Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	0.000	74.327	-	74.327	74.097	81.632	85.468	88.896	0.000	404.420
AE7: *Land-Based Anti-Ship Missile (LBASM) Technology*	-	0.000	0.000	11.900	-	11.900	10.100	0.000	0.000	0.000	0.000	22.000
AF1: *Long Range Maneuverable Fires (LRMF) Technology**	-	0.000	0.000	0.000	-	0.000	0.000	5.100	7.100	8.293	0.000	20.493
AF3: *Extended Range Propulsion Technology*	-	0.000	0.000	5.831	-	5.831	6.601	10.017	11.124	10.868	0.000	44.441
AF5: *Simulation and Aerostructures Technology*	-	0.000	0.000	1.434	-	1.434	1.461	1.490	1.520	1.537	0.000	7.442
AF6: *Structures Technology*	-	0.000	0.000	1.245	-	1.245	1.264	1.289	1.315	1.329	0.000	6.442
AF7: *Warhead Integration Technology*	-	0.000	0.000	1.752	-	1.752	1.792	2.083	2.125	2.149	0.000	9.901
AF8: *Affordable Extended Range Precision Technology*	-	0.000	0.000	0.300	-	0.300	0.294	1.562	1.985	1.441	0.000	5.582
AF9: *Precision and Accuracy Technology*	-	0.000	0.000	8.576	-	8.576	8.746	8.921	9.100	13.607	0.000	48.950
AG1: *Missile Electronics Technology*	-	0.000	0.000	3.148	-	3.148	3.217	3.281	3.347	3.384	0.000	16.377
AG2: *Information and Signal Processing Technology*	-	0.000	0.000	1.669	-	1.669	1.702	1.736	1.771	1.790	0.000	8.668
AG4: *Extended Range Artillery Munition Suite Technology*	-	0.000	0.000	7.092	-	7.092	6.654	5.237	5.341	5.401	0.000	29.725
AG6: *Energetic Materials and Advanced Processing Techno*	-	0.000	0.000	6.885	-	6.885	6.955	7.117	7.259	7.340	0.000	35.556
AG8: *Advanced Energetics Technology*	-	0.000	0.000	10.523	-	10.523	11.407	14.725	15.019	15.186	0.000	66.860
AG9: *Multiple Simul Engagement Technologies (MSET) Tech*	-	0.000	0.000	2.150	-	2.150	3.200	6.626	5.742	3.710	0.000	21.428

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army													Date: March 2019
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602147A *I Long Range Precision Fires Technology*								
AH2: *Single Multi-mission Attack Missile (SMAM) Technol*	-	0.000	0.000	1.317	-	1.317	0.000	0.000	0.000	0.000	0.000	1.317
AH4: *Precision and Coop Weapons in a Denied Env Tech*	-	0.000	0.000	9.505	-	9.505	9.638	9.831	10.051	10.163	0.000	49.188
BN5: *Fuze and Power for Munitions*	-	0.000	0.000	1.000	-	1.000	1.066	2.617	2.669	2.698	0.000	10.050

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

Note

In Fiscal Year (FY) 2020, this Program Element (PE) is realigned with continuity of effort from the following PEs:
* 0602303A Missile Technology
* 0602618A Ballistics Technology
* 0602624A Weapons and Munitions Advanced Technology

A. Mission Description and Budget Item Justification

Work in this Program Element (PE) investigates and develops Long Range Precision Fires (LRPF) technologies to destroy, neutralize, or suppress the enemy by cannon artillery and missile fire and enable integration of fire support assets into combined arms operations. Major Focus Areas for LRPF Science and Technology include: Missiles, Cannon Artillery, and Supporting LRPF Technologies. LRPF Missiles Applied Research investigates and develops a broad range of Missile technologies to enhance Army integrated LRPF capabilities at extended range. Cannon Artillery Applied Research investigates and develops critical technologies to increase range, precision, and both point and area effects for cannon artillery. Supporting LRPF Technologies Applied Research investigates and develops a broad range of component technologies to address weapon cost drivers and enhance performance of future LRPF munitions and systems.

Work in this PE complements PE 0603464A (Long Range Precision Fires Advanced Technology).

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

Work is performed by the United States Army Futures Command (AFC).

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army					Date: March 2019
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*			R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	74.327	-	74.327
Total Adjustments	0.000	0.000	74.327	-	74.327
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	74.327	-	74.327

Change Summary Explanation

FY20 increase related to Science and Technology financial restructure.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*				Project (Number/Name) AE7 / *Land-Based Anti-Ship Missile (LBASM) Technology*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
AE7: *Land-Based Anti-Ship Missile (LBASM) Technology*	-	0.000	0.000	11.900	-	11.900	10.100	0.000	0.000	0.000	0.000	22.000

Note

In Fiscal Year (FY) 2020 this Project is being realigned to:
Program Element (PE) 0602303 Missile Technology:
Project 214 Missile Technology

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by investigating and developing critical technologies to detect, engage, and defeat moving land or maritime surface targets under all conditions.

Work in this Project complements PE 0603464A (Long Range Precision Fires Advanced Technology) / AE8 (Land Based Anti-Ship Missile (LBASM) Advanced Tech.

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Land Based Anti-Ship Missile (LBASM) Technology	-	-	11.900
Description: Investigate and develop critical technologies that enable High Mobility Artillery Rocket System (HIMARS) and Multiple Launch Rocket System (MLRS) rocket/missile artillery systems to destroy enemy air defenses in the land and the maritime domains. ***FY 2020 Plans:*** Will continue development of multi-mode seeker technologies for precision engagement of cross-domain threats in GPS denied or degraded environments. These technologies include miniaturization of radio frequency and imaging infrared sensors; advanced image processing to enable target classification and aim point selection for both land and maritime targets. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This research effort is realigned from PE 0602303A (Missile Technology) / Project 214 (Missile Technology) in FY20 as part of the financial restructure.			
Accomplishments/Planned Programs Subtotals	-	-	11.900

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AE7 / *Land-Based Anti-Ship Missile (LBASM) Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*	Project (Number/Name) AF3 / *Extended Range Propulsion Technology*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AF3: *Extended Range Propulsion Technology*	-	0.000	0.000	5.831	-	5.831	6.601	10.017	11.124	10.868	0.000	44.441

Note

In Fiscal Year (FY) 2020 this Project is realigned from:
Program Element (PE) 0602303 Missile Technology:
*Project 214 Missile Technology

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by designing, fabricating, and investigating missile enabling propulsion technologies to enable range extension and/or block speed improvement for long range applications; and enables improvement in High Performance Propellants (HPP) via gains in energy density and burn rate control.

Work in this Project complements PE 0603464A (Long Range Precision Fires Advanced Technology) / Project AF2 (Long Range Maneuverable Fires (LRMF) Advanced Tech.

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Extended Range Propulsion Technology	-	-	5.831
Description: Designs, fabricates, and investigates missile enabling propulsion technologies to enable significant range extension and/or block speed improvement for long range applications and enables improvement in HPP via gains in energy density and burn rate control.			
FY 2020 Plans: Will continue the design and develop of variable thrust/impulse control sub- system technologies that can efficiently operate over extended duty cycles, altitudes, and tactical temperatures providing enhanced controllability for high speed, high altitude missile applications; Will investigate and develop low cost integral air-breathing propulsion technology that enables significant range extension and/or block speed improvement for long range multi-domain fires applications.			
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 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AF3 / *Extended Range Propulsion Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
This research effort was realigned from PE 0602303A (Missile Technology) / Project 214 (Missile Technology) in FY20 as part of the financial restructure.			
Accomplishments/Planned Programs Subtotals	-	-	5.831

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*	Project (Number/Name) AF5 / *Simulation and Aerostructures Technology*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AF5: *Simulation and Aerostructures Technology*	-	0.000	0.000	1.434	-	1.434	1.461	1.490	1.520	1.537	0.000	7.442

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602303 Missile Technology:
* Project 214 Missile Technology

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by investigating and developing novel aerodynamic modeling and aerostructures to support extended range and maneuvering missile applications in high aerodynamic and thermal loading environments.

Work in this Project complements PE 0603464A (Long Range Precision Fires Advanced Technology) / Project AE8 (Land Based Anti-Ship Missile (LBASM) Advanced Tech, and Project AF2 Long Range Maneuverable Fires (LRMF) Advanced Tech.

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Simulation and Aerostructures Technology	-	-	1.434
Description: Investigate and develop novel aerodynamic modeling and aerostructures to support extended range and maneuvering missile applications in high aerodynamic and thermal loading environments. ***FY 2020 Plans:*** Will develop aero-structural-propulsion design and analysis tools for the design and optimization of very high speed missile airframes and air inlets operating in low density flows at high altitude. These tools are critical for the development of very high speed missile concepts and to guide the design of this class of missile systems. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This research effort was realigned from PE 0602303 (Missile Technology) / Project 214 (Missile Technology) in FY20 as part of the financial restructure.			
Accomplishments/Planned Programs Subtotals	-	-	1.434

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AF5 / *Simulation and Aerostructures Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*				Project (Number/Name) AF6 / *Structures Technology*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
AF6: *Structures Technology*	-	0.000	0.000	1.245	-	1.245	1.264	1.289	1.315	1.329	0.000	6.442

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602303 Missile Technology:
* Project 214 Missile Technology

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by investigating advanced materials supporting survivable, high-speed missiles and identifying approaches of to reduce weight and size of missile structures using advanced materials and manufacturing techniques.

Work in this Project complements PE 0603464/AE8 LBASM Advanced Technology; PE 0602147/AF1 LRMF Technology, and PE 0603464/AF2 LRMF Advanced Technology.

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Structures Technology	-	-	1.245
Description: Investigate advanced materials supporting survivable, high-speed missiles; identify approaches of for reducing weight and size of missile structures using advanced materials and manufacturing techniques. ***FY 2020 Plans:*** Will continue to investigate, analyze and design high temperature, high- strength materials for structural airframe and conformal radio frequency and imaging infrared window/dome applications for high flight speed missile applications. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This research effort was realigned from PE 0602303A (Missile Technology) / Project 214 (Missile Technology) in FY20 as part of the financial restructure.			
Accomplishments/Planned Programs Subtotals	-	-	1.245

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AF6 / *Structures Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*				Project (Number/Name) AF7 / *Warhead Integration Technology*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
AF7: *Warhead Integration Technology*	-	0.000	0.000	1.752	-	1.752	1.792	2.083	2.125	2.149	0.000	9.901

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602303A Missile Technology:
* Project 214 Missile Technology

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by investigating advanced warhead subsystem integration techniques for future missile systems.

Work in this Project complements PE 0603464/AE8 LBASM Advanced Technology; PE 0602147/AF1 LRMF Technology, and PE 0603464/AF2 LRMF Advanced Technology.

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Warhead Integration Technology	-	-	1.752
Description: Investigate advanced warhead subsystem integration techniques for future missile systems. ***FY 2020 Plans:*** Will complete development of a multi-role lethality for multi-role systems analysis tool to be used to predict probability of kill for multiple-purpose warhead configurations against cross-domain targets. Will investigate and design multi-effects warhead and fuze component technologies for very high speed missile terminal target engagement. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This research effort was realigned from PE 0602303A (Missile Technology) / Project 214 Missile Technology in FY20 as part of the financial restructure.			
Accomplishments/Planned Programs Subtotals	-	-	1.752

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AF7 / *Warhead Integration Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*				Project (Number/Name) AF8 / *Affordable Extended Range Precision Technology*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
AF8: *Affordable Extended Range Precision Technology*	-	0.000	0.000	0.300	-	0.300	0.294	1.562	1.985	1.441	0.000	5.582

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602303A Missile Technology:
*Project 214 Missile Technology

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by investigating the design and fabrication of components and subsystems critical to produce affordable extended range precision missiles as well as critical component technologies including: advanced propulsion, seekers/sensors, fire control, datalink, guidance, navigation and controls, and airframes.

Work in this Project complements PE 0603464/AE8 LBASM Advanced Technology; PE 0602147/AF1 LRMF Technology, and PE 0603464/AF2 LRMF Advanced Technology.

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Affordable Extended Range Precision Technology	-	-	0.300
Description: Investigate the design and fabrication of components and subsystems critical to produce affordable extended range precision missiles; Critical component technologies including: advanced propulsion, seekers/sensors, fire control, datalink, guidance, navigation and controls, and airframes. ***FY 2020 Plans:*** Will complete trade studies for affordable discriminate extended range precision missiles for long-range indirect fires capabilities. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This research effort was realigned from PE 0602303 (Missile Technology) / Project 214 (Missile Technology) in FY20 as part of the financial restructure.			
Accomplishments/Planned Programs Subtotals	-	-	0.300

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AF8 / *Affordable Extended Range Precision Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*	Project (Number/Name) AF9 / *Precision and Accuracy Technology*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
AF9: *Precision and Accuracy Technology*	-	0.000	0.000	8.576	-	8.576	8.746	8.921	9.100	13.607	0.000	48.950

Note

In Fiscal Year (FY) 2020 this Project is being realigned from:
Program Element (PE) 0602303A Missile Technology:
* Project 214 Missile Technology

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by investigating and developing advanced missile seekers, sensors, and software/algorithms to increase affordability and performance of missiles for precision at extended ranges. This Project also investigates and develops advanced technologies for effective guidance and navigation of precision missiles through unique navigation technologies and algorithms aimed at reducing size, weight, power and cost.

Work in this Project complements PE 0603464/AE8 LBASM Advanced Technology

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Precision and Accuracy Technology	-	-	8.576
Description: Investigate and develop advanced missile seekers, sensors, and software/algorithms to increase affordability and performance of missiles for precision at extended ranges. This effort investigates and develops advanced technologies for effective guidance and navigation of precision missiles through unique navigation technologies and algorithms aimed at reducing size, weight, power and cost.			
FY 2020 Plans: Will investigate and develop advanced radio frequency and infrared sensor; target acquisition, discrimination, and classification algorithms and processes; and guidance technologies that: reduce size, weight, and power; decrease processing time; lower cost; increase target acquisition range; and ensure accurate long range, high speed missile target engagement in a jammed and complex operating environment; Will investigate and develop advanced position, navigation, and timing technologies, including: improved performance inertial measurement technology with reduced size, weight, power, and cost; celestial navigation			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AF9 / *Precision and Accuracy Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
technology; and vision based technology that ensures accurate long range, high speed missile target engagement in jammed and complex operating environments. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This research effort was realigned from PE 0602303 (Missile Technology) / Project 214 (Missile Technology) in FY20 as part of the financial restrudcture.			
Accomplishments/Planned Programs Subtotals	-	-	8.576

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*				Project (Number/Name) AG1 / *Missile Electronics Technology*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
AG1: *Missile Electronics Technology*	-	0.000	0.000	3.148	-	3.148	3.217	3.281	3.347	3.384	0.000	16.377

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602303A Missile Technology:
* Project 214 Missile Technology

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by investigating and developing technologies and techniques to miniaturize guidance electronics for advanced missile systems.

Work in this Project complements PE 0602147 Long Range Precision Fires Technology and PE 0603464 Long Range Precision Fires Advanced Technology.

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Missile Electronics Technology	-	-	3.148
Description: Investigates and develops technologies and techniques to miniaturize guidance electronics for advanced missile			
FY 2020 Plans: Will investigate and develop advanced thermal management techniques; electronics wire bonding fabrication and assembly techniques; and battery chemistry optimization and high yield energy harvesting technologies for reduced size, weight, and power of multi-mode sensors for cross-domain target acquisition, discrimination and engagement.			
FY 2019 to FY 2020 Increase/Decrease Statement: This research effort was realigned from PE 0602303 (Missile Technology) / Project 214 (Missile Technology) in FY20 as part of the financial restructure.			
Accomplishments/Planned Programs Subtotals	-	-	3.148

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AG1 / *Missile Electronics Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*				Project (Number/Name) AG2 / *Information and Signal Processing Technology*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
AG2: *Information and Signal Processing Technology*	-	0.000	0.000	1.669	-	1.669	1.702	1.736	1.771	1.790	0.000	8.668

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602303 Missile Technology:
* Project 214 Missile Technology

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by investigating and developing image processing technologies and techniques for enhanced target acquisition and engagement and investigating improved secure, digital missile communication with ground and other systems.

Work in this Project complements PE 0602147 Long Range Precision Fires Technology and PE 0603464 Long Range Precision Fires Advanced Technology.

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Information and Signal Processing Technology	-	-	1.669
Description: This effort investigates and develops image processing technologies and techniques for enhanced target acquisition and engagement and investigates improved secure, digital missile communication with ground and other systems. ***FY 2020 Plans:*** Will continue to investigate and develop advanced algorithms and signal processing techniques for enhanced target acquisition and engagement in contested and complex anti-access / area-denial (A2/AD) environments. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This research effort was realigned from PE 0602303A (Missile Technology) / Project 214 Missile Technology.			
Accomplishments/Planned Programs Subtotals	-	-	1.669

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AG2 / *Information and Signal Processing Technology*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*				Project (Number/Name) AG4 / *Extended Range Artillery Munition Suite Technology*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
AG4: *Extended Range Artillery Munition Suite Technology*	-	0.000	0.000	7.092	-	7.092	6.654	5.237	5.341	5.401	0.000	29.725

Note

In Fiscal Year (FY) 2020 this Project was r5ealigned from:
Program Element (PE) 0602624 Weapons and Munitions Technology
* Project H18 Weapons and Munitions Technologies

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by investigating critical enabling component technologies and designing high precision terminal guidance in denied environments, capable of surviving high gun shock loads, at extended ranges.

Work in this Project complements PE 0603464/AG5 Extended Range Artillery Munition Suite Advanced Technology.

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Precision At Range Technologies	-	-	3.092
Description: Investigates technologies that provide affordable precision capabilities for projectiles fired into Global Positioning System (GPS) denied environments. ***FY 2020 Plans:*** Will assess component level enabling technologies for passive seekers to include IR focal plane arrays and associated optics capable of surviving gun shock loading and perform as required. In addition to the terminal seeker hardware development activities, target detection algorithm as well performance modeling of such algorithms will be conducted in support of the terminal seeker development for Extended Range Artillery Projectiles (e.g. XM1155). ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was previously funded in PE 0602624 (Weapons and Munitions Technology) / Project H18 (Weapons and Munitions Technologies) in FY20 as part of the financial restructure.			
Title: Extended Range Artillery Munition Suite Enabling Technologies	-	-	4.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AG4 / *Extended Range Artillery Munition Suite Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Description: This effort develops, matures and integrates a gun hardened suite of components (software, sensors, navigation and communications) to enable the application of distributed, cooperative and collaborative tactics for munitions and Radio Frequency (RF) seeking components. ***FY 2020 Plans:*** Will design and develop component technologies for extended range artillery projectiles (e.g. XM1155) in the areas of increased range, sensor optimization, improved algorithms and refined guidance and navigation system design concepts. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was previously funded in PE 0602624 (Weapons and Munitions Technology) / Project H18 (Weapons and Munitions Technologies) in FY20 as part of the financial restructure.			
Accomplishments/Planned Programs Subtotals	-	-	7.092

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*				Project (Number/Name) AG6 / *Energetic Materials and Advanced Processing Techno*			
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**
AG6: *Energetic Materials and Advanced Processing Techno*	-	0.000	0.000	6.885	-	6.885	6.955	7.117	7.259	7.340	0.000	35.556

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602624 Weapons and Munitions Technology:
* Project H18 Weapons and Munitions Technologies
* Project H28 Warheads/Energetics Technologies

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by investigating critical component technology of propellants and energetic materials to increase the range of artillery and mortar rocket assisted projectiles.

Work in this Project complements PE 0603464/AG5 Extended Range Artillery Munition Suite Advanced Technology.

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Novel Propulsion	-	-	3.452
Description: This effort explores propellant technologies such as powder co-extrusion and grain coatings, while retaining insensitive properties, for employment in gun launch environments as well as directional thrusters including those that deliver a broad spectrum of effects. It also conducts experiments with these propellants to increase the range of artillery and mortar rocket assisted projectiles.			
FY 2020 Plans: Will continue design and development of material synthesis and formulation to support development of encapsulated propellant; will investigate novel burn rate modifiers and enhancers in conjunction with high-energy propellant formulations; fund research to advance maturity of detonation based gun propulsion; conduct experiments and further development on configuration and			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AG6 / *Energetic Materials and Advanced Processing Techno*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
formulation of electrically controlled energetic materials (ECEM); fund research of next generation post launch propulsion on gun launched concepts for extended range. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was realigned from PE 0602624A (Weapons and Munitions Technology) / Project H18 (Weapons and Munitions Technologies) and Project H28 (Warheads/Energetics Technologies) in FY20 as part of the financial restructure.			
Title: Scale-up of Insensitive Energetic Materials ***Description:*** Conduct research to advance the maturity of disruptive energetic materials. ***FY 2020 Plans:*** Will develop modeling and simulation tools required for advanced energetic materials; will investigate the synthesis and fabrication of energetic materials that are applicable to a wide range of additive manufacturing processing technologies; design and develop new processing methods for of novel energetic materials in unique geometries; fund research to investigate embedded ignition for additively manufactured gun propulsion charges. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort was realigned from PE 0602624A (Weapons and Munitions Technology) / Project H18 (Weapons and Munitions Technologies) and Project H28 (Warheads/Energetics Technologies) in FY20 as part of the financial restructure.	-	-	3.433
Accomplishments/Planned Programs Subtotals	-	-	6.885

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*				Project (Number/Name) AG8 / *Advanced Energetics Technology*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
AG8: *Advanced Energetics Technology*	-	0.000	0.000	10.523	-	10.523	11.407	14.725	15.019	15.186	0.000	66.860

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602624 Weapons and Munitions Technology:
* Project H28 Warheads/Energetics Technology

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by investigating critical component technology of materials and novel processing techniques for future explosives and propulsion applications that enable an increase in range, lethality, and utility of ammunitions.

Work in this Project complements PE 0602147/AG6 Energetic Materials and Advanced Processing Technology; PE 0603464/AG7 Energetic Materials and Advanced Processing Advanced Technology.

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Advanced Energetics	-	-	10.523
Description: This effort develops advanced energetic materials and novel processing techniques for future explosives and propulsion applications that enable an increase in range, lethality, and utility of ammunitions.			
FY 2020 Plans: Will mature technologies focused in nano-energetics designs for use in melt-cast formulations; will mature the polymer kinetics for amorphous energetics; will investigate next-generation melt-cast and cast-cure ingredients for higher energy formulations; investigate reaction kinetics for ingredient synthesis applicable to advanced flow reactors; investigate energetic materials applicable for novel energy release mechanisms; design and develop processing parameters necessary to produce energetic materials for additive manufacturing; develop novel modeling and simulation tools required to accurately predict energetic materials performance in novel and unique geometries.			
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 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AG8 / *Advanced Energetics Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
This research effort was realigned from PE 0602624A (Weapons and Munitions Technology) / Project H28 Warheads/Energetics Technology in FY20 as part of the financial restructure.			
Accomplishments/Planned Programs Subtotals	-	-	10.523

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*	Project (Number/Name) AG9 / *Multiple Simul Engagement Technologies (MSET) 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
AG9: *Multiple Simul Engagement Technologies (MSET) Tech*	-	0.000	0.000	2.150	-	2.150	3.200	6.626	5.742	3.710	0.000	21.428

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602303 Missile Technology
* Project 214 Missile Technology

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by investigating critical component technology and designs for future missiles that provide simultaneous multiple launch, control, and supervised autonomous terminal engagement of multiple missiles against stationary and moving hard/soft targets, image-based target discrimination/shared SA/lock-on, and multi-missile control digital datalink with inter-missile cooperative networked communications.

Work in this Project complements PE 0603464/AF4 MSET Advanced Technology.

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Multiple Simultaneous Engagement Technologies (MSET) Technology	-	-	2.150
Description: Investigate critical component technology and designs for future missiles that provide simultaneous multiple launch, control, and supervised autonomous terminal engagement of multiple missiles against stationary and moving hard/soft targets, image-based target discrimination/shared situation awareness/lock-on, and multi-missile control digital datalink with inter-missile cooperative networked communications.			
FY 2020 Plans: Will develop missile MSET system architecture and user-validated concept of operations, and conduct technology and component trade studies.			
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 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AG9 / *Multiple Simul Engagement Technologies (MSET) Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
This research effort was realigned in FY20 from PE 0602303A Missile Technology / Project 214 (Missile Technology) in FY20 as part of the financial restructure.			
Accomplishments/Planned Programs Subtotals	-	-	2.150

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*	Project (Number/Name) AH2 / *Single Multi-mission Attack Missile (SMAM) Technol*	

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
AH2: *Single Multi-mission Attack Missile (SMAM) Technol*	-	0.000	0.000	1.317	-	1.317	0.000	0.000	0.000	0.000	0.000	1.317

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602303A Missile Technology
* Project 214 Missile Technology

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by investigating critical component technology and designs for future missiles that provide expeditionary, scalable, precision strike and loiter capability to rapidly defeat hard targets and swarming or disbursed threats; Provides the missile technology path to supervised autonomous target detection and cooperative engagement/manned-unmanned teaming for offensive, multiple simultaneous engagement capabilities.

Work in this Project complements PE 0603464/AH3 SMAM Advanced Technology and PE 0603464/AH1 Multiple Simultaneous Engagement Technologies (MSET) Advanced Technology.

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Single Multi-mission Attack Missile (SMAM) Technology	-	-	1.317
Description: This effort investigates critical component technology and designs for future missiles that provide expeditionary, scalable, precision strike and loiter capability to rapidly defeat hard targets and swarming or disbursed threats; Provides the missile technology path to supervised autonomous target detection and cooperative engagement/manned-unmanned teaming for offensive, multiple simultaneous engagement capabilities.			
FY 2020 Plans: Will complete development and lab validation of radio module for extended range digital datalink with anti-jam capability to enable operation in contested environments.			
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 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AH2 / *Single Multi-mission Attack Missile (SMAM) Technol*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
This research effort was realigned from PE 0602303A (Missile Technology) / Project 214 (Missile Technology) in FY20 as part of the financial restructure.			
Accomplishments/Planned Programs Subtotals	-	-	1.317

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*				Project (Number/Name) AH4 / *Precision and Coop Weapons in a Denied Env 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**
AH4: *Precision and Coop Weapons in a Denied Env Tech*	-	0.000	0.000	9.505	-	9.505	9.638	9.831	10.051	10.163	0.000	49.188

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 062618A Ballistics Technology:
* Project H80 Survivability and Lethality Technology

A. Mission Description and Budget Item Justification

This Project demonstrates technologies and understanding to deliver accurate fires from extended ranges in denied environments. Work in this PE researches technologies for navigation of munitions without Global Positioning System (GPS) and flying munitions to much greater distances against advanced threat Area Denial Assets by delivering navigation technology for multiple munitions with complementary sensors and maneuverability technology for munitions with enhanced lift and control characteristics.

Work in this Project transitions foundational understating obtained in PE 0601102A/Project AA7 Mechanics and Ballistics and complements PE 0602141A Project AH5 Projectile and Multi-Function Warhead Technologies, Project AH6 Disruptive Energetics and Propulsion Technologies, Project AH7 Lethal and Scalable Effects Technologies, and Project AH8 Lethality Materials and Processes Technology.

The cited work transitions products for future close- and deep-range Long Range Precision Fires capabilities (e.g., Extended Range Cannon Artillery, Precision Strike Missile) and 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 Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Munition Navigation Technology in Contested Environments	-	-	5.000
Description: This effort investigates, designs, and transitions technologies to improve navigation (e.g., better accuracy, more information/aim-point refinement, reduce GPS dependency) of munitions subject to denied environments (e.g., electro-magnetic spectrum contested, counter-measures). Key technologies include algorithms for image processing, state estimation, and communications, embedded processing and electronics, and sensors (e.g., inertial, imagers with optics, software-defined radios and antennae).			
FY 2020 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AH4 / *Precision and Coop Weapons in a Denied Env Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Will demonstrate technologies for improved navigation in gun firings with open-loop maneuvers; will develop data-driven and model-based image processing, state estimation, and communications algorithms in simulation and verify implementation in common software/hardware-in-the-loop environment; Design guidance electronics with apertures, characterize static and dynamic performance, and validate mechanical/thermal survivability in lab. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This research effort was realigned from PE 062618A (Ballistics Technology) / Project H80 Survivability and Lethality Technologies in FY20 as part of the financial restructure.			
Title: Munition Maneuvering Technology in Extreme Environments ***Description:*** This effort investigates and designs technologies to improve maneuverability (e.g., extended range glide, intercept moving target, course- correct to imperfectly located target, perform evasive terminal maneuver to increase survivability) of munitions subject to extreme environments (set- back, set-forward, and balloting loads encountered during gun launch and thermal loads encountered during high speed/long time flights). These technologies include the maneuvering airframe, control actuation, and flight control algorithms. ***FY 2020 Plans:*** Will demonstrate technologies for increased range/lateral acceleration in gun firings with open-loop maneuvers; will perform un/coupled fluid dynamics, heat transfer, structural dynamics, flight dynamics and control computations validated by spark range and onboard sensor flights; Develop flight control algorithms for automating flight conditions and configurations and assess flight performance in simulation; Design control actuation, characterize static and dynamic performance, and validate mechanical/thermal survivability in lab and verify flight control and control actuation implementation in common software/hardware-in-the-loop environment. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This research effort was realigned from PE 062618A (Ballistics Technology) / Project H80 Survivability and Lethality Technologies in FY20 as part of the financial restructure.	-	-	4.505
Accomplishments/Planned Programs Subtotals	-	-	9.505

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** AH4 / *Precision and Coop Weapons in a Denied Env Tech*

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602147A / *Long Range Precision Fires Technology*				Project (Number/Name) BN5 / *Fuze and Power for Munitions*			
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**
BN5: *Fuze and Power for Munitions*	-	0.000	0.000	1.000	-	1.000	1.066	2.617	2.669	2.698	0.000	10.050

Note

In Fiscal Year (FY) 2020 this Project was realigned from:
Program Element (PE) 0602624A Weapons and Munition Technology:
* Project H18 Weapons and Munitions Technologies

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by investigating critical component technologies and designs capable to enable advanced lethality and scalable warheads for future munitions as well as exploring new power technologies for extended runtime and extended range munitions.

The cited work is consistent with the Assistant 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 Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Advanced Energetics	-	-	1.000
Description: This effort develops advanced fuze and power technologies for future munition applications that enable an increase in range and lethality, of ammunitions. ***FY 2020 Plans:*** Will advance the capability of state of the art in fuze proximity sensors to track targets in order to improve burst point accuracy and countermeasure robustness; will maximize usage of all real time battlefield targeting data and integrate with fuze setters, fuze sensors, power sources, component protective technologies and unique fuze ignition schemes to design and develop extremely reliable and versatile fuzes; will investigate these new fuze designs to support hypersonics, autonomous fuzing for varied targets including Unmanned Aerial Systems. These technologies will continue to leverage the OSD Joint Munitions Program TCG - 5 and TCG-10 and the OSD Joint Fuze Technology Program. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This research effort was realigned from PE 0602624A (Weapons and Munition Technology) / Project H18 (Weapons and Munitions Technologies) in FY20 as part of the financial restructuring.			
Accomplishments/Planned Programs Subtotals	-	-	1.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602147A / *Long Range Precision Fires Technology*	**Project (Number/Name)** BN5 / *Fuze and Power for Munitions*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A