Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Army											Date: May 2021	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603116A *I Lethality Advanced Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	-	-	8.066	-	8.066	-	-	-	-	-	-
CG2: *Lethality Enabling University Adv Development*	-	-	-	6.981	-	6.981	-	-	-	-	-	-
CH5: *Terminal Effects Against Critical Targets Adv Tech*	-	-	-	1.085	-	1.085	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	8.066	-	8.066
Total Adjustments	0.000	0.000	8.066	-	8.066
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	8.066	-	8.066

Change Summary Explanation

New Program Element in Fiscal Year (FY) 2022 established for enabling science and technology efforts that support advanced lethality research.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army			Date: May 2021
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603116A / *Lethality Advanced Technology*	Project (Number/Name) CG2 / *Lethality Enabling University Adv Development*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
CG2: *Lethality Enabling University Adv Development*	-	-	-	6.981	-	6.981	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new start in FY 2022.

This project is a FY22 new start. This project was created to demonstrate increased investment in our university partners.

A. Mission Description and Budget Item Justification

The Project leverages advanced developments and technological innovations from academia, of lethal directed energy, laser diagnostics and accelerated design of future hypersonics, deep learning and novel materials of importance to the Army, by maturing developments and performs demonstrations focused on getting technology to the warfighter more quickly. This Project exploits advanced research and development efforts to focus more on mid to far-term Army modernization priorities while also maintaining delivery of near-term technologies critical to the Long Range Precision Fires and Air and Missile Defense. This Project focuses on maturation and demonstration of various advanced technologies originating from extramural applied research in academia pertaining to lethal directed energy, laser diagnostics, future hypersonic glide body design, deep learning, novel materials, and expansion of the Ballistic, Aero-Optics and Materials (B.A.M.) range applied to lethality. This effort validates advanced research and performs demonstrations leading to potential emerging technologies in areas of strategic importance to the Army in directed energy, future hypersonic glide body design, deep learning and novel materials, etc., by bringing competitively selected Universities with research and development teams into Technical Alliances.

Work in this Project supports the Army Modernization Priority Long Range Precision Fires and Air and Missile Defense.

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

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

This work is done in coordination with PE 0620141A (Lethality Technology), PE 0602147A (Long Range Precision Fires), PE 0603464A (Long Range Precision Fires Advanced Technology), and PE 0603466A (Air and Missile Defense Advanced Technology)

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Laser Diagnostics for Hypersonics and Directed Energy	-	-	2.208

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603116A / *Lethality Advanced Technology*	**Project (Number/Name)** CG2 / *Lethality Enabling University Adv Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: This effort matures laser diagnostics to assess turbulence and boundary layer transition, leading to validation of hypersonic flight models and enhanced directed energy system effectiveness and range through improved targeting, prediction and beam control. ***FY 2022 Plans:*** Will mature a suite of laser diagnostics for hypersonic ground testing and models to predict effects of atmospheric turbulence on laser propagation. Advanced development to inform the expansion of the Ballistic, Aero-Optics and Materials (B.A.M.) range for testing and evaluation of hypersonic and directed energy systems. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** This effort is a new start.			
Title: Turbulence and Transition Modeling and Validation for Hypersonic Vehicles ***Description:*** This effort matures modeling turbulence and transition for hypersonic vehicles to accelerate design of future hypersonic glide bodies and systems through modeling and sub scale testing. ***FY 2022 Plans:*** Will accelerate and mature the design and advancement of hypersonic glide bodies and systems through turbulence and transition modeling. Reduce flight test risk through modeling and sub scale wind tunnel testing of effects of new design features. Advanced development to inform the expansion of the Ballistic, Aero-Optics and Materials (B.A.M.) range for testing and evaluation of aerothermodynamic performance at hypersonic speeds. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** This effort is a new start.	-	-	2.853
Title: Novel Materials for Extreme Environments ***Description:*** This effort matures and validates computational and multiscale models of high strain rate materials to mitigate the effects of hypervelocity impacts (HVIs) and offer thermal protection. ***FY 2022 Plans:*** Will mature and validate critical high temperature materials and characterization testing and analysis capability for the design of thermal protection systems to defeat emerging threats from hypersonic weapons. Provide protection overmatch from high kinetic energy impacts through material layering and unique structures. ***FY 2021 to FY 2022 Increase/Decrease Statement:***	-	-	0.800

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603116A / *Lethality Advanced Technology*	**Project (Number/Name)** CG2 / *Lethality Enabling University Adv Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
This effort is a new start.			
Title: Intelligent Hypersonics and Other Missile Defense Systems ***Description:*** This effort matures and validates hypersonic vehicle flight systems with deep learning neural networks that can adapt to changing conditions and become more lethal. Integration of air and missile defense (AMD) C2 systems and their instrumentation, simulation, and stimulation. ***FY 2022 Plans:*** Will validate ablation characteristics and the semi-autonomous synthetic flight control systems performance utilizing machine learning and deep neural network tools for hypersonic vehicle geometries. Will integrate robust and extensible instrumentation, simulation, and stimulation prototype capability for prototype development, and operational testing of air and missile defense (AMD) C2 systems. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** This effort is a new start.	-	-	1.120
Accomplishments/Planned Programs Subtotals	-	-	6.981

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army			Date: May 2021
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603116A / *Lethality Advanced Technology*	Project (Number/Name) CH5 / *Terminal Effects Against Critical Targets Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
CH5: *Terminal Effects Against Critical Targets Adv Tech*	-	-	-	1.085	-	1.085	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In Fiscal Year (FY) 2022, this is a realignment from OSDPE 0603116A, Project AI3.

A. Mission Description and Budget Item Justification

This Project matures and demonstrates engineering tools and high-fidelity modeling and simulation capabilities to predict and optimize weapon performance to ensure lethality against structures and critical assets. This project provides validated engineering tools and technologies to rapidly evaluate and predict weapon performance.

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

Work in this Project is performed by the United States (U.S.) Engineer Research and Development Center (ERDC) in coordination with U.S. Army Futures Command (AFC).

Work in this Project complements PE 0602141A (Lethality Technology) / Project CF8 (Terminal Effects Against Critical Targets Tech).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Advanced Terminal Effects Demonstration	-	-	1.085
Description: Demonstrates and provides a predictive capability for terminal effects and lethality and a fast running engineering tool to support long-range precision fires weaponeering on critical structural and geological targets of interest. ***FY 2022 Plans:*** Will provide engineering codes for blast effects against structures and critical targets and will demonstrate damage detection algorithms for Battle Damage Assessment (BDA) tools. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding increase in FY22 reflects planned lifecycle of this effort, beginning in FY22.			
Accomplishments/Planned Programs Subtotals	-	-	1.085

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603116A / *Lethality Advanced Technology*	**Project (Number/Name)** CH5 / *Terminal Effects Against Critical Targets Adv Tech*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A