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Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army **Date:** March 2023

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
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COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
Total Program Element	-	107.454	128.529	34.683	-	34.683	30.525	38.190	46.582	47.127	0.000	433.090
AE7: Land-Based Anti-Ship Missile (LBASM) Technology	-	13.540	-	-	-	-	-	-	-	-	0.000	13.540
AF1: Long Range Maneuverable Fires (LRMF) Technology	-	20.865	2.595	-	-	-	-	-	-	-	0.000	23.460
AF3: Extended Range Propulsion Technology	-	9.526	8.834	11.201	-	11.201	-	4.162	14.403	14.560	0.000	62.686
AF8: Affordable Extended Range Precision Technology	-	8.367	9.609	9.929	-	9.929	9.133	9.151	9.169	9.274	0.000	64.632
AG4: Extended Range Artillery Munition Suite Technology	-	10.744	6.434	1.310	-	1.310	9.341	12.968	11.303	11.459	0.000	63.559
AG6: Energetic Materials and Advanced Processing Techno	-	3.341	3.664	-	-	-	-	-	-	-	0.000	7.005
AH4: Precision and Coop Weapons in a Denied Env Tech	-	9.083	9.163	8.950	-	8.950	9.241	9.096	8.892	8.988	0.000	63.413
BN5: Fuze and Power for Munitions	-	2.488	2.730	3.293	-	3.293	2.810	2.813	2.815	2.846	0.000	19.795
BO9: WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE (CA)	-	29.500	85.500	-	-	-	-	-	-	-	0.000	115.000

A. Mission Description and Budget Item Justification

This Program Element (PE) is directly aligned to the Army Long Range Precision Fires (LRPF) Modernization Priority. Work in this PE investigates and develops 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 covering Strategic, Operational and Tactical Fires Lines of Effort. 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.

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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 2: Applied Research</i>	R-1 Program Element (Number/Name) PE 0602147A / <i>Long Range Precision Fires Technology</i>
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Research in this PE complements PE 0603464A (Long Range Precision Fires Advanced Technology).

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

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

B. Program Change Summary (\$ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	93.785	43.029	39.089	-	39.089
Current President's Budget	107.454	128.529	34.683	-	34.683
Total Adjustments	13.669	85.500	-4.406	-	-4.406
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	85.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	13.669	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-4.406	-	-4.406

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: BO9: *WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE (CA)*

Congressional Add: *Program Increase - Extended Range Hybrid and Precision Gun Launched Projectiles*

Congressional Add: *Program Increase - Novel Printed Armament Components*

Congressional Add: *Extended Range Propulsion Technology*

Congressional Add: *High Speed Structures for Advanced Materials*

Congressional Add: *Program Increase - ADVANCED GRAPHITIC FOAM FOR LONG-RANGE PRECISION FIRES*

Congressional Add: *Program Increase - ALUMINUM LITHIUM ALLOY SOLID ROCKET ADVANCEMENT*

Congressional Add: *Program Increase - EXTENDED RANGE AND HYBRID GUN LAUNCHED UNMANNED AERIAL SYSTEMS*

Congressional Add: *Program Increase - HIGH SPEED MISSILE MATERIALS*

Congressional Add: *Program Increase - HIGH TEMPERATURE SUPER ALLOYS*

Congressional Add: *Program Increase - LOW COST MISSILE TECHNOLOGY DEVELOPMENT*

Congressional Add: *Program Increase - REACTIVE MATERIALS*

	FY 2022	FY 2023
	10.000	-
	3.000	-
	6.500	-
	10.000	-
	-	15.000
	-	15.000
	-	15.000
	-	10.000
	-	5.000
	-	10.000
	-	10.500

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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 2: Applied Research</i>	R-1 Program Element (Number/Name) PE 0602147A / <i>Long Range Precision Fires Technology</i>
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Congressional Add Details (\$ in Millions, and Includes General Reductions)

Congressional Add: *Program Increase - THERMODYNAMIC LATENT PROPULSION*

Congressional Add Subtotals for Project: BO9

Congressional Add Totals for all Projects

	FY 2022	FY 2023
	-	5.000
	29.500	85.500
	29.500	85.500

Change Summary Explanation

Funding decrease result of efforts transitioning from Budget Activity 2.

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army	Date: March 2023
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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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
<i>AE7: Land-Based Anti-Ship Missile (LBASM) Technology</i>	-	13.540	-	-	-	-	-	-	-	-	0.000	13.540

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, and developing technologies for Precision Strike Missile (PrSM) modular payloads for the delivery of dedicated Army intelligence, surveillance and reconnaissance (ISR) payloads and attack capabilities via long range missiles.

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

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

Research in this Project is performed by the United States (US) Army Futures Command (AFC).

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

	FY 2022	FY 2023	FY 2024
Title: Precision Strike Missile Modular Payload Technology	13.540	-	-
Description: Investigate and develop critical technologies for the delivery of dedicated Army ISR payloads and attack capabilities via long range missiles. Technology examples include: ISR sensor and associated signal processing technologies for target acquisition, identification, and engagement; datalink and communications technologies to transmit targetable data; compact propulsion technologies to enable loiter time on station; and payload dispensing technologies for deploying these payloads from high speed long range missiles.			
Accomplishments/Planned Programs Subtotals	13.540	-	-

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army **Date:** March 2023

Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602147A / Long Range Precision Fires Technology	Project (Number/Name) AF1 / Long Range Maneuverable Fires (LRMF) Technology
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COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AF1: Long Range Maneuverable Fires (LRMF) Technology	-	20.865	2.595	-	-	-	-	-	-	-	0.000	23.460

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires Modernization Priority capabilities by developing next generation Multi-Domain Operations extended range weapon system technology for Precision Strike Missile to increase survivability, penetration, and range in anti-access/area-denial (A2/AD) and denied environments.

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

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

Research in this Project is performed by the United States (US) Army Futures Command (AFC).

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

	FY 2022	FY 2023	FY 2024
Title: Long Range Maneuverable Fires (LRMF) Technology	20.865	2.595	-
Description: Investigates and develops critical technologies for next generation Multi-Domain Operations extended range weapon system technology for Precision Strike Missile to increase survivability, penetration, and range in complex A2/AD and denied environments.			
FY 2023 Plans: Design and develop critical combined cycle propulsion technologies for integration into the Precision Strike Missile (PrSM) and assess autonomy technologies for unmanned launcher operation.			
FY 2023 to FY 2024 Increase/Decrease Statement: Funding realigned to PE 0603464A (Long Range Precision Fires Advanced Technology) / AF2 (Long Range Maneuverable Fires (LRMF) Advanced Tech).			
Accomplishments/Planned Programs Subtotals	20.865	2.595	-

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602147A / <i>Long Range Precision Fires Technology</i>	Project (Number/Name) AF1 / <i>Long Range Maneuverable Fires (LRMF) Technology</i>

D. Acquisition Strategy
N/A

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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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AF3: Extended Range Propulsion Technology	-	9.526	8.834	11.201	-	11.201	-	4.162	14.403	14.560	0.000	62.686

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.

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

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

Research in this Project is performed by the United States (US) Army Futures Command (AFC).

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

	FY 2022	FY 2023	FY 2024
Title: Extended Range Propulsion Technology	9.526	8.667	11.201
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 2023 Plans: Complete flight weight combined cycle air-breathing propulsion subsystem design and begin fabrication and integration for follow-on experiments and assessments. Expand and validate a propulsion modeling toolkit that allows rapid motor development; continue developing new mixing techniques to produce higher performance propellants; determine optimized parameters for advanced, high energy propellants that will improve long range performance capability.			
FY 2024 Plans: Will conduct a flight weight air-breathing propulsion system experiment to validate and advance the component design; conduct a static test to determine capability of new mixing techniques to produce higher performance and minimized smoke propellants; determine feasibility and applicability of air-breathing pressure-gain combustion technology; continue to conduct experiments			

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023		
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 2022	FY 2023	FY 2024
to establish understanding of solid thermodynamic latent propulsion technology for potential to enable throttling of solid rocket propellants, enhancing system capabilities and survivability. FY 2023 to FY 2024 Increase/Decrease Statement: Funding increase reflects planned additional experiments to advance technology readiness level of air-breathing motor technology.				
Title: SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC §638 FY 2023 Plans: Funding transferred in accordance with Title 15 USC §638 FY 2023 to FY 2024 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC §638		-	0.167	-
Accomplishments/Planned Programs Subtotals		9.526	8.834	11.201
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army **Date:** March 2023

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
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COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AF8: Affordable Extended Range Precision Technology	-	8.367	9.609	9.929	-	9.929	9.133	9.151	9.169	9.274	0.000	64.632

A. Mission Description and Budget Item Justification

This Project directly supports Long Range Precision Fires (LRPF) 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, airframes, and additional high payoff areas.

Research in this Project complements Program element (PE) 0603464A (Long Range Precision Fires Advanced Technology) / AE8 (Land-Based Anti-Ship Missile (LBASM) Advanced Tech); PE 0602147A (Long Range Precision Fires Technology) / AF1 (Long Range Maneuverable Fires (LRMF) Technology) and PE 0603464A (Long Range Precision Fires Advanced Technology) / AF2 (Long Range Maneuverable Fires (LRMF) Advanced Tech)

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2022	FY 2023	FY 2024
Title: LRPF High Payoff Missile Technology	8.367	9.385	9.929
Description: Identify and explore potential breakthrough technologies to mitigate or eliminate warfighter gaps in Long Range Precision Fires to gain overmatch against potential peer and near-peer adversaries.			
FY 2023 Plans: Develop and conduct assessments of improved target state estimation techniques for strategic hypersonic missiles to enhance endgame performance; verify analysis tools that provide insight into high temperature structural composites; compare alternative navigation technology and guidance options to allow operation in GPS denied environments; integrate and verify improved navigation components for higher inertial accuracy for long range fires; finalize compact thermal management solutions to optimize board level sensor-on-a-chip operation for integrated application; investigate active enhanced image stabilization for improved sensor accuracy in high vibration environments.			
FY 2024 Plans: Will complete assessments and validation of improved target state estimation techniques for strategic hypersonic missiles to enhance endgame performance; conduct experiments to validate analysis tools for high temperature structural composites; investigate reachback datalinks to support employment of on-board missile sensors for deep fires targeting; research missile			

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023		
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		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2022	FY 2023	FY 2024
battery size, weight, power, and cost upgrades over existing off the shelf components; develop alternative navigation technology and guidance algorithms to allow operation in GPS denied environments. FY 2023 to FY 2024 Increase/Decrease Statement: Funding increase reflects lifecycle plan for this effort.				
Title: SBIR/STTR Transfer Description: Funding transferred in accordance with Title 15 USC §638 FY 2023 Plans: Funding transferred in accordance with Title 15 USC §638 FY 2023 to FY 2024 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC §638		-	0.224	-
Accomplishments/Planned Programs Subtotals		8.367	9.609	9.929
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army										Date: March 2023		
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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AG4: <i>Extended Range Artillery Munition Suite Technology</i>	-	10.744	6.434	1.310	-	1.310	9.341	12.968	11.303	11.459	0.000	63.559

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, and automated cannon artillery technologies to increase operational tempo and unburden the soldier.

Research in this Project complements Program Element (PE) 0603464A Long Range Precision Fires Advanced Technology / AG5 (Extended Range Artillery Munition Suite Adv Tech).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2022	FY 2023	FY 2024
Title: Precision At Range Technologies	3.087	-	-
Description: Investigates technologies that provide affordable precision capabilities for projectiles fired into Global Positioning System (GPS) denied environments.			
Title: Extended Range Artillery Munition Suite Enabling Technologies	1.935	2.133	-
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 2023 Plans: Validate component technologies for extended range artillery projectiles using refined guidance and navigation system design concepts; mature component level technologies to validate size, weight, and power allocations required for future munition systems; validate solutions to enable in-flight, intra-munition communications, enhancing performance against targets in highly cluttered environments.			
FY 2023 to FY 2024 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023		
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 2022	FY 2023	FY 2024
Efforts in support of 6.2 activities are complete in FY23.				
Title: Optionally Manned Artillery Platform Technology		2.786	-	-
Description: This effort designs and develops cannon artillery automation technologies including automated fuze/fuze setting technologies, automated prognostics/diagnostics, automated and rapid rearm technologies, and automated ammunition inventory to increase operational tempo of current and future cannon artillery systems to unburden the soldier				
Title: Large Caliber Cannon Technologies		2.936	3.198	-
Description: This effort will advance the current state of the art in cannon and barrel technology for compatibility with higher velocity and precision munitions, harder rotating bands, high temperature operation, robustness against non-firing loads, and minimized weight and imbalance. This effort will investigate cannon concepts focused on residual stress & dynamic strain reduction, coating metallurgy, and barrel cooling to increase tube life and performance in high demand environments.				
FY 2023 Plans: Continue to investigate and develop technologies to improve the life and performance of large caliber cannons. Conduct experiments on novel materials using modeling and simulation to include: impacts on dynamic strain; residual stress through tri-axial stress/strain measurements of cannon tubes; novel refractory coating technologies; and barrel cooling techniques to reduce temperature at high rates of fire. Modeling and experiments will be conducted to mature component technologies for future armament systems.				
FY 2023 to FY 2024 Increase/Decrease Statement: Funding reflects planned life cycle for this effort as all the modeling and experiments on the component technologies will be completed in FY23.				
Title: Precision Munitions Technology		-	1.103	1.310
Description: This effort develops technology enablers which are critical to increasing precision and effectiveness for large caliber armaments at extended ranges in extreme launch and flight environments. These technology enhancements are required for sustaining and increasing mission capabilities in degraded and contested environments.				
FY 2023 Plans: Design munition precision technology enablers including: RF converged seeker technologies, gun hardened inertial navigation systems, and on-board targeting algorithms. Investigate small form factor gun hardened systems to evaluate performance against				

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Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602147A / <i>Long Range Precision Fires Technology</i>	Project (Number/Name) AG4 / <i>Extended Range Artillery Munition Suite Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2022	FY 2023	FY 2024
<p>aerial and ground targets. Validate modeling and simulation results of Integrated Aerial Defense System (IADS) penetration by precision artillery munitions.</p> <p>FY 2024 Plans: Will develop munition technology enablers which will increase precision and effectiveness for large caliber armaments at extended ranges. These technologies will include: RF converged and multimodal seeker technologies, gun hardened inertial navigation systems, on-board targeting algorithms, and munition self-protection capabilities. Will design small form factor gun hardened components to investigate the performance against aerial and ground targets. Will validate prior modeling and simulation results of Integrated Aerial Defense Systems penetration of precision artillery munitions.</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.</p>				
Accomplishments/Planned Programs Subtotals		10.744	6.434	1.310
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

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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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AG6: Energetic Materials and Advanced Processing Techno	-	3.341	3.664	-	-	-	-	-	-	-	0.000	7.005

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.

Research in this Project complements (Program Element) PE 0602141A (Lethality Technology) / AH9 (Advanced Warheads Technology) and PE 0603464A (Long Range Precision Fires Advanced Technology) / AG5 (Extended Range Artillery Munition Suite Adv Tech).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2022	FY 2023	FY 2024
Title: Scale-up of Insensitive Energetic Materials	3.341	3.664	-
Description: Conduct research to advance the maturity of disruptive energetic materials.			
FY 2023 Plans: Validate the synthesis and fabrication of energetic materials applicable to a wide range of additive manufacturing technologies; conduct experiments of additive energetic components and novel energetic materials initiated with additive energetic component materials to reduce sensitivity; design energetic processing technologies for advanced energetic materials.			
FY 2023 to FY 2024 Increase/Decrease Statement: Funding decrease reflects planned lifecycle conclusion of this effort			
Accomplishments/Planned Programs Subtotals	3.341	3.664	-

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

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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
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COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
AH4: Precision and Coop Weapons in a Denied Env Tech	-	9.083	9.163	8.950	-	8.950	9.241	9.096	8.892	8.988	0.000	63.413

A. Mission Description and Budget Item Justification

This Project investigates technologies to deliver accurate fires from extended ranges in denied environments and informs future close- and deep-range Long Range Precision Fires capabilities (e.g., Extended Range Cannon Artillery, Precision Strike Missile).

Research in this Program Element (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.

Research in this Project transitions foundational research obtained in PE 0601102A (Defense Research Sciences) / AA7 (Mechanics and Ballistics) and complements PE 0602141A (Lethality Technology) / Project AH6 (Disruptive Energetics and Propulsion Technologies), Project AH7 (Lethal and Scalable Effects Technologies), and Project AH8 (Lethality Materials and Processes Technology).

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2022	FY 2023	FY 2024
<p>Title: Munition Navigation Technology in Contested Environments</p> <p>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).</p>	4.817	-	-
<p>Title: Munition Maneuvering Technology in Extreme Environments</p> <p>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</p>	4.266	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023		
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 2022	FY 2023	FY 2024
loads encountered during high speed/long time flights). These technologies include the maneuvering airframe, control actuation, and flight control algorithms.				
<p>Title: Foundational Weapons Flight and Guidance Technology in Extreme Environments</p> <p>Description: This effort investigates, designs, and develops technologies to improve guidance (e.g., better accuracy, more information/aim-point refinement, reduce GPS dependency) and flight (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 (e.g., set-back, set-forward and balloting load, electro-magnetic spectrum contested, counter-measures). Key navigation technologies include algorithms for image processing, state estimation, communications, embedded processing and electronics, and sensors (e.g., inertial, imagers with optics, software-defined radios and antennae). Key maneuvering technologies include the airframe, control actuation, and flight control algorithms.</p> <p>FY 2023 Plans: Validate mid-course navigation technologies (image and radio frequency based); mature terminal guidance algorithms using simulation and experimental data capture; conduct experiments on collaborative engagements to include multiple unmanned aerial systems equipped with imagers, software-defined radios, inertial measurement units, and embedded processors for validation of unanchored multi-agent localization (UMAL), UMAL-Aided anchored localization, formation control, multi-agent tracking, and weapon-target assignment; conduct experiments to better understand and characterize complex control vehicle flight response, validate spiral technologies for long-range precision fires airframe design concepts and flight control algorithms; conduct analysis of unique ballistic launch and flight system simulations; design munition guidance algorithms and required system characteristics to improve terminal survivability against integrated air defense system targets.</p> <p>FY 2024 Plans: Will investigate novel flight control algorithms and vehicle control mechanisms to improve stability and maneuverability while surviving high-G cannon launch, high thermal load in flight, and defenses from integrated air defense systems; recommend design paths for high-lift, low-drag munition configurations for future Army cannon and missile fires; define limitations of algorithms for image-based mid-course navigation of Army munitions in Global Positioning System (GPS)-denied environments; formulate algorithms for delivering collaborative weapons in contested environments using multi-agent simulation and surrogate unmanned aerial system experiments; develop Army launch and flight platform and improved instrumentation for laboratory firing range facilities; confirm maturity of select weapon flight and guidance technologies in extreme Army environments of high mechanical and thermal loading, terminal survivability, and contested electro-magnetic spectrum; improve understanding of complex weapon flight and guidance problems through advancing combined experimental-modeling capabilities.</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement:</p>		-	9.124	8.950

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023		
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 2022	FY 2023	FY 2024
Funding decrease supports planned lifecycle of this effort.				
Title: SBIR/STTR Transfer		-	0.039	-
Description: Funding transferred in accordance with Title 15 USC §638				
FY 2023 Plans: Funding transferred in accordance with Title 15 USC §638				
FY 2023 to FY 2024 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC §638				
Accomplishments/Planned Programs Subtotals		9.083	9.163	8.950
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army **Date:** March 2023

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
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COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BN5: Fuze and Power for Munitions	-	2.488	2.730	3.293	-	3.293	2.810	2.813	2.815	2.846	0.000	19.795

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 run time and extended range munitions.

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

Research in this Project is performed by the United States Army Futures Command (AFC).

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

	FY 2022	FY 2023	FY 2024
Title: Advanced Energetics	2.488	2.730	3.293
Description: This effort develops advanced fuze and power technologies for future munition applications that enable an increase in range and lethality, of ammunitions.			
FY 2023 Plans: Investigate hardened electronic and energetic interface concepts for future initiation systems; wireless communications designs for global positioning system (GPS) synchronization and secure data transfer; design novel thermal batteries for increased range munition applications; validate captive flight testing for tracking proximity sensor algorithm development.			
FY 2024 Plans: Will design fuze and power component technology supporting electronic countermeasure evaluations for proximity. Will develop wireless synchronization between GPS components. Will conduct experiments on advanced initiation scheme for lethality concepts. Will develop advanced thermal batteries for future munitions.			
FY 2023 to FY 2024 Increase/Decrease Statement: Funding change reflects planned lifecycle of this effort.			
Accomplishments/Planned Programs Subtotals	2.488	2.730	3.293

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602147A / <i>Long Range Precision Fires Technology</i>	Project (Number/Name) BN5 / <i>Fuze and Power for Munitions</i>

D. Acquisition Strategy

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army										Date: March 2023		
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602147A / Long Range Precision Fires Technology				Project (Number/Name) BO9 / WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE (CA)			
COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
BO9: WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE (CA)	-	29.500	85.500	-	-	-	-	-	-	-	0.000	115.000

Note
Congressional Interest Item funding provided for Weapons and Munitions Tech Program Initiative.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Weapons and Munitions Tech Program Initiative.

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

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

	FY 2022	FY 2023
Congressional Add: Program Increase - Extended Range Hybrid and Precision Gun Launched Projectiles	10.000	-
FY 2022 Accomplishments: Congressional Interest Item funding provided for Extended Range and Hybrid Gun Launched Unmanned Aerial System		
Congressional Add: Program Increase - Novel Printed Armament Components	3.000	-
FY 2022 Accomplishments: Congressional Interest Item funding provided for Novel Printed Armament Components		
Congressional Add: Extended Range Propulsion Technology	6.500	-
FY 2022 Accomplishments: Congressional Interest Item funding provided for Extended Range Propulsion Technology		
Congressional Add: High Speed Structures for Advanced Materials	10.000	-
FY 2022 Accomplishments: Congressional Interest Item funding provided for High Speed Structures for Advanced Materials		
Congressional Add: Program Increase - ADVANCED GRAPHITIC FOAM FOR LONG-RANGE PRECISION FIRES	-	15.000

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Army	Date: March 2023
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Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602147A / Long Range Precision Fires Technology	Project (Number/Name) BO9 / WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE (CA)
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2022	FY 2023
FY 2023 Plans: Congressional Interest Item funding provided for ADVANCED GRAPHITIC FOAM FOR LONG-RANGE PRECISION FIRES		
Congressional Add: Program Increase - ALUMINUM LITHIUM ALLOY SOLID ROCKET ADVANCEMENT FY 2023 Plans: Congressional Interest Item funding provided for ALUMINUM LITHIUM ALLOY SOLID ROCKET ADVANCEMENT	-	15.000
Congressional Add: Program Increase - EXTENDED RANGE AND HYBRID GUN LAUNCHED UNMANNED AERIAL SYSTEMS FY 2023 Plans: Congressional Interest Item funding provided for EXTENDED RANGE AND HYBRID GUN LAUNCHED UNMANNED AERIAL SYSTEMS	-	15.000
Congressional Add: Program Increase - HIGH SPEED MISSILE MATERIALS FY 2023 Plans: Congressional Interest Item funding provided for HIGH SPEED MISSILE MATERIALS	-	10.000
Congressional Add: Program Increase - HIGH TEMPERATURE SUPER ALLOYS FY 2023 Plans: Congressional Interest Item funding provided for HIGH TEMPERATURE SUPER ALLOYS	-	5.000
Congressional Add: Program Increase - LOW COST MISSILE TECHNOLOGY DEVELOPMENT FY 2023 Plans: Congressional Interest Item funding provided for LOW COST MISSILE TECHNOLOGY DEVELOPMENT	-	10.000
Congressional Add: Program Increase - REACTIVE MATERIALS FY 2023 Plans: Congressional Interest Item funding provided for Reactive Materials	-	10.500
Congressional Add: Program Increase - THERMODYNAMIC LATENT PROPULSION FY 2023 Plans: Congressional Interest Item funding provided for THERMODYNAMIC LATENT PROPULSION	-	5.000
Congressional Adds Subtotals	29.500	85.500

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A