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 1: *Basic Research*					R-1 Program Element (Number/Name) PE 0601601A *I Artificial Intelligence and Machine Learning Basic Research*							
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	-	-	-	10.183	-	10.183	-	-	-	-	-	-
CL3: *AI/ML Basic Research Hub*	-	-	-	10.183	-	10.183	-	-	-	-	-	-

Note

In Fiscal Year (FY) 2022, this Program Element (PE) is created to focus on basic research efforts in the Army portfolio pertaining to Artificial Intelligence (AI) and Machine Learning (ML) coordinated by the Army's Artificial Intelligence Integration Center (AI2C); with funding realigned from:
PE 0601102A Defense Research Sciences
AA1 ILIR - AMC
AA2 ILIR - SMDC
AA6 Robotics and Mobile Energy
AA7 Mechanics and Ballistics
AA8 Sensing and Electromagnetics
AB1 Basic Res in Infect Dis, Oper Med and Combat Care
AB2 Protection, Maneuver, Geospatial, Natural Sciences
AB4 Army Research Centers
AC6 International Science and Technology
PE 0601104A University and Industry Research Centers / AB7 Army Collaborative Research and Tech Alliances,
This was a part of the Program Evaluation Groups (PEG) efficiency drill.

A. Mission Description and Budget Item Justification

This PE executes intramural and extramural basic research in artificial intelligence (AI) and machine learning (ML) to support an AI-enabled Multi-Domain Operations (MDO) Force. The PE includes Projects that perform basic research in AI/ML with the potential to impact areas such as: Target Detection using Multiple Cooperative Autonomous Sensors (MCAS); more effective and quicker leader decision-making through use of AI-enhanced Common Operating Procedure (COP); replication of tactical behaviors to enable autonomous capabilities for maneuver; predictive maintenance; Intel support for Operations (specifically in support of long range precision fires); AI-enabled network/cybersecurity; intelligent business and process automation; and medical support. The Army's Artificial Intelligence Integration Center (AI2C) will provide strategic guidance and coordination of these basic research efforts in AI/ML across the Army Modernization enterprise.

Work in this PE contributes to the Army Science and Technology (S&T) portfolio and is fully coordinated with efforts in PE 0602180A Artificial Intelligence Technologies and PE 0603040A Artificial Intelligence Advanced Technologies.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering S&T focus areas, the Army Modernization Strategy and the Joint Artificial Intelligence Center (JAIC).

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 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601601A *I Artificial Intelligence and Machine Learning Basic Research*

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

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	10.183	-	10.183
Total Adjustments	0.000	0.000	10.183	-	10.183
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	10.183	-	10.183

Change Summary Explanation

In FY2022, this is a new PE with one new FY22 Project funded by realignments from Program Element (PE) 0601104A University and Industry Research Centers, AB7 Army Collaborative Research and Tech Alliances to align Artificial Intelligence efforts, and from PE 0601102A Defense Research Sciences as a part of the Program Evaluation Group (PEG) efficiency drill.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army			Date: May 2021
Appropriation/Budget Activity 2040 / 1	R-1 Program Element (Number/Name) PE 0601601A / *Artificial Intelligence and Machine Learning Basic Research*	Project (Number/Name) CL3 / *AI/ML Basic Research Hub*	

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
CL3: *AI/ML Basic Research Hub*	-	-	-	10.183	-	10.183	-	-	-	-	-	-

Note

In Fiscal Year (FY) 2022, this is a New Project realigned from:
* PE 0601104A University and Industry Research Centers / AB7 Army Collaborative Research and Tech Alliances
and from all the Projects in Basic Research portfolio as part of the Program Evaluation Groups (PEG) efficiency drill.

A. Mission Description and Budget Item Justification

The AI/ML Basic Research Hub is a consortium of industry, government, and academia focused on AI basic research originating from world leaders in academic research pertaining to AI/ML breakthrough technologies for future application to Army-relevant areas such as object recognition using Multiple Cooperative Autonomous Sensors, leader decision-making, replication of tactical behaviors to enable autonomous capabilities for maneuver, predictive maintenance, Intel support for Operations, network and cybersecurity, AI-enhanced common operating picture, intelligent business and process automation, and medical support. Collaboration between academia, industry, and government is a key element of the Hub concept as each member brings with it a distinctly different approach to research. Academia is known for its cutting-edge innovation; the industrial partners are able to leverage existing research results for transition and to deal with technology bottlenecks; and Army AI researchers keep the program oriented toward solving complex Army technology problems.

Work in this PE contributes to the Army Science and Technology (S&T) portfolio and is fully coordinated with efforts in PE 0602180A Artificial Intelligence Technologies and PE 0603040A Artificial Intelligence Advanced Technologies.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering S&T focus areas, the Army Modernization Strategy and the Joint Artificial Intelligence Center (JAIC) mission initiatives.

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Intelligence support to Operations	-	-	1.500
Description: Research Artificial Intelligence (AI) / Machine Learning (ML) methodologies to perform object detection on imagery to augment operations and to better understand the enemy?s capabilities and projected lethality. Investigate meeting the challenge of recognition of surrogate targets in S&T test ranges that are not absolute visual representations, using AI capabilities trained on real operational objects. Perform basic research in area of intelligence support for operations in support of long range precision fires.			
FY 2022 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Army		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Will research the ability to model, animate, and render synthetic data to train algorithms using a high-altitude electro-optical (EO) imagery training set comprised of synthetic data created from open source imagery and limited real-world data. Will also research new low-shot object detection and recognition techniques for small sample learning, and unsupervised computer vision approaches to improve battlespace awareness. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY2022, this is a new effort for use of AI/ML methodologies in support of Intelligence Operations			
Title: Artificial Intelligence Hub ***Description:*** The AI Hub is located at Carnegie Mellon University as a consortium of industry, government, and academia focused on building and optimizing the Army's AI and ML initiatives with the goal of accelerating the fielding of capability. The AI Hub will utilize the Army Artificial Intelligence Innovation Institute (A2I2) data and AI/ML algorithms and software tools to investigate AI and ML capabilities to address the Army's unique problems. The AI Hub will focus on research into AI technologies for future application to Army-relevant areas such as, but not limited to, replication of tactical behaviors to enable autonomous capabilities for maneuver, robotics, predictive maintenance, multi-domain Command, Control, Communications, and Computers (C4), network resiliency and cybersecurity, AI-enhanced common operating picture (CoP), intelligent business and process automation, decision support, AI-enabled collaborative data infrastructure platform, medical support and force protection. ***FY 2022 Plans:*** Will investigate new ways of streamlining collaborative AI development with approaches that improve developer productivity and application robustness; research AI-enabled cyber security methodologies in adversarial AI/counter AI, cyber intrusion, and ML-based anomaly detection with counter-actions that are robust to enemy deception; research into safe manned-unmanned vehicle teaming to improve system performance; research to improve the understanding and use of reinforcement learning for studying strategic and cooperative interactions in multi-agent systems and improve decision support. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding and the work for this effort is administratively realigned from PE 0601104A University and Industry Research Centers / AB7 Army Collaborative Research and Tech Alliances	-	-	5.555
Title: ATR-MCAS ***Description:*** Combat Formations require the ability to autonomously maneuver to identify threats and enable friendly forces to disintegrate and exploit enemy forces in the close and deep maneuver areas. This effort researches AI-based, multi-system approaches to aided threat recognition (ATR) using a combination of autonomous air & ground sensors to build a more accurate operating picture when given zone recon missions. ATR and situational awareness is improved through the direct cooperation & autonomous mobility of the sensors.	-	-	3.128

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Appropriation/Budget Activity 2040 / 1	**R-1 Program Element (Number/Name)** PE 0601601A / *Artificial Intelligence and Machine Learning Basic Research*	**Project (Number/Name)** CL3 / *AI/ML Basic Research Hub*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2022 Plans: Will research emerging AI-based, multi-system ground and air vehicle-based object recognition strategies based on autonomous collection, integration, and analysis of information from myriad sensors/systems; will further investigate AI methods that raise the level and number of tasks that can be executed autonomously or semi-autonomously by vehicles in the fleet; will perform research into advanced algorithms for autonomous ground and air platform movement with obstacle detection/avoidance in GPS-denied, dense urban and low/no- light environments; will research AI-enabled tactical maneuver of ground platforms by using terrain and vegetation to avoid enemy detection. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY2022, this is a new effort for use of Mobile Cooperative and autonomous sensors.			
Accomplishments/Planned Programs Subtotals	-	-	10.183

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A