Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army											Date: February 2020	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602308A *I Advanced Concepts and Simulation*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	-	28.623	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	28.623
C90: *Advanced Distributed Simulation*	-	27.046	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	27.046
D02: *Modeling & Simulation For Training And Design*	-	1.577	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.577

Note

In Fiscal Year (FY) 2020 this Program Element (PE) is realigned with continuity of effort from the following PEs:
* PE 0602143A Soldier Lethality Technology
* PE 0602145A Next Generation Combat Vehicle Technology

A. Mission Description and Budget Item Justification

This PE investigates and designs enabling technologies to create effective training capabilities for the Warfighter and supports the underpinning technologies and understanding to establish architecture standards and interfaces necessary for realizing the Army vision of creating a realistic synthetic "electronic battlefield" environment for use across the spectrum of doctrine, organization, training, leader development, materiel, personnel, and facilities (DOTLM-PF). Project C90 focuses on advancing component technologies required for real time interactive linking within and among constructive, virtual, and live simulation and training by refining technologies for advanced distributed interactive simulation. Project D02 further develops concepts for immersive training and learning environments with the Institute for Creative Technologies (ICT) at the University of Southern California, Los Angeles, California.

Work in this PE complements and is fully coordinated with PE 0601104A (University and Industry Research Centers), PE 0602785A (Manpower/Personnel/Training Technology), PE 0602786A (WarfighterTechnology), PE 0602787A (Medical Technology), PE 0603001A (Warfighter Advanced Technology), PE 0603007A (Manpower, Personnel and Training Advance Technology), PE 0603015A (Next Generation Training & Simulation Systems) and PE 0603710A (Night Vision Advanced Technology).

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

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

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602308A *I Advanced Concepts and Simulation*

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	28.470	0.000	0.000	-	0.000
Current President's Budget	28.623	0.000	0.000	-	0.000
Total Adjustments	0.153	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	1.063	-			
• SBIR/STTR Transfer	-0.910	-			

Change Summary Explanation

Funds reprogrammed out for higher priority Army requirements.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602308A / *Advanced Concepts and Simulation*	Project (Number/Name) C90 / *Advanced Distributed Simulation*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
C90: *Advanced Distributed Simulation*	-	27.046	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	27.046

Note

In Fiscal Year (FY) 2020 this Project is being realigned to:
Program Element (PE) 0602143A Soldier Lethality Technology
* Project BC3 Soldier Decision Making & Comms Performance Tech
* Project BC7 Training Technology (Other than STE)
* Project BE8 Synthetic Training Environment (STE) Technology)
PE 0602145A Next Generation Combat Vehicle Technology
* Project BF6 Crew Augmentation and Optimization Tech

A. Mission Description and Budget Item Justification

This Project investigates and designs enabling technologies for advancing distributed simulation and training (live, virtual and constructive) environments. This includes networking of models representing complex human behavior, complex data interchange between simulations, synthetic natural environments, medical training simulations, ground platform training, adaptive tutoring for individuals and teams, and collaborative training. The Project researches the ability to create a virtual representation of combined arms environments, with the Warfighter-in-the-loop that constructive (event driven) simulations cannot simulate.

Efforts in this Project support the Under Secretary of Defense for Research and Engineering Science and Technology priorities and the Army Modernization Strategy.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Live and Medical Training Technologies ***Description:*** Included in this effort will be the development of new medical training simulations to train medical personnel across all levels of care and the development of live training technology that can be applied across all military levels and training environments.	3.185	-	-
Title: Adaptive Tutoring ***Description:*** This effort investigates adaptive tutoring and immersive learning environments with social simulations to conduct kinetic and non-kinetic training for individuals and teams.	2.800	-	-
Title: Training Effectiveness Research	1.333	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602308A / *Advanced Concepts and Simulation*	**Project (Number/Name)** C90 / *Advanced Distributed Simulation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Description: This effort will research and develop simulation architectures, tools, and models that can represent current and future semi and fully autonomous systems. The architecture, tools and models will enable the evaluation of the training impacts (i.e., cognitive, physiological, and team coordination) of future autonomous systems and technologies on individual, crew, and unit tasks. The training demands of systems that are increasingly complex, intelligent, and self-adaptive far exceed those of legacy systems that require training of primarily procedural tasks. This is compounded by parallel increases in autonomy and responsibility at lower echelons.			
Title: Rapid Soldier Capability Enhancement - Training ***Description:*** Research the relationship of augmentation agents and Soldier performance & behavior. Investigate the effects of augmentation agents (perceptual, cognitive, and/or physical), used either individually or coupled as a system of agents, on Soldier performance, resilience, and training during operationally relevant tasks. Development of guidelines and models for designing and employing augmentation agents. Implementation of guidelines will enhance augmented Soldier performance.	2.100	-	-
Title: Synthetic Natural Environments ***Description:*** This effort investigates and develops tools and methods to improve the speed, fidelity and delivery of synthetic terrain and environmental data to support Training Aid Devices (TADs), simulation and mission rehearsal systems.	2.200	-	-
Title: Mixed Reality Research ***Description:*** This effort investigates and develops enabling virtual and augmented reality simulation and training technologies to support future training environments and Army senior leader initiatives in Decide Faster, Asymmetric Vision, and Manned-Unmanned Teaming capabilities. These technologies support the Army capability needs for enhanced dismounted Soldier performance in complex urban environments. Identification of future technologies will be done in concurrence with the core modeling and simulation enablers for megacities.	4.000	-	-
Title: Cyber for Training Simulations ***Description:*** This effort investigates and develops analytical capabilities to more accurately characterize, model, and predict human behavior related to Cyber Electromagnetic Activities (CEMA) events from the tactical to the strategic level.	2.750	-	-
Title: Artificial Intelligence ***Description:*** This effort investigates artificial intelligence techniques to develop intelligent, human-like, virtual characters to maximize and accelerate Soldier learning in future simulation and training applications. This effort also develops novel methods for joint human/intelligent agent learning and decision making.	1.500	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602308A / *Advanced Concepts and Simulation*	**Project (Number/Name)** C90 / *Advanced Distributed Simulation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Synthetic Training Environment Acceleration ***Description:*** This effort designs and develops technologies that will transition to advanced technology development in order to enable a Synthetic Training Environment which is a single, interconnected training system in which units from squad through Army Service Component Command (ASCC) can train in the most appropriate domain - live, virtual, constructive, and gaming, or in all four simultaneously.	3.171	-	-
Title: Advancing Distributed Simulations ***Description:*** Effort supports key foundational areas for advancing distributed simulations and training, to explore technical solutions in Augmented Reality/Virtual Reality (AR/VR) network optimization and data compression, realistic AR/VR software tool for physical world simulation, and design of Internet of Things (IoT) and Artificial Intelligence/Machine Learning (AI/ML) training assessment tools.	4.000	-	-
Title: FY 2018 NDAA SEC 825 MDAP Cost Overrun ***Description:*** FY 2018 NDAA SEC 825 MDAP Cost Overrun	0.007	-	-
Accomplishments/Planned Programs Subtotals	27.046	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army			Date: February 2020
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602308A / *Advanced Concepts and Simulation*	Project (Number/Name) D02 / *Modeling & Simulation For Training And Design*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
D02: *Modeling & Simulation For Training And Design*	-	1.577	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	1.577

Note

In Fiscal Year (FY) 2020 this Project is being realigned to:
Program Element (PE) 0602143A Soldier Lethality Technology
* Project BC7 Training Technology (Other than STE)
* Project BE8 Synthetic Training Environment (STE) Technology

A. Mission Description and Budget Item Justification

This Project transitions basic research into applied research. This Project investigates and designs training applications to enable the Army to train any time and any place. Efforts include designing virtual humans that embody natural language, speech recognition in noisy environments, gesture, gaze, and conversational speech. Techniques and methods are assessed for integrating different sensory cues into virtual environments that result in enhanced training and leader development. The project leverages the capabilities of industry and the research and development community through the synthesis of creativity and technology, including work at the Army Research Institute and the Army Research Laboratory.

Efforts in this Project support the Under Secretary of Defense for Research and Engineering Science and Technology (S&T) priorities and the Army Modernization Strategy.

Developed technologies and techniques are transitioned for maturation and demonstration to PE 0603015A (Next Generation Training & Simulation Systems) / Project S28 (Immersive Learning Environments).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021
Title: Immersive Technology Environments ***Description:*** Conduct applied research that enables responsive and reconfigurable environments that immerse human senses such as sight, sound, and touch in mixed reality environments to include physical elements providing touch and feel to simulate objects such as obstacles and walls.	1.052	-	-
Title: Immersive Technology Techniques ***Description:*** This effort develops tools, techniques and technologies for improving the immersion of human senses within simulation environments and therefore creating enhanced realism.	0.525	-	-
Accomplishments/Planned Programs Subtotals	1.577	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602308A / *Advanced Concepts and Simulation*	**Project (Number/Name)** D02 / *Modeling & Simulation For Training And Design*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A