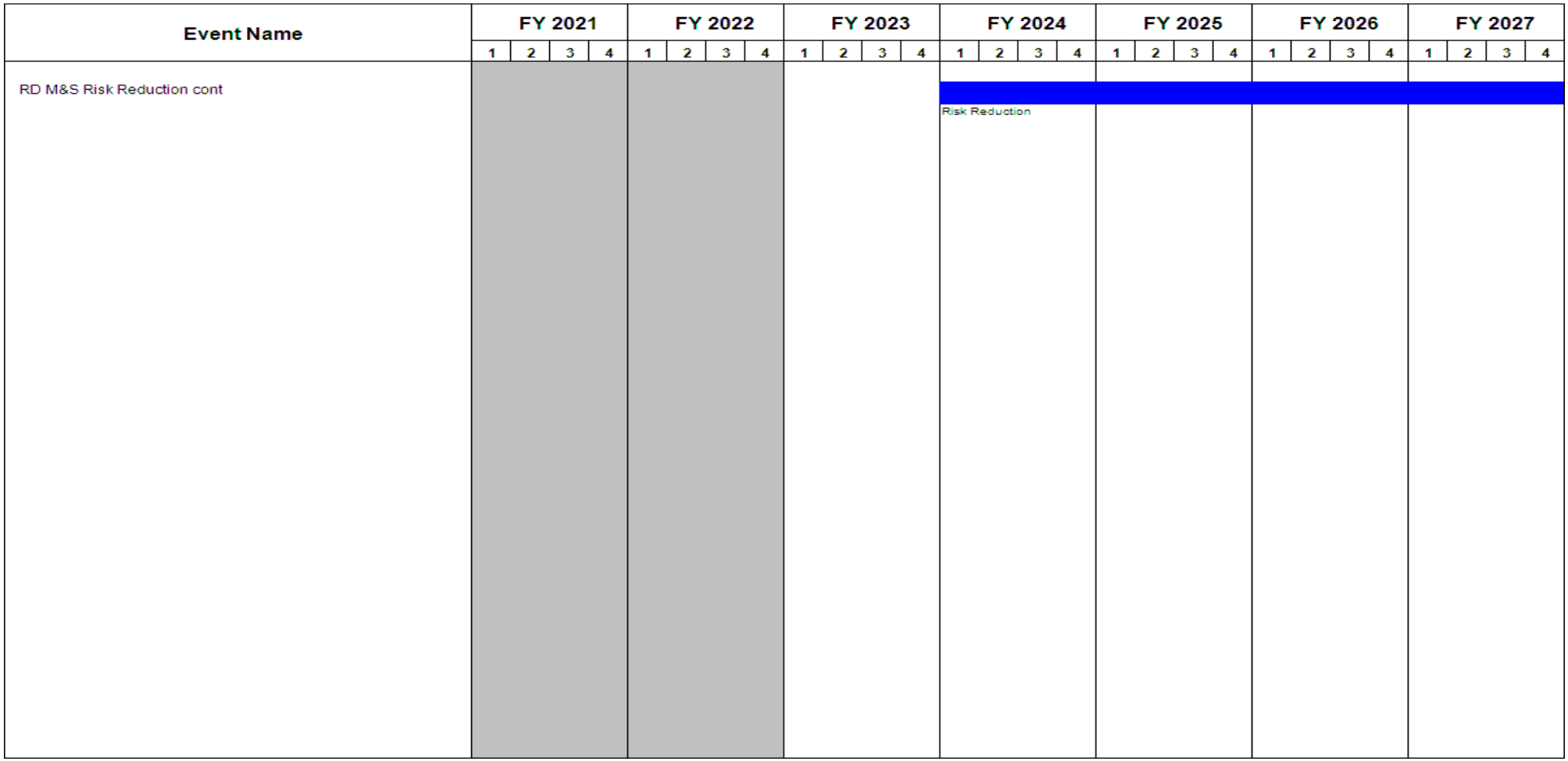

Exhibit R-4A, RDT&E Schedule Details: PB 2023 Army		Date: April 2022
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604017A / *Robotics Development*	**Project (Number/Name)** FD9 / *Robotics Systems*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Robotics Development	1	2017	4	2022
RD (ERP, CBRN, CRS-LR, etc.)	1	2021	4	2021
RD MODELING & SIMULATION (M&S)	1	2017	4	2022
RD MODELING & SIMULATION (M&S) cont.	1	2024	4	2027
RD M&S Initial Capability Development	4	2017	4	2020
RD M&S Data Source Matrix Development	1	2017	4	2022
RD M&S Data Source Matrix Development cont	1	2024	4	2027
RD M&S Developmental testing	2	2018	4	2022
RD M&S Development Testing cont	1	2024	4	2027
RD M&S Use Case Development	1	2018	4	2022
RD M&S Use Case Development cont	1	2024	4	2027
RD M&S Validation, Verification Accreditation	4	2018	4	2022
RD M&S Validation, Verification Accreditation cont	1	2024	4	2027
M&S Risk Reduction	1	2021	4	2022
RD M&S Risk Reduction cont	1	2024	4	2027
MMP Experimental Unit Prototyping - Contract Award	1	2019	1	2019
MMP - ATEC Safety Testing	4	2019	2	2020
ABV RCS market research	3	2020	4	2020