Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	-	145.618	95.229	196.676	-	196.676	156.986	272.762	314.992	254.062	0.000	1,436.325
AX3: *Technology Maturation Initiatives**	-	0.000	0.000	0.000	-	0.000	10.000	138.244	296.992	250.456	0.000	695.692
AX4: *Computational Prototyping Environment (CPE)*	-	0.000	0.000	3.966	-	3.966	5.426	6.918	0.000	0.000	0.000	16.310
AX5: *Next Generation Close Combat Missile*	-	0.000	0.000	9.000	-	9.000	5.000	0.000	0.000	0.000	0.000	14.000
AX6: *Active Protection Systems Integration*	-	0.000	0.000	9.400	-	9.400	10.500	0.000	0.000	0.000	0.000	19.900
AX7: *Multi-Mission High Energy Laser (MMHEL) Sys Demo*	-	0.000	0.000	18.650	-	18.650	8.150	0.000	0.000	0.000	0.000	26.800
AX8: *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*	-	0.000	0.000	27.200	-	27.200	4.000	0.000	0.000	0.000	0.000	31.200
AX9: *Adv Mobility Experimental Prototype Adv Tech*	-	0.000	0.000	10.500	-	10.500	15.800	10.500	7.200	3.606	0.000	47.606
AY1: *MUM-T Platform Enabler*	-	0.000	0.000	7.200	-	7.200	4.500	4.200	0.000	0.000	0.000	15.900
AY2: *Army Operational Fires*	-	0.000	0.000	18.900	-	18.900	28.400	41.900	10.800	0.000	0.000	100.000
AY3: *Strategic Long Range Cannon*	-	0.000	0.000	91.860	-	91.860	65.210	71.000	0.000	0.000	0.000	228.070
DS3: *Technology Maturation Initiatives*	-	145.618	95.229	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	240.847

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

Note

The following Projects within this Program Element (PE) are new starts:
* AX8 (Adv Leth and Accuracy Sys for Med Calber)
* AX9 (Adv Mobility Experimental Prototype Adv Tech)
* AY1 (MUM-T Platform Enabler)
* AY2 (Army Operational Fires)
* AY3 (Strategic Long Range Cannon)

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*

A. Mission Description and Budget Item Justification

This Program Element (PE) funds experimental prototyping and demonstration of selected technology enabled capabilities to support advanced ground systems, aviation systems, command, control, communications & reconnaissance systems and equipment, precision weapons, High Energy Laser (HEL) systems, and Soldier equipment. Funding facilitates maturation and demonstration of advanced technologies and systems in relevant environments and tactical/operational scenarios as well as the maturation and demonstration of a robust Virtual Proving Ground (VPG) for rapid, accurate, and computational prototyping of major Army platforms. Benefits include maturing technologies to a goal of Technology Readiness Level (TRL) 7, informing emerging requirements for future programs of record, and reducing technology risk in order to transition of leap-ahead capabilities into acquisition programs. Technology Maturation Initiative efforts mature and integrate advanced component technologies into system and sub-system technology demonstrators and experimental prototypes, which are then validated and transitioned to priority Army experimentation efforts and programs of record. Computational Prototyping Environment (CPE) efforts include demonstration of physics-based, computational modeling integrated with new advances in deep learning to explore design tradespaces and understand defeat strategies for prototype platforms. This PE provides the Army with an improved mechanism for enabling greater competition in the latter stages of technology maturation and establishes a closer alignment between Science and Technology (S&T) efforts and acquisition programs.

The cited work is consistent with the Under Secretary of Defense, Research and Engineering priority focus areas and the Army Modernization Strategy. Work in this PE is performed by the Army Futures Command (AFC), the Engineer Research Development Center (ERDC), and U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (SMDC/ARSTRAT).

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	115.221	95.347	99.584	-	99.584
Current President's Budget	145.618	95.229	196.676	-	196.676
Total Adjustments	30.397	-0.118	97.092	-	97.092
• Congressional General Reductions	-0.093	-0.118			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	35.000	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-4.510	-			
• Adjustments to Budget Years	-	-	97.092	-	97.092

Change Summary Explanation

FY 2018 Congressional Add to Project DS3, Technology Maturation Initiatives for Multi-Mission High-Energy Laser Research ($35.000 million).
FY 2020 increase due to new starts for Projects AX8, AX9, AY1, AY2, and AY3 to support Army Modernization Priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX4 / *Computational Prototyping Environment (CPE)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AX4: *Computational Prototyping Environment (CPE)*	-	0.000	0.000	3.966	-	3.966	5.426	6.918	0.000	0.000	0.000	16.310
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year (FY) 2019 this effort was funded in Program Element (PE) 0604115A (Technology Maturation Initiatives) / Project DS3 (Technology Maturation Initiatives).

A. Mission Description and Budget Item Justification

This Project funds the development and demonstration of a robust Virtual Proving Ground (VPG) for rapid, accurate, and computational prototyping of major Army platforms. Computation Prototyping Environment (CPE) provides the ability to validate platform design variations in a VPG, in a way that identifies potential performance and design failures, and assesses mitigating solutions and trades prior to cost-bearing production and manufacturing. Activities under this Project include the maturation and integration of physics-based, computational modeling with new advances in deep learning in order to provide the ability to virtually explore design tradespaces and understand possible defeat strategies. This Project leverages recent Department of Defense (DOD) advancements in large data tradespace analytics, high-fidelity physics-based modeling, deep learning techniques, high-performance computing capabilities, and inverse modeling approaches to enable rapid computational prototyping to inform emerging acquisition programs.

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

Funding has been realigned to reflect the FY 2020 financial restructure and Army Modernization Priorities.

Work in this Project is performed by the Engineer Research and Development Center (ERDC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Computational Prototyping Environment (CPE)	-	-	3.966
Description: Computational Prototyping Environment (CPE) matures and integrates physics-based, computational modeling with new advances in deep learning in order to demonstrate a robust Virtual Proving Ground (VPG) that provides the ability to virtually explore design tradespaces and understand possible defeat strategies for prototype Army platforms. Demonstrates rapid computational prototyping to inform emerging acquisition programs through large data tradespace analytics, high-fidelity physics-based modeling, deep learning techniques, high-performance computing capabilities, and inverse modeling approaches. CPE capabilities will be piloted to support and inform Army Future Vertical Lift platform designs.			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX4 / *Computational Prototyping Environment (CPE)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Will integrate physical test data from Future Vertical Lift platforms into prototype VPG to validate computational models. Will leverage DOD high-performance computing to begin integration of artificial intelligence and machine learning algorithms into VPG. Develop framework for incorporating environmental and mission relevant data to virtual proving ground. Develop data repository for physical test data, computational models, and operation environments. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** In FY 2019, funding for this effort resides in PE/Proj 0604115A/DS3. Funding has been realigned in FY 2020 to reflect the FY 2020 financial restructure and Army Modernization Priorities.			
Accomplishments/Planned Programs Subtotals	-	-	3.966

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX4 / *Computational Prototyping Environment (CPE)*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Computational Prototyping Environment	C/Various	ERDC : Vicksburg, MS	-	-		-		3.966		-		3.966	12.500	16.466	-
		Subtotal	-	-		-		3.966		-		3.966	12.500	16.466	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		3.966		-		3.966	12.500	16.466	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX4 / *Computational Prototyping Environment (CPE)*

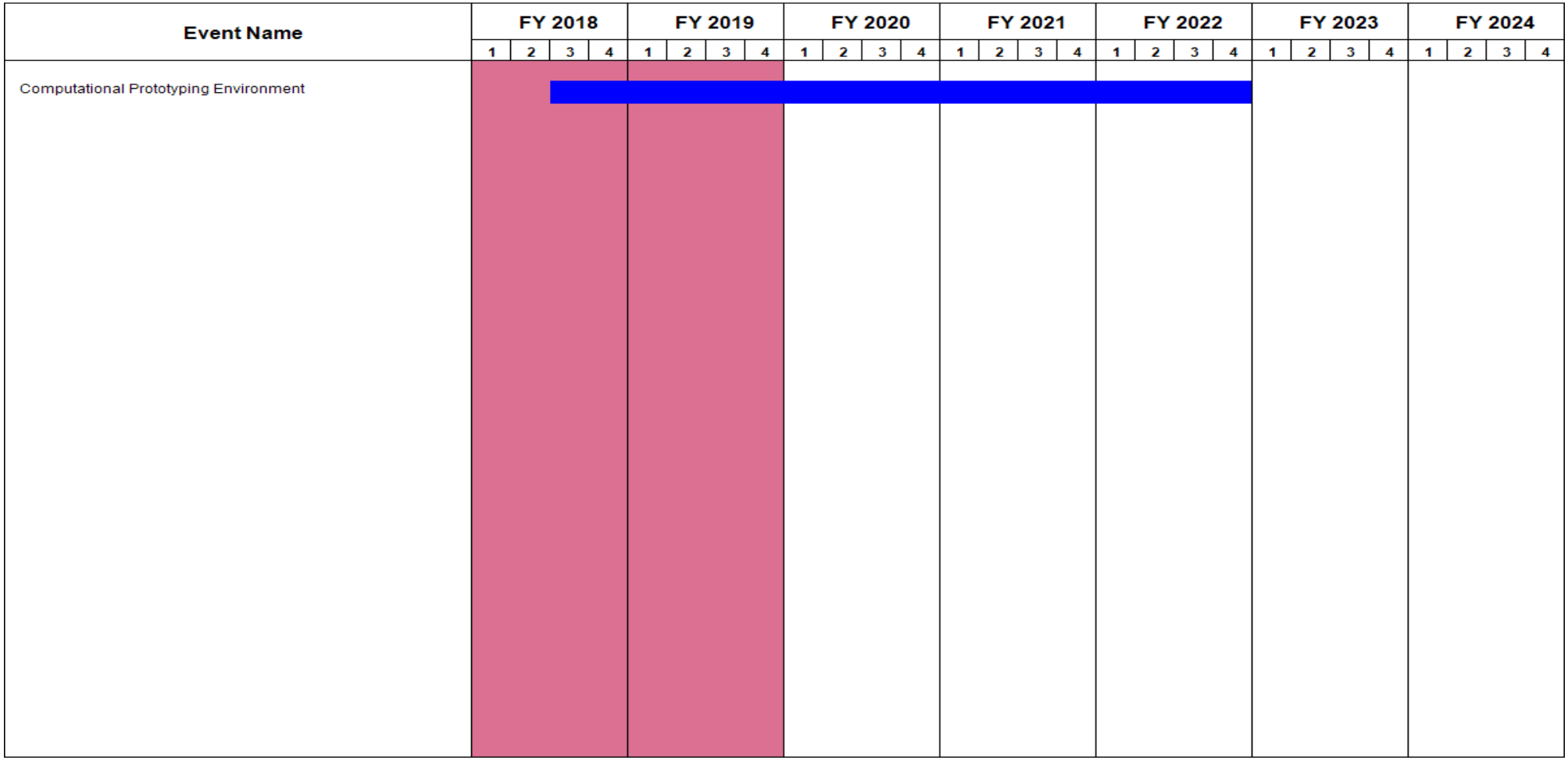

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX4 / *Computational Prototyping Environment (CPE)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Computational Prototyping Environment	3	2018	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX5 / *Next Generation Close Combat Missile*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AX5: *Next Generation Close Combat Missile*	-	0.000	0.000	9.000	-	9.000	5.000	0.000	0.000	0.000	0.000	14.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year (FY) 2019, this effort was previously funded in Program Element (PE) 0604115A (Technology Maturation Initiatives) / Project DS3 (Technology Maturation Initiatives).

A. Mission Description and Budget Item Justification

This Project demonstrates a prototype close combat missile with a multi-pulse, boost-sustain flight propulsion system providing extended range and decreased time of flight. Activities mature proof-of-principle hardware into an integrated tactical-representative design, and demonstrate a prototype missile with lethality overmatch of emerging threats. Early prototyping work concludes in FY 2021 to mature technology and demonstrate needed Warfighter capability in advance of acquisition program of record.

Work in this PE complements PE 0603462A, Next Generation Close Combat Vehicle Advanced Technology.

Funding has been realigned to reflect the FY 2020 financial restructure and Army Modernization Priorities.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. Work in this Project is performed by the U.S. Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Next Generation Close Combat Missile	-	-	9.000
Description: This effort demonstrates a prototype close combat missile with a multi-pulse, boost-sustain flight propulsion system providing extended range and decreased time of flight. ***FY 2020 Plans:*** Will optimize, integrate, and conduct experimental testing of the prototype propulsion subsystem component hardware (Electro-Mechanical Control Actuation System, Airframe, Launch Motor, and a Boost-Sustain Propulsion Section). Will conduct wind tunnel testing to verify predicted aerodynamic and control surface performance. Will exercise subsystem performance models in an integrated flight simulation and mature flight software. ***FY 2019 to FY 2020 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX5 / *Next Generation Close Combat Missile*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
In FY 2019, funding for this effort resides in PE/Proj 0604115A/DS3.			
Accomplishments/Planned Programs Subtotals	-	-	9.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX5 / *Next Generation Close Combat Missile*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Next Generation Close Combat Missile	Various	AMRDEC : Huntsville, AL	-	-		-		9.000		-		9.000	5.000	14.000	-
		Subtotal	-	-		-		9.000		-		9.000	5.000	14.000	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		9.000		-		9.000	5.000	14.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX5 / *Next Generation Close Combat Missile*

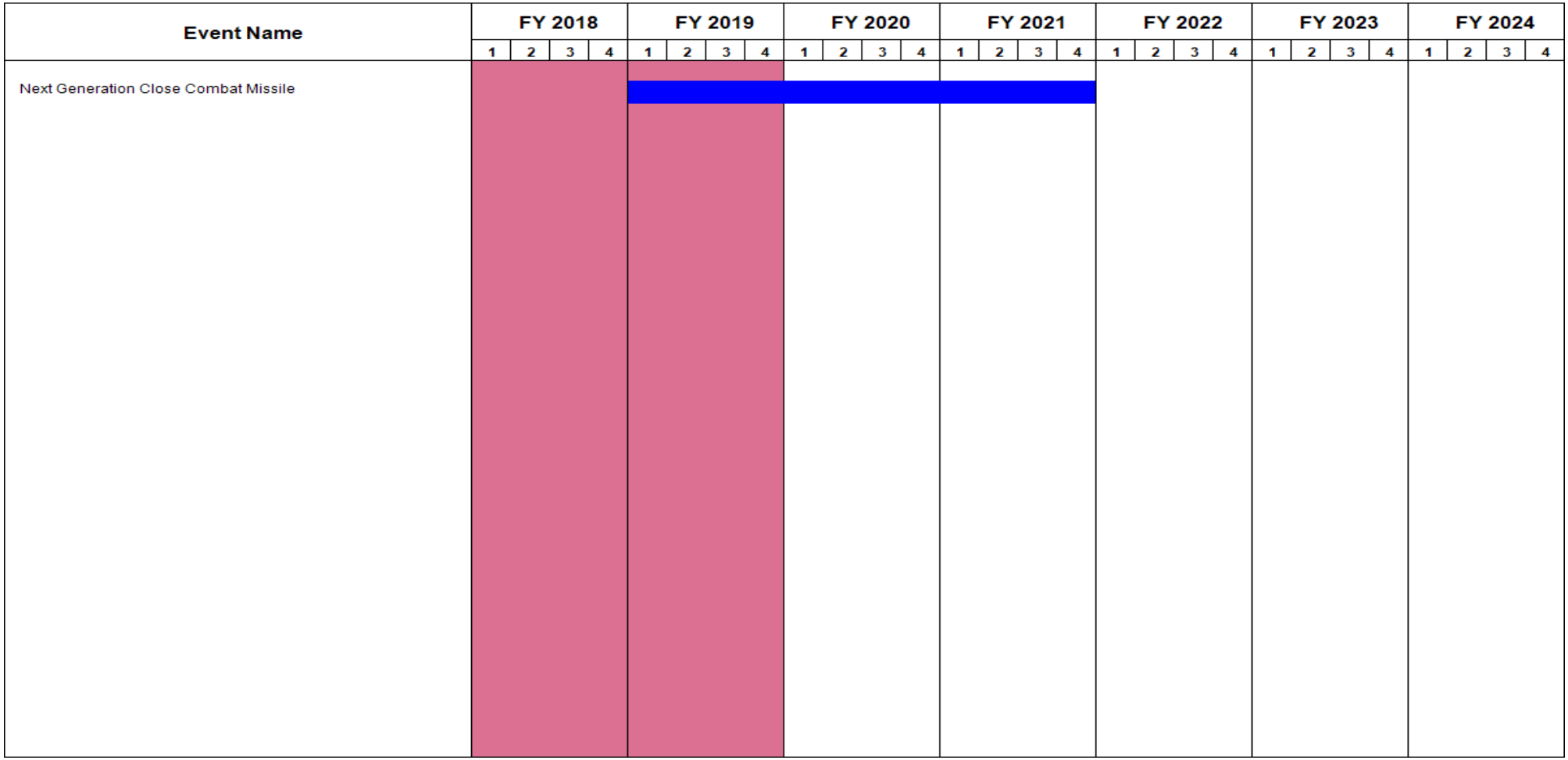

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX5 / *Next Generation Close Combat Missile*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Next Generation Close Combat Missile	1	2019	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX6 / *Active Protection Systems Integration*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AX6: *Active Protection Systems Integration*	-	0.000	0.000	9.400	-	9.400	10.500	0.000	0.000	0.000	0.000	19.900
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year (FY) 2019, this effort was funded in Program Element (PE) 0604115A (Technology Maturation Initiatives) / Project DS3 (Technology Maturation Initiatives).

A. Mission Description and Budget Item Justification

This Project matures, integrates, and demonstrates protection and survivability technologies as part of active protection systems (APS) prototyping for the Army's combat fleet of vehicles. Activities integrate complimentary survivability technologies to enable layers of enhanced protection capability, providing greater survivability against current and emerging advanced threats. This Project demonstrates a suite of technologies on a fielded combat vehicle platform using an APS common architecture, and defines component interface standards and specifications that will enable adaptive APS solutions. Activities support the Army's APS strategy to maintain or reduce vehicle weight by reducing reliance on armor with other means such as sensing, warning, hostile fire detection, and active countermeasures.

Work in this Project is coordinated with PE 0603462A (Next Generation Combat Vehicle Advanced Technology) and transitions to PE 0604852A (Suite of Vehicle Protection Systems - EMD).

Funding has been realigned to reflect the FY 2020 financial restructure and Army Modernization Priorities.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. Work is performed by the U.S. Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Agile Layered Protection: APS Integration Advanced Technology Demonstrator	-	-	9.400
Description: Activities integrate and demonstrate mature APS technologies layered through a common architecture on an Army ground combat vehicle platform, addressing technical and integration challenges for a system designed to address both current and emerging advanced threats. Selects and integrates mature component technologies that are best suited to optimize added capability for the ATD platform. Demonstrates a suite of APS technologies and effects that optimize performance levels for survivability and protection through advanced threat detection, multiple threat defeat systems, and improved situational awareness. Work is coordinated with PE 0602622A, 0603004A, 0602705A, 0602712A, 0603710A, 0602601A, 0603270A, 0603313A, 0603005A, 0603462A.			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX6 / *Active Protection Systems Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
FY 2020 Plans: Will continue to integrate selected APS technologies onto the combat vehicle platform demonstrator. Will validate the integrated APS system function on the demonstrator, and test and evaluate the platform vehicle to ensure the added suite of technologies does not introduce unintended degraded performance to the vehicle?s mission. Upon completion of testing, results will inform vehicle Product Manager?s acquisition planning for the APS protection suite. Will continue the vehicle protection layering approach and select additional (mature) APS component technologies for integration, offering incremental improvement options for protection and survivability for the vehicle platform. Will design and begin integration of additional layered protection technologies. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** In FY 2019, funding for this effort resides in PE/Project 0604115A/DS3.			
Accomplishments/Planned Programs Subtotals	-	-	9.400

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX6 / *Active Protection Systems Integration*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineer Integration of APS Layered Protection	C/Various	Various : Various	-	-		-		6.400		-		6.400	0.000	6.400	-
Validation of APS Layered Protection	Various	Various : Various	-	-		-		2.000		-		2.000	0.000	2.000	-
Integration of added APS Layered Protection	C/Various	Various : Various	-	-		-		1.000		-		1.000	0.000	1.000	-
		Subtotal	-	-		-		9.400		-		9.400	0.000	9.400	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		9.400		-		9.400	0.000	9.400	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX6 / *Active Protection Systems Integration*

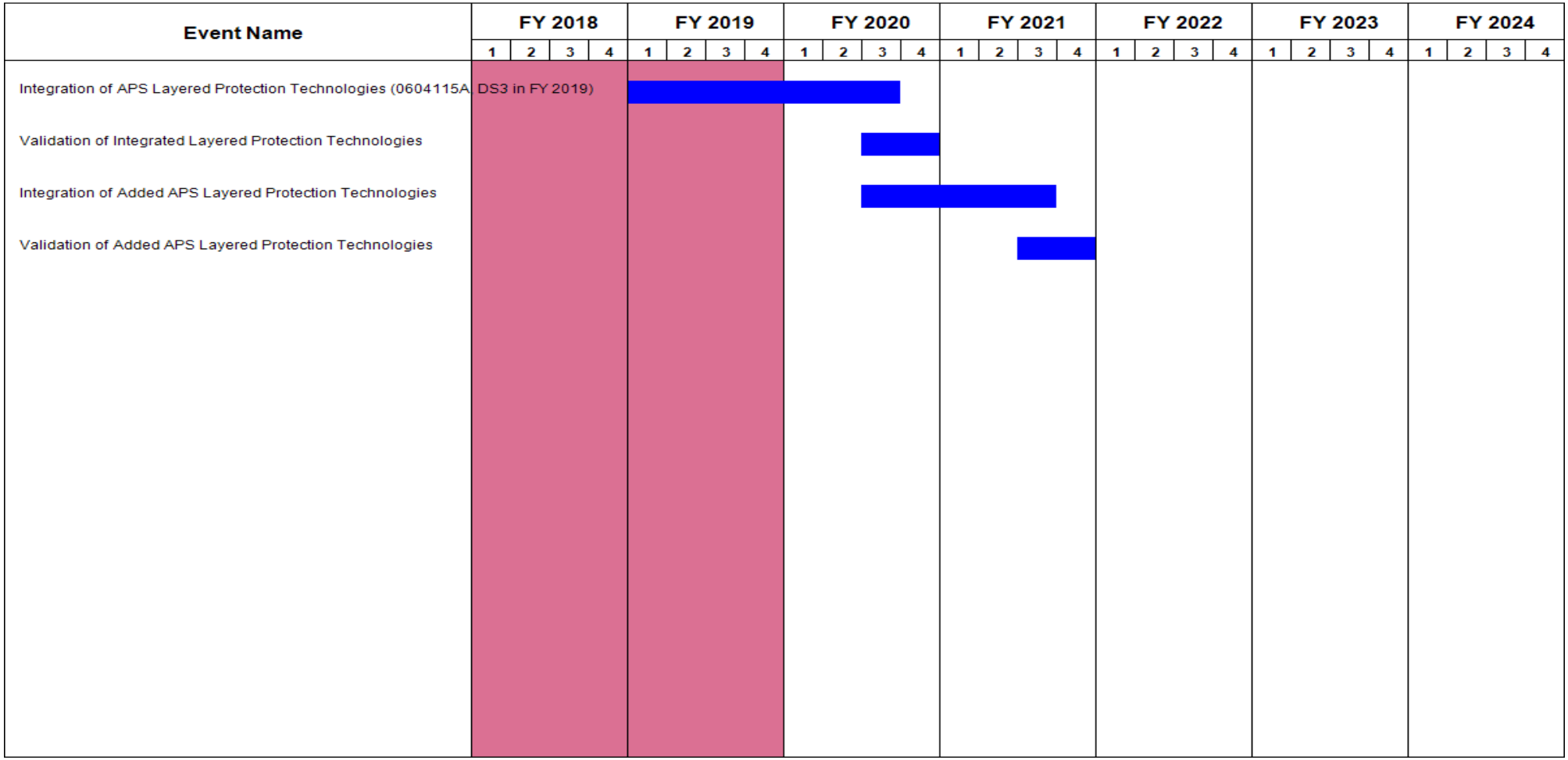

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX6 / *Active Protection Systems Integration*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Integration of APS Layered Protection Technologies (0604115A, DS3 in FY 2019)	1	2019	3	2020
Validation of Integrated Layered Protection Technologies	3	2020	4	2020
Integration of Added APS Layered Protection Technologies	3	2020	3	2021
Validation of Added APS Layered Protection Technologies	3	2021	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX7 / *Multi-Mission High Energy Laser (MMHEL) Sys Demo*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AX7: *Multi-Mission High Energy Laser (MMHEL) Sys Demo*	-	0.000	0.000	18.650	-	18.650	8.150	0.000	0.000	0.000	0.000	26.800
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year (FY) 2019, this effort was funded in Program Element (PE) 0604115A (Technology Maturation Initiatives) / Project DS3 (Technology Maturation Initiatives).

A. Mission Description and Budget Item Justification

This Project matures and demonstrates an integrated a 50 kilowatt (kW)-class laser weapon system into a Stryker platform, providing a system-level, High Energy Laser (HEL) experimental prototype for demonstration in realistic operating environments. These demonstrations will inform requirements, decrease risk for future Army HEL acquisition programs, and support the future development of warfighter Tactics/Techniques/Procedures and Concept of Operations. HEL weapon systems are expected to complement conventional offensive and defensive weapons at a lower cost-per-shot than current systems and without the need to stockpile ordnance. A 50 kW-class laser weapon system has the potential to engage and defeat rockets, artillery, mortars (RAM); unmanned aerial vehicles (UAVs); sensors; and optics for maneuvering Brigade Combat Teams (BCTs). Demonstrations will also inform potential future capability to defeat both fixed- and rotary-wing manned aircraft. Leveraging Government investments and Industry technology advancements, will review and select existing HEL subsystem designs for integration into a Stryker combat vehicle; will conduct integration and demonstration of a system-level HEL experimental prototype; and will provide assessment of technical performance in an operational environment.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. Work in this Project is performed by the United States Army Space and Missile Defense Command/Army Forces Strategic Command (SMDC/ARSTRAT).

Funding has been realigned to reflect the FY 2020 financial restructure and to support Army Modernization Priorities in support of the National Defense Strategy.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Multi-Mission High Energy Laser (MMHEL) Integration and Demonstration	-	-	18.650
Description: This effort matures, integrates and demonstrates HEL technologies on Army Stryker to inform Maneuver-Short Range Air Defense (M-SHORAD) requirements and reduce risk for M-SHORAD. The goal is to protect maneuvering forces from RAM and UAS threats. Knowledge gained from demonstration will be transitioned to PEO Missiles and Space to inform the future objective M-SHORAD Program of Record following the FY21 demonstration.			
FY 2020 Plans: Will complete procurement and integration of system hardware; will complete evaluation of subsystems against performance parameters; will continue integrating initial firing doctrine as well as Battle Management, Communications, Command, Control,			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX7 / *Multi-Mission High Energy Laser (MMHEL) Sys Demo*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Computer, and Intelligence software; will begin planning technology readiness level 7 demonstration, procure targets for the demonstration; and begin the system level test/fix/test process of MMHEL. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort is realigned from PE/Project 0604115A/DS3 in FY 2020.			
Accomplishments/Planned Programs Subtotals	-	-	18.650

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX7 / *Multi-Mission High Energy Laser (MMHEL) Sys Demo*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Multi-Mission High Energy Laser (MMHEL) Integration and Demonstration	C/Various	SMDTC : Huntsville, AL	-	-		-		18.650		-		18.650	8.150	26.800	-
		Subtotal	-	-		-		18.650		-		18.650	8.150	26.800	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		18.650		-		18.650	8.150	26.800	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX7 / *Multi-Mission High Energy Laser (MMHEL) Sys Demo*

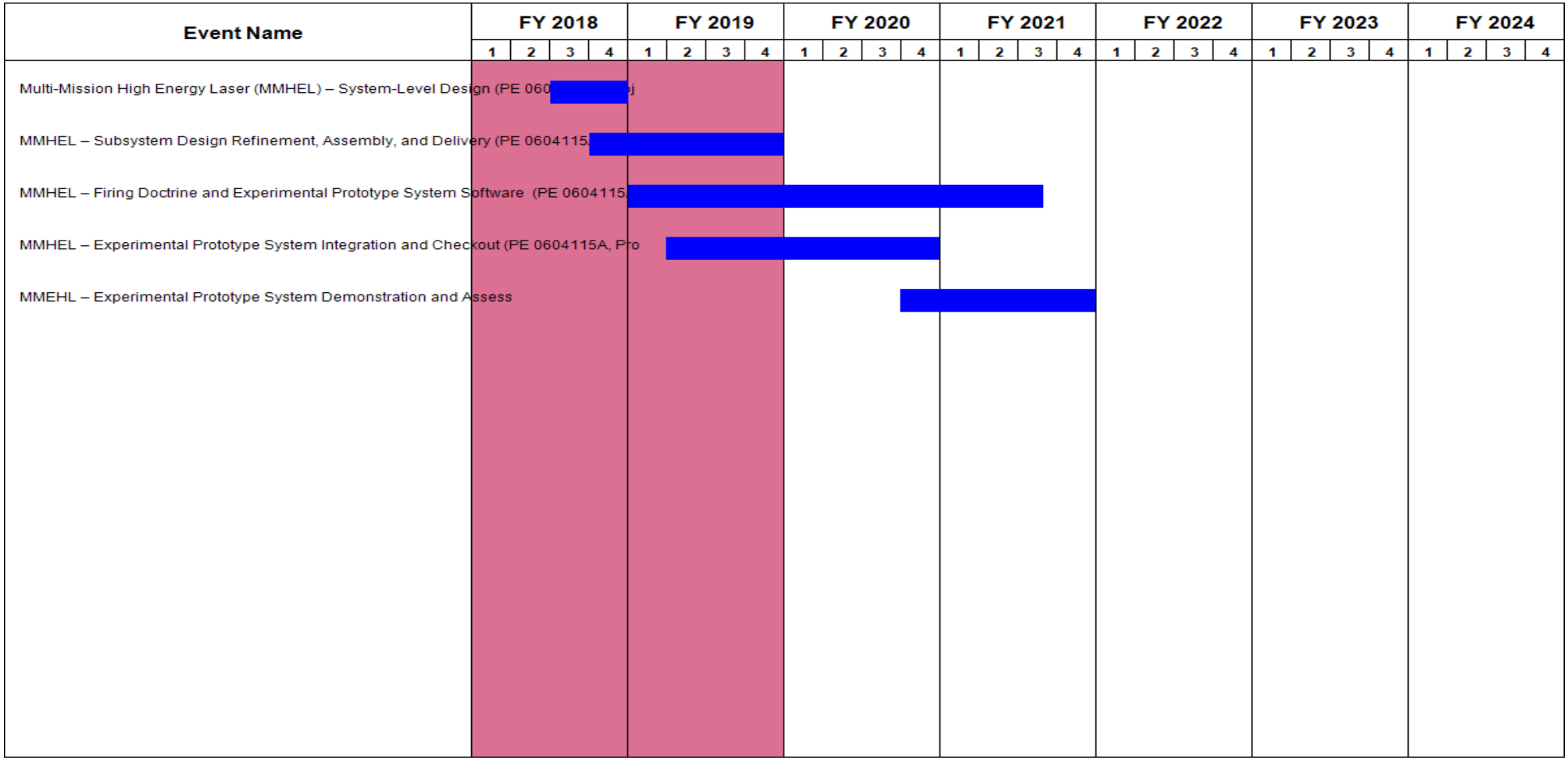

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX7 / *Multi-Mission High Energy Laser (MMHEL) Sys Demo*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Multi-Mission High Energy Laser (MMHEL) ? System-Level Design (PE 0604115A, Proj	3	2018	4	2018
MMHEL ? Subsystem Design Refinement, Assembly, and Delivery (PE 0604115A, Projec	4	2018	4	2019
MMHEL ? Firing Doctrine and Experimental Prototype System Software (PE 0604115A	1	2019	3	2021
MMHEL ? Experimental Prototype System Integration and Checkout (PE 0604115A, Pro	2	2019	4	2020
MMEHL ? Experimental Prototype System Demonstration and Assess	4	2020	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX8 / *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AX8: *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*	-	0.000	0.000	27.200	-	27.200	4.000	0.000	0.000	0.000	0.000	31.200
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This Project is a new start in FY 2020.

A. Mission Description and Budget Item Justification

This Project matures and integrates next-generation 50mm weapon system technologies transitioned from under the Advanced Lethality and Accuracy System for Medium Caliber (ALAS-MC) advanced technology development effort into a vehicle-agnostic combat turret to inform requirements for the Next Generation Combat Vehicle (NGCV). This Project integrates and assesses critical ALAS-MC 50mm technology components for on-the-move engagement of moving personnel and materiel targets, bringing the subsystem to Technology Readiness Level (TRL) 7. Under Advanced Targeting and Lethality Automated System (ATLAS), this Project matures and integrates advanced Artificial Intelligence/Machine Learning (AI/ML) algorithms to enable aided target detection/recognition capability for NGCV using next generation, multi-spectral electro-optical and infrared (EO/IR) targeting sensors. AI/ML algorithms are integrated with real-time intelligent fire control and mission planning interfaces to demonstrate automated turret capabilities, and provide overmatch via reduced target acquisition and engagement timelines.

Work in this Project is related to and fully integrated with the efforts funded in PE 0603462A, Project BF5, Advanced Lethality and Accuracy System for Med Cal; and PE 0603462A, Project BG1, Sensors for Autonomous Operations and Survivability Advanced Technology.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. Work in this Project is performed by the U.S. Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Advanced Lethality and Accuracy System for Med Cal (ALAS-MC)	-	-	5.000
Description: This effort matures and integrates the next generation 50mm weapon system technologies transitioned from the Advanced Lethality and Accuracy System for Medium Caliber (ALAS-MC) advanced technology development effort into vehicle-agnostic combat turret to inform requirements for the Next Generation Combat Vehicle.			
FY 2020 Plans: Will mature next generation 50mm armament and fire control systems to TRL 7 by integrating and assessing 50mm component technologies for on-the-move engagement of moving personnel and materiel targets.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX8 / *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
This effort is a new start in FY 2020.			
Title: Advanced Targeting and Lethality Automated System (ATLAS)	-	-	22.200
Description: The Advanced Targeting and Lethality Automated System (ATLAS) effort matures, integrates, and demonstrates novel algorithms and sensor enhancements in a Next Generation Combat Vehicle (NGCV) vehicle agnostic, robotic turret. It integrates autonomous, wide-area search sensors and gimballed targeting sensors with real-time computer aided detection, recognition, and identification of threats for significantly decreased time to engagement. It integrates target acquisition with intelligent fire control system to demonstrate an end-to-end engagement system on NGCV platforms, and enable experimentation and soldier touch-points with robotic turret concepts. ***FY 2020 Plans:*** Will mature synthetic, augmented, and real threat data sets to train and test automated target recognition (ATR) algorithms in a variety of complex, cluttered environments. Will execute initial demonstration of advanced targeting sensors with embedded ATR processing in a relevant test environment using a stationary vehicle. Will develop and demonstrate sensor and algorithm integration approaches with intelligent fire control systems. Synthetic imagery development and data collections will inform on-the-move target detection and recognition algorithms for a wider variety of environments. Will develop and mature moving and stationary target indicators. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort is a new start in FY 2020.			
Accomplishments/Planned Programs Subtotals	-	-	27.200

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX8 / *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ALAS-MC: Procure Ammo Rounds H/W	C/Various	ARDEC : Picatinny, NJ	-	-		-		3.700		-		3.700	0.000	3.700	-
ALAS-MC: Control Unit	C/Various	ARDEC : Picatinny, NJ	-	-		-		0.300		-		0.300	0.000	0.300	-
ALAS-MC: Test Hardware	TBD	ARDEC : Picatinny, NJ	-	-		-		0.200		-		0.200	0.000	0.200	-
ATLAS: System Design	TBD	CERDEC : Fort Belvoir, VA	-	-		-		5.000		-		5.000	0.000	5.000	-
ATLAS: Artificial Intelligence/Machine Learning Development	TBD	CERDEC : Fort Belvoir, VA	-	-		-		6.500		-		6.500	0.000	6.500	-
ATLAS: Data Collection and Synthetic Data	TBD	CERDEC : Fort Belvoir, VA	-	-		-		9.300		-		9.300	0.000	9.300	-
ATLAS: Integration and Test	TBD	CERDEC : Fort Belvoir, VA	-	-		-		1.400		-		1.400	0.000	1.400	-
		Subtotal	-	-		-		26.400		-		26.400	0.000	26.400	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ALAS-MC	TBD	ARDEC : Picatinny, NJ	-	-		-		0.800		-		0.800	0.000	0.800	-
		Subtotal	-	-		-		0.800		-		0.800	0.000	0.800	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		27.200		-		27.200	0.000	27.200	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX8 / *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*

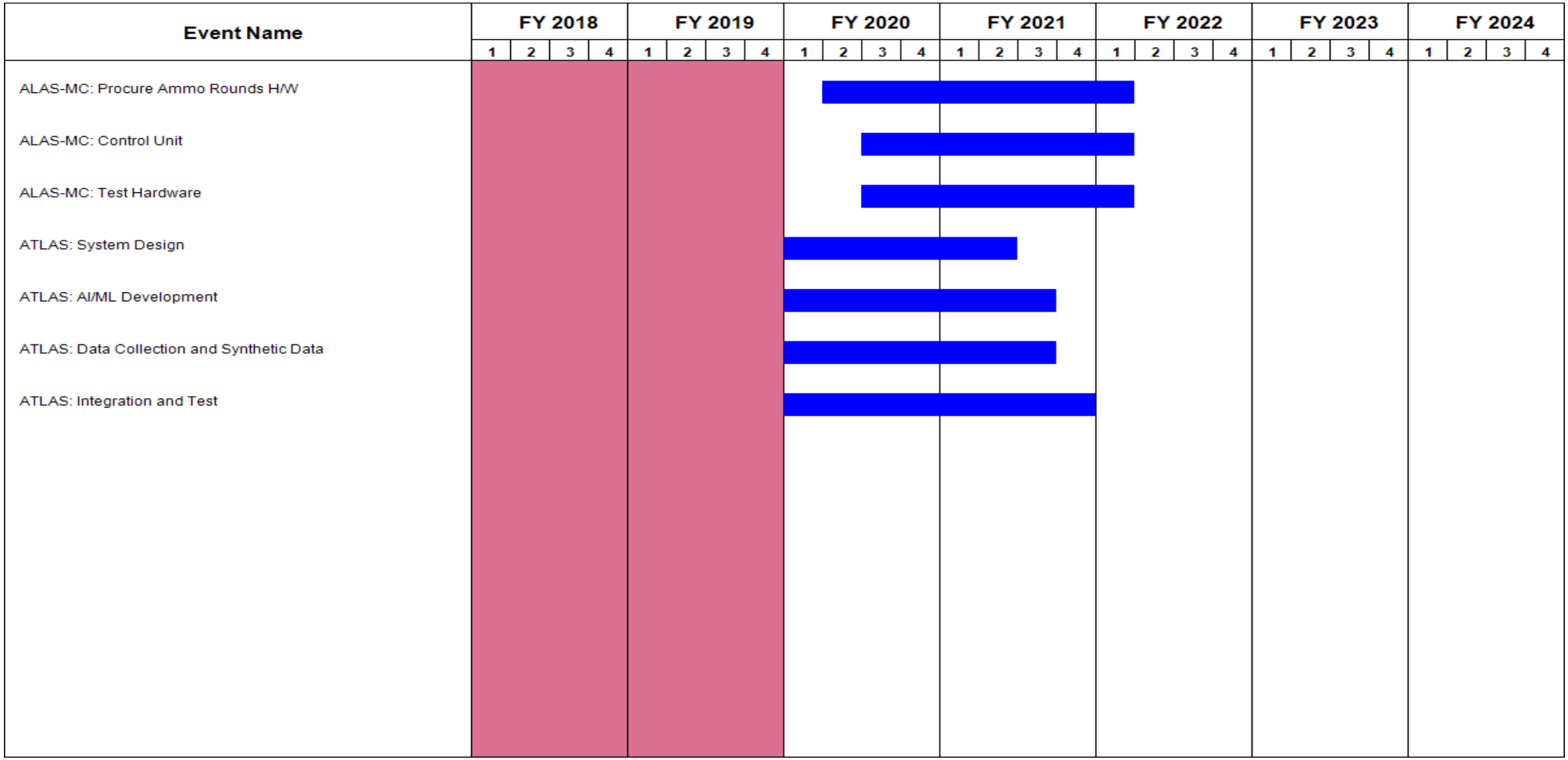

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX8 / *Adv Leth and Accuracy Sys for Med Calber (ALAS-MC)*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
ALAS-MC: Procure Ammo Rounds H/W	2	2020	1	2022
ALAS-MC: Control Unit	3	2020	1	2022
ALAS-MC: Test Hardware	3	2020	1	2022
ATLAS: System Design	1	2020	2	2021
ATLAS: AI/ML Development	1	2020	3	2021
ATLAS: Data Collection and Synthetic Data	1	2020	3	2021
ATLAS: Integration and Test	1	2020	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX9 / *Adv Mobility Experimental Prototype Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AX9: *Adv Mobility Experimental Prototype Adv Tech*	-	0.000	0.000	10.500	-	10.500	15.800	10.500	7.200	3.606	0.000	47.606
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

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

A. Mission Description and Budget Item Justification

This Project integrates and demonstrates advanced powertrain, power generation, and running gear technologies into a prototype ground combat vehicle. Advanced Mobility Experimental Prototype activities will demonstrate increased mobility, increased maneuver speeds, reduced fuel demands, and onboard power generation available for advanced lethality and protection technologies. The experimental prototype will be evaluated in realistic operating environment to validate performance and capability enhancements to inform ground combat vehicle programs of record.

This work is coordinated with PE/Project 0603462A/BG4 (Advanced Mobility Experimental Prototype (AMEP)).

The cited work is consistent with the Under Secretary of Defense, Research and Engineering priority focus areas and the Army Modernization Strategy. Work in this Project is performed by the U.S. Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Advanced Mobility Experimental Prototype	-	-	10.500
Description: Efforts integrate and demonstrate advanced powertrain, power generation, and running gear technologies into a ground combat vehicle to demonstrate reduced percentage of no-go terrain for ground vehicles, increased maneuver speeds across all traversable terrain, reduced fuel demands thus extending operation time between resupply, and onboard power generation to enable the integration of energy based capabilities such as directed energy weapons and electromagnetic armor. This effort is coordinated with efforts in PE/Project 0603462A/BG4.			
FY 2020 Plans: Will fabricate powertrain, power generation, and running gear technologies. Will develop designs for integration onto a surrogate combat vehicle platform, minimizing modifications to surrogate structure. Will develop and mature air induction/filtration, exhaust system, fuel cooling, final drives, and controls.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX9 / *Adv Mobility Experimental Prototype Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
This effort is a new start in FY 2020 and was not funded in FY 2019.			
Accomplishments/Planned Programs Subtotals	-	-	10.500

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AX9 / *Adv Mobility Experimental Prototype Adv Tech*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Initial Integration Design of Components	C/Various	TARDEC : Warren, MI	-	-		-		1.000		-		1.000	0.000	1.000	-
Develop air handling, cooling system, final drives & controls	C/Various	TARDEC : Warren, MI	-	-		-		3.000		-		3.000	0.000	3.000	-
Fabricate Powertrain Technologies	C/Various	TARDEC : Warren, MI	-	-		-		3.500		-		3.500	4.000	7.500	-
Fabricate Advanced Running Gear	C/Various	TARDEC : Warren, MI	-	-		-		2.500		-		2.500	3.000	5.500	-
Design Integration for Surrogate Platform	C/Various	TARDEC : Warren, MI	-	-		-		0.500		-		0.500	4.500	5.000	-
		Subtotal	-	-		-		10.500		-		10.500	11.500	22.000	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		10.500		-		10.500	11.500	22.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX9 / *Adv Mobility Experimental Prototype Adv Tech*

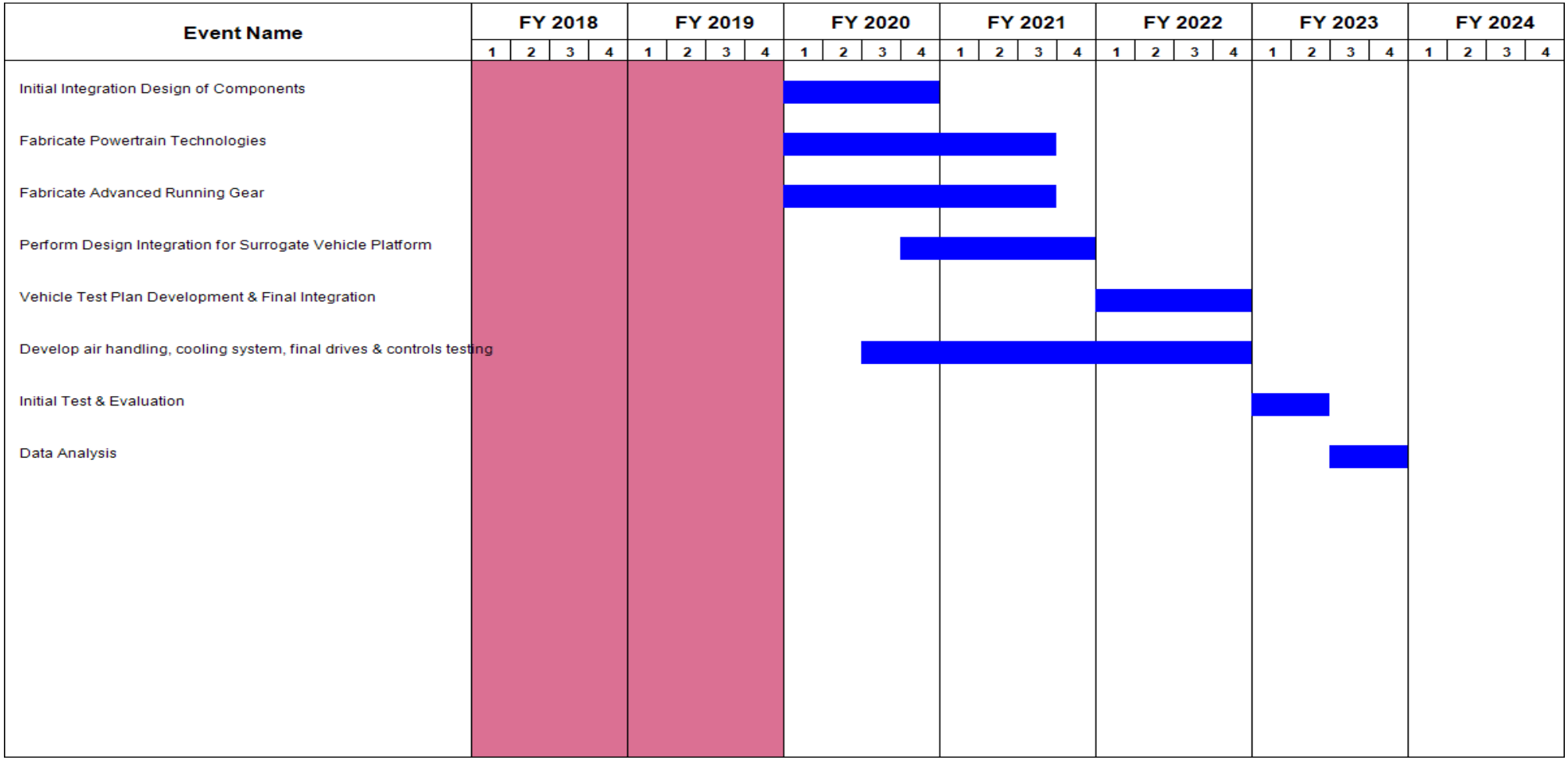

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AX9 / *Adv Mobility Experimental Prototype Adv Tech*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Initial Integration Design of Components	1	2020	4	2020
Fabricate Powertrain Technologies	1	2020	3	2021
Fabricate Advanced Running Gear	1	2020	3	2021
Perform Design Integration for Surrogate Vehicle Platform	4	2020	4	2021
Vehicle Test Plan Development & Final Integration	1	2022	4	2022
Develop air handling, cooling system, final drives & controls testing	3	2020	4	2022
Initial Test & Evaluation	1	2023	2	2023
Data Analysis	3	2023	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AY1 / *MUM-T Platform Enabler*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AY1: *MUM-T Platform Enabler*	-	0.000	0.000	7.200	-	7.200	4.500	4.200	0.000	0.000	0.000	15.900
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

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

A. Mission Description and Budget Item Justification

This Project will mature and demonstrate Manned Unmanned Teaming (MUMT) technologies in a realistic operating environment to drive down risk in three critical areas for ground MUMT: remote lethality, unmanned maneuver and network. These major technical hurdles will be addressed by integrating mature technologies into the MUMT Campaign of Learning through three, synergistic integration efforts: Unmanned Aerial Vehicle (UAV)/ground platform integration, a transportable MUMT simulation environment and an advanced interface for the Warfighter.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. Work in this Project is performed by the U.S. Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Unmanned Aerial Vehicle (UAV) / Ground Platform Integration	-	-	4.050
Description: This effort matures and demonstrates in an operational environment technologies that address critical capability challenges related to the integration of Unmanned Aerial Vehicles (UAVs) and ground vehicle platforms. This effort also improves human-machine interactions through an intuitive Warfighter Machine Interface (WMI) between operators and unmanned platforms. The end state is to analyze the operational impact of multiple advanced enabling technologies to reduce risk in critical capabilities that support MUMT operations. ***FY 2020 Plans:*** Will conduct task and workflow analysis for the integration of electro-optic sensors, a communications repeater, and advanced WMI to improve situational awareness and network communications. Will select baseline platforms for the ground and aerial vehicles. Will mature the demonstrator technology by optimizing subsystem performance during hardware and software integration on the vehicle platform. Will conduct engineering demonstration of integrated technologies to validate approach prior to operational demonstrations. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort is a new start in FY 2020			
Title: Transportable Manned Unmanned Teaming (MUMT) Simulation	-	-	3.150

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY1 / *MUM-T Platform Enabler*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Description: This effort provides an immersive, transportable Manned Unmanned Teaming (MUMT) simulation environment in order to gather insights from diverse user groups to shape and inform MUMT Tactics, Techniques and Procedures (TTPs). Specifically, it provides the capability to optimize Warfighter Machine Interface (WMI) implementations and advanced payloads for multiple MUMT scenarios. The end state is to provide Soldiers across the fighting echelon, from command to end user, the requisite knowledge to formulate the appropriate Concept of Operations (CONOPS) 7.200 for MUMT in order to operate and fight disbursed against near-peer adversaries with greater lethality and force projection. ***FY 2020 Plans:*** Will design and begin development of a realistic, transportable simulator to virtually assess the control vehicle layout under various conditions and modes. Will mature the simulation environment and associated technologies in preparation for user virtual assessments to shape and inform MUMT TTPs. Will develop scenarios for virtual simulation that will engage the user base on software improvements to the WMI. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort is a new start in FY 2020.			
Accomplishments/Planned Programs Subtotals	-	-	7.200

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY1 / *MUM-T Platform Enabler*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UAV / Ground Platform Integration	C/Various	TARDEC : Warren, MI	-	-		-		4.050		-		4.050	8.700	12.750	-
Transportable Simulator	C/Various	TARDEC : Warren, MI	-	-		-		3.150		-		3.150	0.000	3.150	-
		Subtotal	-	-		-		7.200		-		7.200	8.700	15.900	N/A

	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		7.200		-		7.200	8.700	15.900	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY1 / *MUM-T Platform Enabler*

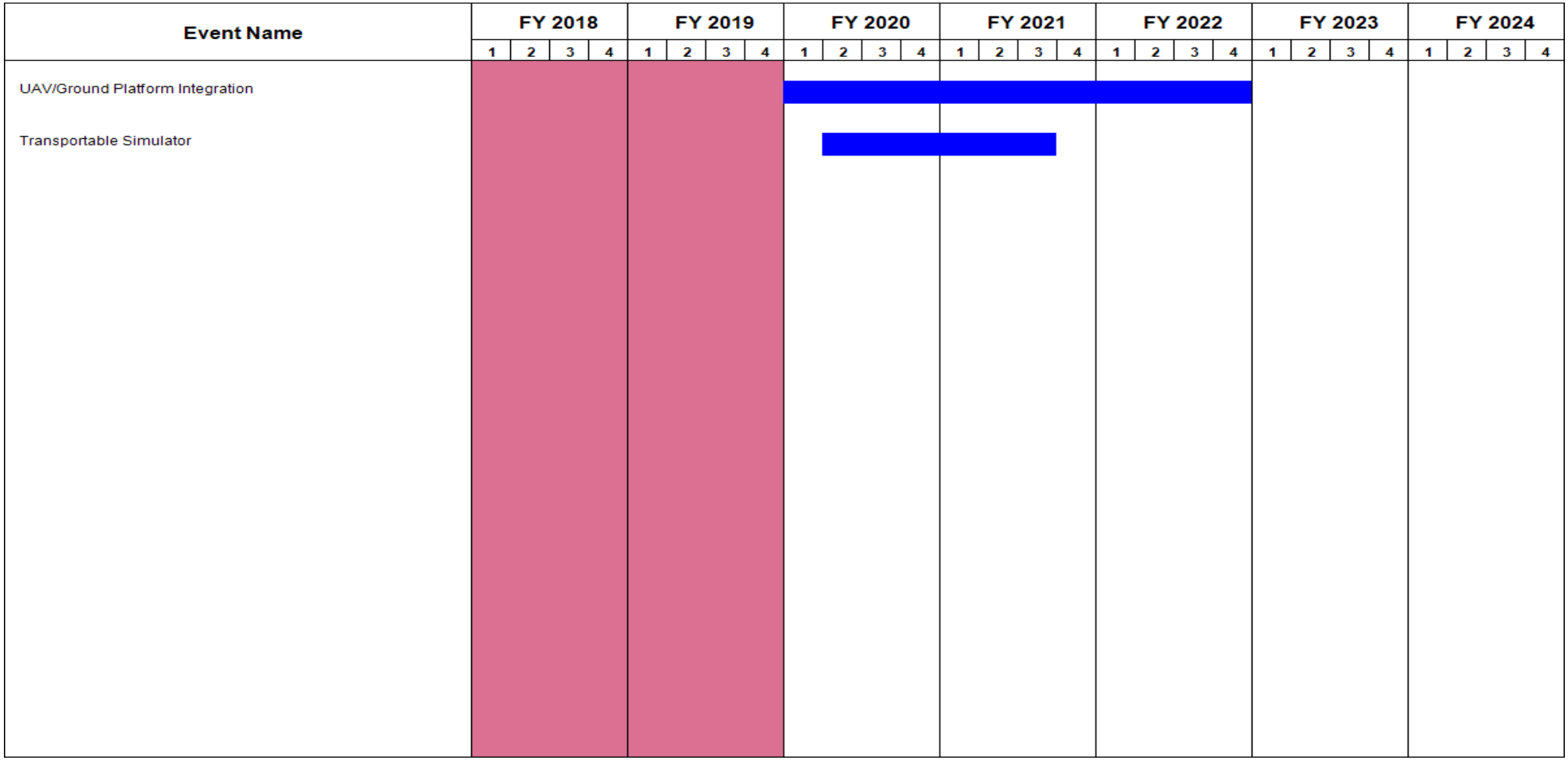

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY1 / *MUM-T Platform Enabler*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
UAV/Ground Platform Integration	1	2020	4	2022
Transportable Simulator	2	2020	3	2021

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AY2 / *Army Operational Fires*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AY2: *Army Operational Fires*	-	0.000	0.000	18.900	-	18.900	28.400	41.900	10.800	0.000	0.000	100.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

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

A. Mission Description and Budget Item Justification

This Project matures and demonstrates a ground-launched, treaty-compliant weapon system capable of destroying critical relocatable, time sensitive targets in contested Anti-Access/Area Denied (A2/AD) environments. Activities include system-level prototyping to extend the range of Army fires well beyond 499km to complement other fires developments.

Work in this Project complements PE 0603464 Long Range Precision Fires Advanced Technology.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. Work in this Project is performed by the U.S. Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Army Operational Fires	-	-	18.900
Description: This effort matures and demonstrates a ground-launched, treaty-compliant weapon system capable of destroying critical relocatable, time sensitive targets in contested A2/AD environments. ***FY 2020 Plans:*** Will develop system architecture and interfaces; will initiate fire control software development; and perform sub-system testing and evaluation of solid rocket booster and launch platform hardware. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort is a new start in FY 2020			
Accomplishments/Planned Programs Subtotals	-	-	18.900

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY2 / *Army Operational Fires*

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY2 / *Army Operational Fires*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Army Operational Fires	C/Various	AMRDEC : Huntsville, AL	-	-		-		18.900		-		18.900	81.100	100.000	-
		Subtotal	-	-		-		18.900		-		18.900	81.100	100.000	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		18.900		-		18.900	81.100	100.000	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY2 / *Army Operational Fires*

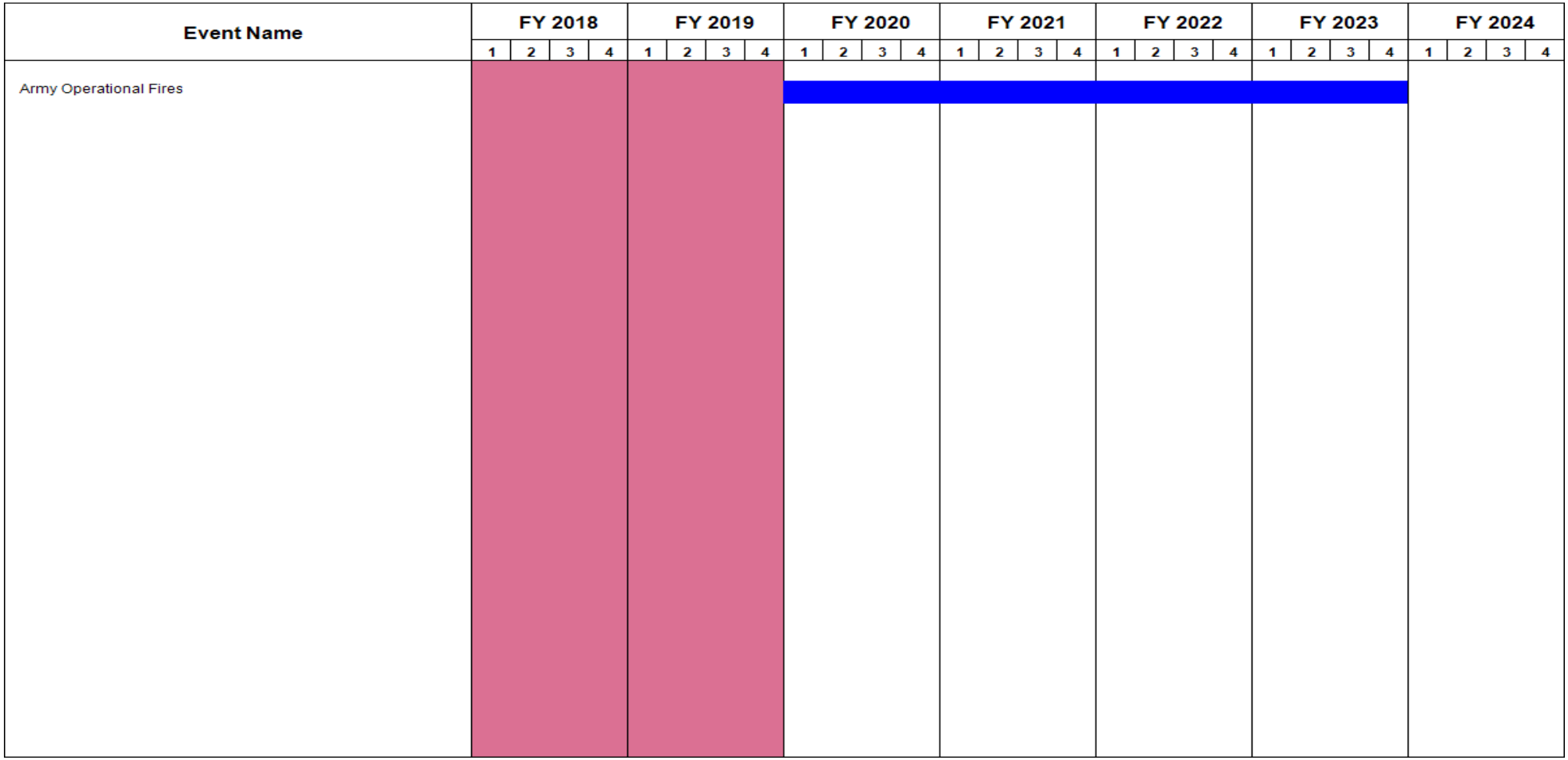

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY2 / *Army Operational Fires*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Army Operational Fires	1	2020	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AY3 / *Strategic Long Range Cannon*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AY3: *Strategic Long Range Cannon*	-	0.000	0.000	91.860	-	91.860	65.210	71.000	0.000	0.000	0.000	228.070
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

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

A. Mission Description and Budget Item Justification

This Project matures and integrates long-range armament technologies for both weapons and munitions to demonstrate potential deep strike objective capabilities from future cannon artillery systems. It will demonstrate revolutionary performance to support Long Range Fires by further developing, integrating, and demonstrating enhanced lethality and range extension solutions for cannon system performance with maximum effects. Strategic Long Range Cannon activities include integrating component technologies into sub-system and system-level experimental prototypes for novel cannon, munition, and fire control, including guidance and propulsion. Extended Range Cannon Artillery (ERCA) activities mature, integrate, and demonstrate a novel sub-system for ammunition handling and a long-range artillery projectile to support prototyping and experimentation of a next-generation, extended range armaments system that will provide significantly increased range and accuracy without an increase in platform weight. This Project also demonstrates and experiments with emerging and commercially-available technology components to demonstrate improved Stinger capabilities when used in a Man Portable Air Defense System (MANPADS) configuration.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy. Work in this Project is performed by the U.S. Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Strategic Long Range Cannon	-	-	64.860
Description: This effort will integrate and prototype subsystem technologies to further enhance range, lethality, and precision enablers for extended range cannon and munition systems. ***FY 2020 Plans:*** Will scale up cannon and projectile technology components and fabricate sub-system prototype hardware leveraging activities and information gained under 0603464A/AE6 (Strategic Long Range Cannon Advanced Technology). Will integrate test hardware and conduct subsystem testing and experimentation. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort is a new start in FY 2020			
Title: Extended Range Cannon Artillery (ERCA) Autoloader	-	-	11.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY3 / *Strategic Long Range Cannon*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Description: This effort matures, integrates, and demonstrates a novel technology sub-system prototype for ammunition handling to support the prototyping of a next-generation, extended range armaments system that will provide significantly increased range and accuracy without an increase in platform weight. ***FY 2020 Plans:*** Will mature and integrate ammunition handling automation technologies into a sub-system prototype for demonstration and validation of performance. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This is an FY 2020 new start effort			
Title: Extended Range Cannon Artillery (ERCA) Projectile ***Description:*** This effort integrates component technologies that provide optimized range, precision, counter-measure, and payload into a long-range artillery projectile sub-system for demonstration and experimentation. Activities support the maturation and prototyping of a next-generation, extended range armaments system that will provide significantly increased range and accuracy without an increase in platform weight. ***FY 2020 Plans:*** Will mature and integrate enabling component technologies into long-range artillery projectile sub-system. Will demonstrate and validate increased range, sensor optimization and integration, and improved performance for armor and counter-battery defeat at extended ranges in contested and GPS-denied environments. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This is an FY 2020 new start effort	-	-	4.000
Title: Dismounted Man-Portable Air Defense System (MANPADS) Experiment ***Description:*** This effort demonstrates and experiments with potential government and/or industry technology components to improve the effective range of the Stinger missile in the man-portable air defense system (MANPADS) configuration. The goal of this effort is to demonstrate improved Stinger capabilities when used in a MANPADS configuration. ***FY 2020 Plans:*** Will select technology components from government and/or industry sources and conduct system demonstrations and experimentation in realistic and representative operational environment(s). Will conduct experimentation efforts using various system component options to demonstrate improved effective range of the Stinger missile when configured for man-portable air	-	-	12.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY3 / *Strategic Long Range Cannon*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
defense (MANPADS). Experimentation results will inform requirements and systems planning for future Mobile Short-Range Air Defense (M-SHORAD) capabilities. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This is an FY 2020 new start effort			
Accomplishments/Planned Programs Subtotals	-	-	91.860

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) AY3 / *Strategic Long Range Cannon*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Strategic Long Range Cannon	C/Various	ARDEC : Picatinny, NJ	-	-		-		64.860		-		64.860	136.210	201.070	-
Extended Range Cannon Artillery (ERCA) Autoloader	C/Various	ARDEC : Picatinny, NJ	-	-		-		11.000		-		11.000	0.000	11.000	-
Extended Range Cannon Artillery (ERCA) Projectile	C/Various	ARDEC : Picatinny, NJ	-	-		-		4.000		-		4.000	0.000	4.000	-
		Subtotal	-	-		-		79.860		-		79.860	136.210	216.070	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Dismounted Man-Portable Air Defense System (MANPADS) Experiment	Option/ Various	PEO M&S, PM Cruise MIssile Defense System : Huntsville, AL	-	-		-		12.000		-		12.000	0.000	12.000	-
		Subtotal	-	-		-		12.000		-		12.000	0.000	12.000	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		91.860		-		91.860	136.210	228.070	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY3 / *Strategic Long Range Cannon*

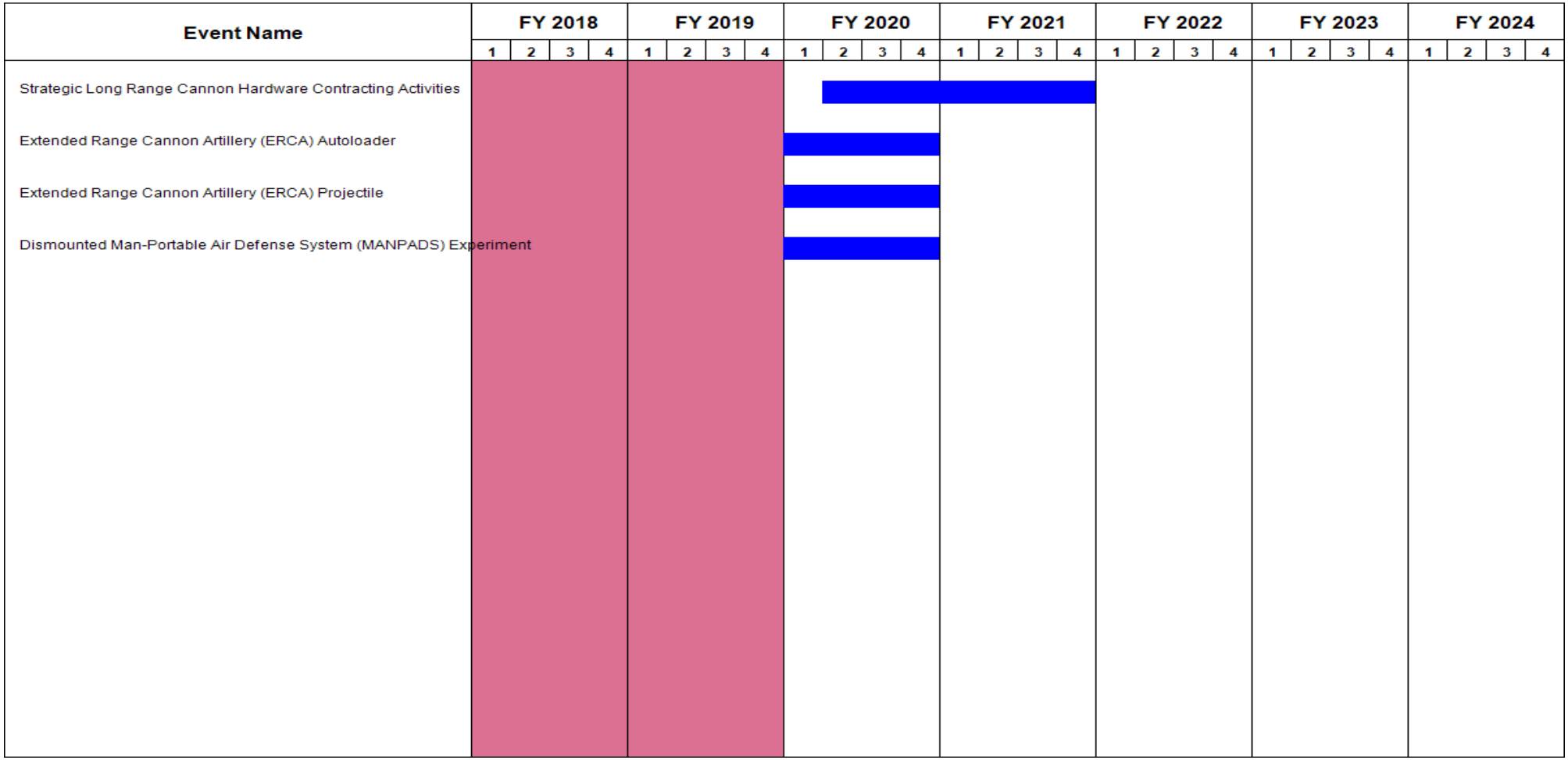

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** AY3 / *Strategic Long Range Cannon*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Strategic Long Range Cannon Hardware Contracting Activities	2	2020	4	2021
Extended Range Cannon Artillery (ERCA) Autoloader	1	2020	4	2020
Extended Range Cannon Artillery (ERCA) Projectile	1	2020	4	2020
Dismounted Man-Portable Air Defense System (MANPADS) Experiment	1	2020	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 4	R-1 Program Element (Number/Name) PE 0604115A / *Technology Maturation Initiatives*	Project (Number/Name) DS3 / *Technology Maturation Initiatives*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
DS3: *Technology Maturation Initiatives*	-	145.618	95.229	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	240.847
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Beginning in Fiscal Year (FY) 2020, Program Element (PE) 0604115A (Technology Maturation Initiatives) / Project DS3 (Technology Maturation Initiatives) has been realigned to:
PE 0604115A Technology Maturation Initiatives:
* Project AX3 (Technology Maturation Initiatives)
* Project AX4 (Computational Prototyping Environment (CPE))
* Project AX5 (Next Generation Close Combat Missile)
* Project AX6 (Active Protection Systems Integration)
* Project AX7 (Multi-Mission High Energy Laser (MMHEL) Sys Demo)
* Project AX8 (Adv Leth and Accuracy Sys for Med Calber ALAS-MC)
* Project AX9 (Adv Mobility Experimental Prototype Adv Tech)
* Project AY1 (MUM-T Platform Enabler)
* Project AY2 (Army Operational Fires)
* Project AY3 (Strategic Long Range Cannon)

A. Mission Description and Budget Item Justification

This Project funds the maturation, integration, and demonstration of advanced technology demonstrators and experimental prototypes to support advanced ground systems; aviation systems; command, control, communication & reconnaissance systems and equipment; precision weapons, High Energy Laser (HEL) systems; and Soldier equipment. Technology Maturation Initiative (TMI) efforts mature and integrate component technologies into early system and sub-system experimental prototypes for demonstration in relevant environments and tactical/operational scenarios, taking technologies to a goal of Technology Readiness Level (TRL) 7. Technology demonstrators and experimental prototypes are validated and transitioned to priority Army experimentation and acquisition efforts to inform requirements for future programs of record and reduce the risk of technology insertion. These efforts are typically 2-4 years in duration, and are approved by Army senior leadership based on priority and opportunity, to ensure that demonstrations have high potential for filling capability gaps and transitioning. Activities include the maturation, integration, and demonstration of HEL prototype weapons performance on a combat platform in realistic operational environments in support of the Army's objective capability for Maneuver-Short Range Air Defense (M-SHORAD). A 50 kilowatt (kW)-class laser weapon system has the potential to engage and defeat rockets, artillery, mortars (RAM), unmanned aerial systems(UASs), sensors, and optics for maneuvering brigade combat teams (BCTs). Activities also include sub-system prototyping and integration of leap-ahead ground combat vehicle powertrain technologies; and integration and demonstration of key Active Protection System (APS) components to provide modular and layered vehicle protection effects (hard-kill and soft-kill), enabling power projection and enhanced survivability. Computational Prototyping Environment (CPE) efforts include demonstration of physics-based, computational modeling integrated with new advances in deep learning to explore

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** DS3 / *Technology Maturation Initiatives*

design tradespaces and understand defeat strategies for prototype platforms. This Project provides the Army with an improved mechanism for enabling greater competition in the latter stages of technology maturation and establishing a closer alignment between Science and Technology (S&T) efforts and acquisition programs.

The cited work is consistent with the Under Secretary of Defense, Research and Engineering priority focus areas and the Army Modernization Strategy. Work in this Project is performed by the Army Futures Command (AFC); the United States Army Space and Missile Defense Command/Army Forces Strategic Command (SMDC/ ARSTRAT); and the Engineer Research and Development Center (ERDC).

Funding has been realigned to reflect the FY 2020 financial restructure and Army Modernization Priorities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Vehicle Survivability Subsystem Demonstrator	9.860	7.361	-
Description: The Vehicle Survivability Subsystem effort integrates and demonstrates cost effective, lightweight designs for the optimization of hull, frame, body, cab and armor technologies to achieve survivability systems weight reductions of 10-15% and increased vehicle survivability against advanced and emerging threats. This effort is coordinated with efforts in PE 0603005A. ***FY 2019 Plans:*** Complete design optimization of the integrated survivability demonstrator to prepare for system level durability and blast testing, achieving survivability systems weight reductions and increasing survivability against advanced and emerging threats. Integrate passive blast technologies and active blast mitigation system countermeasures into a demonstrator for underbody blast and structural evaluation. Conduct durability and blast testing to demonstrate the performance of integrated blast components, including surrogate armor, active blast mitigation, advanced energy absorbing (EA) floors, adjustable EA seats and restraints, and lighter weight hull with same or better levels of protection. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Planned progression of the effort, which concludes in FY 2019.			
Title: Advanced Powertrain Subsystem Demonstrator	12.433	10.600	-
Description: The Advanced Powertrain Subsystem Demonstrator effort fabricates, integrates, and demonstrates next generation, scalable combat vehicle powertrain technologies into a high power dense and more fuel efficient combat vehicle powertrain. This powertrain will demonstrate advancements in engine and transmission subsystem components specific for military platforms in order to provide an integrated advanced propulsion system . This effort is coordinated with efforts in PE 0603005A. ***FY 2019 Plans:*** Build upon and add components to the major subsystem integration of the multi-cylinder engine and the advanced high efficiency transmission, as part of the overall advanced powertrain demonstrator integration. Verify and validate that all components function as expected. Using a reduced risk strategy, mature and demonstrate high power-density and more fuel efficient integrated			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** DS3 / *Technology Maturation Initiatives*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
powertrain to support military tracked vehicles. Optimize system controls to improve performance for a wide range of powertrain applications. The technology is being developed for future military vehicle application such as the Bradley Family of Vehicles and future infantry vehicles. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Planned progression of the effort, which concludes in FY 2019.			
Title: Modular Active Protection System (MAPS) Demonstration ***Description:*** This effort conducts Active Protection System (APS) component and subsystem technology maturation and adaption, aligned with Survivability Sets 1, 2, and 3, as well as Expedited APS activity, to increase component reliability, comply with the Army's modular approach to active protection, and resolve component integration challenges. It integrates subsystem technology demonstrators and conducts demonstrations of soft-kill and hard-kill APS capability to verify APS performance within the modular and safe design approach, and to reduce technical risk for APS transition for the current and future combat and tactical vehicle platforms.	8.641	-	-
Title: Active Protection Systems (APS) Integration and Demonstration ***Description:*** This effort synchronizes emerging S&T products with the Vehicle Protection Suite (VPS) Program of Record and matures key Active Protection System (APS) technologies to a Technology Readiness Level 7 for integration onto current and future ground platforms. It matures Modular Active Protection Framework (MAF)-compliant effectors and sensors, and integrates them onto ground combat vehicles for prototype system test and demonstration. It conducts independent evaluation to inform system development processes that ensure safety compliance for future VPS increment upgrades as new threats emerge. ***FY 2019 Plans:*** Conduct system-level testing of the Modular Active Protection Framework and Controller base-kit. Determine best candidate APS effector and sensor technologies that are MAF-compliant for system-level integration and validation. Begin system-level integration of selected APS effector and sensor technologies on desired combat platform prototypes. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Beginning in FY 2020, this effort realigns to PE 0604115A/Project AX6 as part of the financial restructure.	-	7.404	-
Title: Multi-Mission High Energy Laser (MMHEL) ***Description:*** This effort matures and integrates a 50 kW-class laser system into a Stryker platform, providing a system-level, High Energy Laser (HEL) experimental prototype for demonstration in realistic operating environments. These demonstrations will inform requirements, decrease risk for future Army HEL acquisition programs, and support the future development of warfighter Tactics/Techniques/Procedures (TTPs) and Concept of Operations (CONOPS). HEL weapon systems are expected	78.684	54.741	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** DS3 / *Technology Maturation Initiatives*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
to complement conventional offensive and defensive weapons at a lower cost-per-shot than current systems and without the need to stockpile ordnance. A 50 kW-class laser weapon system has the potential to engage and defeat rockets, artillery, mortars (RAM); UAVs; sensors; and optics for maneuvering BCTs. Demonstrations will also inform potential future capability to defeat both fixed- and rotary-wing manned aircraft. Leveraging Government investments and Industry technology advancements, will review and select existing HEL subsystem designs for integration into a Stryker vehicle; will conduct integration and demonstration of a system-level HEL experimental prototype; and will provide assessment of technical performance in an operational environment. ***FY 2019 Plans:*** Complete design reviews of HEL subsystems (including laser, beam control, power, thermal management, and Army Battle Management Command, Control, and Computers (BMC3) architecture). Begin integration of HEL subsystem hardware and evaluate 50kW-class laser subsystems against performance parameters. Develop initial fire control logic for BMC4I software and define BMC4I interfaces with Army BMC4I network. Develop target laser vulnerability module which provides data on the amount of laser energy required to destroy a given target based upon the location of the laser spot on the target. As complete subsystems are delivered, integrate into a system-level experimental prototype and begin system checkout. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Beginning in FY 2020, this effort realigns to PE 0604115A/Project AX7 as part of the financial restructure.			
Title: MMHEL Integration and Demonstration (CA) ***Description:*** This effort procures equipment/components/subsystems at an accelerated rate compared to the original MMHEL 48 month schedule. This enables completion of the MMHEL Technology Readiness Level 7 demonstration 12 months earlier than original schedule.	35.000	-	-
Title: Next Generation Close Combat Missile ***Description:*** The Next Generation Close Combat Missile (NG CCM) effort demonstrates a prototype close combat missile with a multi-pulse, boost-sustain flight propulsion system providing extended range and decreased time of flight. Activities mature proof-of-principle hardware into an integrated tactical-representative design and demonstrate a prototype missile with lethality overmatch of emerging threats to address near-term Warfighter needs, in advance of acquisition program of record. ***FY 2019 Plans:*** Optimize and tailor missile propellant formulation to balance performance versus shock-sensitivity. Conduct a Force Effectiveness Experiment with the Maneuver Center of Excellence/Maneuver Battle Lab. Evaluate preliminary design concepts as a basis for	-	9.424	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** DS3 / *Technology Maturation Initiatives*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
trade studies, development of detailed designs, and NG CCM prototype development and testing. Fabricate wind tunnel models to support further system maturation and testing of NG CCM?s increased range and standoff capabilities. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Beginning in FY 2020, this effort realigns to PE 0604115A/Project AX5 as part of the financial restructure.			
Title: Computational Prototyping Environment ***Description:*** The Computational Prototyping Environment (CPE) effort creates an integrated, robust, and verified system that leverages recent Department of Defense advancements in large data tradespace analytics, high-fidelity physics-based modeling, deep learning techniques, high performance computing capabilities, and inverse modeling approaches. The CPE demonstrates the early developmental verification and validation of selected weapons platform variations in a way that accurately identifies potential performance and design failures, while also testing and mitigating solutions and multiple trades in a Virtual Proving Ground (VPG) prior to cost-bearing production and manufacturing. CPE efforts facilitate rapid, accurate, and computational prototyping in a robust VPG for early performance verification of new capabilities. ***FY 2019 Plans:*** Complete initial prototype VPG build. Integrate and validate existing high-fidelity, physics-based models and simulation tools with the prototype VPG to provide an initial proof of concept in support of future VPG development. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Beginning in FY 2020, this effort realigns to PE 0604115A/Project AX4 as part of the financial restructure.	1.000	2.219	-
Title: FY 2019 SBIR / STTR Transfer ***Description:*** FY 2019 SBIR / STTR Transfer ***FY 2019 Plans:*** FY 2019 SBIR / STTR Transfer ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 SBIR / STTR Transfer	-	3.480	-
Accomplishments/Planned Programs Subtotals	145.618	95.229	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** DS3 / *Technology Maturation Initiatives*

D. Acquisition Strategy

Activities are conducted both in-house and through competitively awarded contracts using best value source selection procedures. Multiple competitive contracts will be awarded. The Other Transaction Agreement (OTA) # W15QKN-14-9-1001 Initiative (Task Order) DOTC-16-01-INIT-0302 will be the primary contract vehicle for the MMHEL effort.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** DS3 / *Technology Maturation Initiatives*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Vehicle Survivability Subsystem Demonstrator	C/Various	Various : Various	11.954	9.860		7.361		-		-		-	0.000	29.175	-
Advanced Powertrain Subsystem Demonstrator	C/Various	Various : Various	14.512	12.433		10.600		-		-		-	0.000	37.545	-
Modular Active Protection Systems (MAPS) Demonstrations	C/Various	Various : Various	21.073	8.641		-		-		-		-	0.000	29.714	-
Active Protection Systems (APS) Integration	C/Various	Various : Various	-	-		7.404		-		-		-	0.000	7.404	-
Multi-Mission High Energy Laser (MMHEL)	C/Various	Various : Huntsville, AL	-	78.684		54.741		-		-		-	0.000	133.425	-
MMHEL Integration and Demonstration (CA)	C/Various	Various : Huntsville, AL	-	35.000		-		-		-		-	0.000	35.000	-
Computational Prototyping Environment	C/Various	Various : Various	-	1.000		2.219		-		-		-	0.000	3.219	-
Next Generation Close Combat Missile	C/Various	Various : Various	-	-		9.424		-		-		-	0.000	9.424	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		3.480		-		-		-	0.000	3.480	-
		Subtotal	47.539	145.618		95.229		-		-		-	0.000	288.386	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	47.539	145.618		95.229		-		-		-	0.000	288.386	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** DS3 / *Technology Maturation Initiatives*

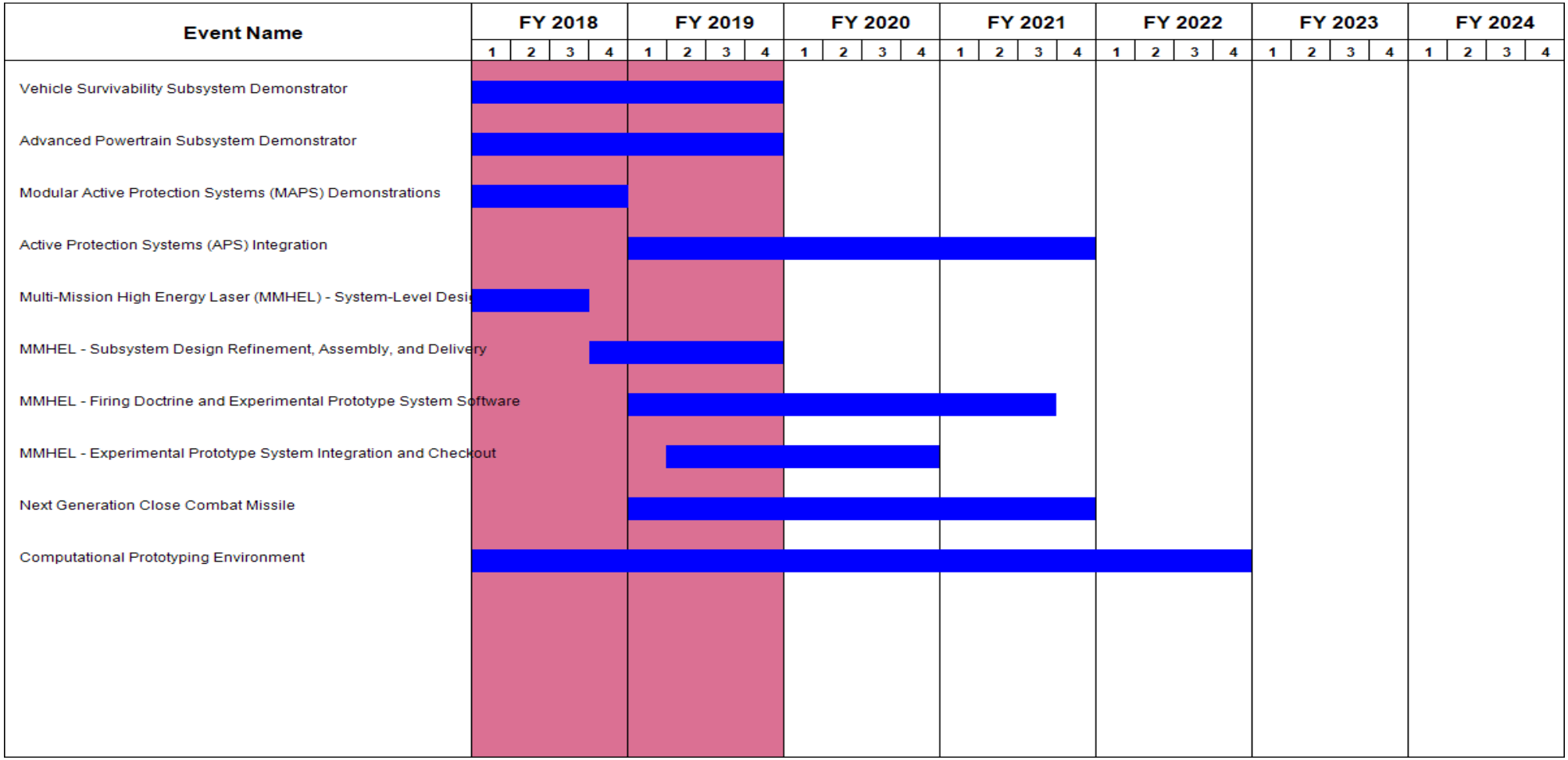

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 4	**R-1 Program Element (Number/Name)** PE 0604115A / *Technology Maturation Initiatives*	**Project (Number/Name)** DS3 / *Technology Maturation Initiatives*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Vehicle Survivability Subsystem Demonstrator	1	2017	4	2019
Advanced Powertrain Subsystem Demonstrator	1	2017	4	2019
Modular Active Protection Systems (MAPS) Demonstrations	1	2017	4	2018
Active Protection Systems (APS) Integration	1	2019	4	2021
Multi-Mission High Energy Laser (MMHEL) - System-Level Design	1	2018	3	2018
MMHEL - Subsystem Design Refinement, Assembly, and Delivery	4	2018	4	2019
MMHEL - Firing Doctrine and Experimental Prototype System Software	1	2019	3	2021
MMHEL - Experimental Prototype System Integration and Checkout	2	2019	4	2020
Next Generation Close Combat Missile	1	2019	4	2021
Computational Prototyping Environment	1	2018	4	2022

Note

N/A