Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Army											Date: March 2024	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602181A *I All Domain Convergence Applied Research*							
COST ($ in Millions)	**Prior Years**	**FY 2023**	**FY 2024**	**FY 2025 Base**	**FY 2025 OCO**	**FY 2025 Total**	**FY 2026**	**FY 2027**	**FY 2028**	**FY 2029**	**Cost To Complete**	**Total Cost**
Total Program Element	-	26.362	14.297	12.269	-	12.269	10.155	9.893	10.007	10.108	0.000	93.091
CM7: *Collaborative Convergence Applied Research*	-	26.362	14.297	12.269	-	12.269	10.155	9.893	10.007	10.108	0.000	93.091

A. Mission Description and Budget Item Justification

The Program Element (PE) executes research as part of a campaign of learning to assess feasibility of technologies in an operational environment, learning from early failure and re-scope research to improve speed of response, scalability, interoperability, and range of engagement. This PE will investigate technologies that will enable sensor to shooter applications, from tactical to strategic level, taking a system design approach in support of Army experimentation events and Department of Defense (DoD) Combined Joint All-Domain Command and Control (CJADC2). The research will enable optimal lethal and non-lethal effects across all domains using artificial intelligence and machine learning to improve how we recognize threats, augment and enhance leader decision-making, and replicate tactical behaviors to enable autonomous capabilities.

Work in this PE complements PE 0602145A (Next Generation Combat Vehicle Technology), PE 0602146A (Network C3I Technology) and PE 0603463 (Network C3I Advanced Technology).

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

Work in this program is performed by the Army Research Laboratory (ARL).

B. Program Change Summary ($ in Millions)	**FY 2023**	**FY 2024**	**FY 2025 Base**	**FY 2025 OCO**	**FY 2025 Total**
Previous President's Budget	27.360	14.297	22.613	-	22.613
Current President's Budget	26.362	14.297	12.269	-	12.269
Total Adjustments	-0.998	0.000	-10.344	-	-10.344
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.001	-			
• SBIR/STTR Transfer	-0.999	-			
• Adjustments to Budget Years	-	-	-10.344	-	-10.344

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Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602181A *I All Domain Convergence Applied Research*

Change Summary Explanation

Decrease in funding due to the of realignment of funding supporting all domain situational awareness into a broader integrated sensor to shooter project with integration from network, fires, and ground. Realignment of funding went to Lethality Technology PEs 0602141A CIB and 0603116 CID.

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army			Date: March 2024
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602181A / *All Domain Convergence Applied Research*	Project (Number/Name) CM7 / *Collaborative Convergence Applied Research*	

COST ($ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
CM7: *Collaborative Convergence Applied Research*	-	26.362	14.297	12.269	-	12.269	10.155	9.893	10.007	10.108	0.000	93.091

A. Mission Description and Budget Item Justification

This Project supports research required to oppose adversary technologies in the threat based early operational environment. Focus is on those technologies that will aid in reducing the sensors to shooters timelines. This is accomplished using Artificial Intelligence (AI) algorithm decision agent design architectures, advanced methods for processing data, and improved AI performance. Additionally, this Project will research technologies and solutions necessary to enable mission command in multi-domain operations. The project will accelerate emerging research to achieve sensor to shooter dominance.

Work in this Project complements Program Element (PE) 0603041A (All Domain Convergence Advanced Technology), PE 0602146A (Network C3I Technology) and PE 0603463 (Network C3I Advanced Technology).

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

Work in this Project is performed by the Army Research Laboratory (ARL).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: AI-Enabled Decision Support in Distributed Networks	3.488	3.641	3.665
Description: This effort research techniques to understand and model complex multi-platform tactical networks in Multi-Domain Operational environments to develop training data sets for AI-enabled tactical decision support capabilities. This effort leverages Army research informed by Army Doctrine on data value, consensus, uncertainty, human-agent teaming and network science to optimize decision support training data production. Supports AI-enabled decision support capabilities for Next Generation Combat Vehicle, Network, Future Vertical Lift, and Long-Range Precision Fires Army Modernization Priorities.			
FY 2024 Plans: Will research real-time human-in-the-loop (HITL) feedback process to improve target detection and decision support for multi-platform networks; explore techniques to modify in real-time HITL for improved accuracy and efficiency; conduct experiments to assess performance improvements from hardware-software co-design; investigate multi-agent reinforcement learning (MARL) on Capability Graph Networks (CGN) for basic fire and maneuver missions.			
FY 2025 Plans: Will research methods to identify tactical Windows of Opportunity across distributed network domains using models such as Spatio-Temporal Graph Neural Networks for novel adaptive sampling in the time domain with accelerated model-hardware			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602181A / *All Domain Convergence Applied Research*	**Project (Number/Name)** CM7 / *Collaborative Convergence Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
codesign; investigate techniques for information synthesis with multi-modal analytics (imagery, video, Synthetic Aperture Radar (SAR), acoustic); research algorithms for human-robot distributed decision making with multi-agent reinforcement learning; investigate explainability features and methods to insert knowledge mechanisms (update rules-base) into "Neuro-Symbolic AI" agents (the combination of artificial neural networks and data-driven deep learning with knowledge representation and reasoning approaches). ***FY 2024 to FY 2025 Increase/Decrease Statement:*** Funding increase is an economic adjustment.			
Title: Synthetic Data for AI-Enabled Decision Support ***Description:*** This effort research approaches to incorporate synthetic data to augment Army training data sets and optimize AI performance for uncommon Multi-Domain Operations (MDO) targets and environments. This effort investigates efficacy and optimal application of synthetic training data developed using multiple technical methods, including physics-based models and generative adversarial techniques. This effort will experiment with artificially augmented data sets to enable classification of rare targets and cost-effective enterprise-level training data generation. Supports AI-enabled decision support capabilities for Next Generation Combat Vehicle, Network, Future Vertical Lift, and Long-Range Precision Fires Army Modernization Priorities. ***FY 2024 Plans:*** Will mature synthetic data generation pipelines in both the electro-optical/visible and infrared spectral bands, consisting of physics based and generative adversarial based data-driven approaches, for both target signatures and background scenes to optimize machine learning detection/classification accuracy on targets while reducing false alarms in the background; develop synthetic environments/simulation testbeds for assessment of deep reinforcement learning based course of action generation as a command and control decision aid; conduct experiments in Army-relevant environments and field assessments to validate synthetic data methodology. ***FY 2025 Plans:*** Will investigate methods for domain adaptation with focus on AiTR pipelines for Army domains to include synthetic-to-real shift and experiments with mixed data to learn 3D mesh representations for multimodal view-invariant action recognition; develop methods to integrate synthesis and machine learning to enable continual (lifelong) learning for increased robustness and adaptation; investigate machine learning paradigms based on large pre-trained models that leverage self-supervised latent spaces for computer and robot vision tasks and reduce the need for large quantities of custom training data; study methods for modifying attributes of own assets (e.g., their textures and shape) to defend against adversarial AI attacks. ***FY 2024 to FY 2025 Increase/Decrease Statement:***	5.125	5.974	4.263

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Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602181A / *All Domain Convergence Applied Research*	**Project (Number/Name)** CM7 / *Collaborative Convergence Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Decrease funding reflect planned lifecycle for this effort.			
Title: Data Characterization for AI-Enabled Decision Support ***Description:*** This effort will investigate techniques for data management, characterization, curation, labeling, and classification to enable repeatable, robust performance of trained AI-enabled decision support capabilities for complex, multi-platform tactical networks in varied tactical Multi-Domain Operations (MDO) environments. Supports AI-enabled decision support capabilities for Next Generation Combat Vehicle, Network, Future Vertical Lift, and Long-Range Precision Fires Army Modernization Priorities. ***FY 2024 Plans:*** Will support systematic data collection and curation for continuous AI algorithm development; research and implement techniques for ingesting large, diverse data sets relevant to broad AI algorithm development across the Army; formalize methods for including synthetic data to augment real data. ***FY 2025 Plans:*** Will investigate data mesh connectivity across Department of Defense data sources to enable seamless access to data for continuous AI algorithm improvement; develop processes and methods to rapidly and securely transition basic and applied research to laboratory experimentation on mission relevant data; enable government research algorithms to inform mission requirement decision makers. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** Decrease funding reflect planned lifecycle for this effort.	4.486	4.682	4.341
Title: Lethality Architecture ***Description:*** Designs networked lethality role-based architecture to support automated decision aids and target handoff capability for combined arms operations. Designs a hybrid distributed architecture that will ingest real-time, prioritized data for decision agents to support scalable operations with reduced processing time.	7.783	-	-
Title: Algorithms and Environment ***Description:*** Designs and develops a data model for commander decision aided algorithms to support integrated direct & indirect fires; defines the process and data structure to automate decision aids and target handoff for simultaneous engagements to air/ ground platforms; and designs decentralized data structures and hybrid databases that can scale to echelons and user selectable input.	1.992	-	-
Title: Fires Coordination	3.488	-	-

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Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602181A / *All Domain Convergence Applied Research*	**Project (Number/Name)** CM7 / *Collaborative Convergence Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Description: Designs and develops integrated direct/indirect effects coordination and execution. Investigates autonomous cooperative engagement methods by modeling adversary behavior to determine the optimal shooter(s) for a large number of targets to achieve tactical overmatch. Design learning behaviors capable of incorporating commander's guidance and based on enemy data and historic performance.			
Accomplishments/Planned Programs Subtotals	26.362	14.297	12.269

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A