Exhibit R-2, RDT&E Budget Item Justification: PB 2013 Army										DATE: February 2012	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*							
COST ($ in Millions)	**FY 2011**	**FY 2012**	**FY 2013 Base**	**FY 2013 OCO**	**FY 2013 Total**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**Cost To Complete**	**Total Cost**
Total Program Element	19.907	20.900	23.507	-	23.507	24.063	24.237	25.191	25.662	Continuing	Continuing
C90: *Advanced Distributed Simulation*	14.045	14.713	17.125	-	17.125	17.566	17.632	18.474	18.831	Continuing	Continuing
D02: *MODELING & SIMULATION FOR TRAINING AND DESIGN*	5.862	6.187	6.382	-	6.382	6.497	6.605	6.717	6.831	Continuing	Continuing

Note

FY13 funding increased for training and simulation technology.

A. Mission Description and Budget Item Justification

This program element (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 0602787A (Medical Technology), PE 0603007A (Manpower, Personnel and Training Advance Technology), and PE 0603015A (Next Generation Training & Simulation Systems).

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

Work in this PE is performed by the Army Research Laboratory, Human Research and Engineering Directorate, Simulation and Training Technology Center (STTC), Orlando, FL.

Exhibit R-2, RDT&E Budget Item Justification: PB 2013 Army					DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*		R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*			
B. Program Change Summary ($ in Millions)	**FY 2011**	**FY 2012**	**FY 2013 Base**	**FY 2013 OCO**	**FY 2013 Total**
Previous President's Budget	20.582	20.933	21.291	-	21.291
Current President's Budget	19.907	20.900	23.507	-	23.507
Total Adjustments	-0.675	-0.033	2.216	-	2.216
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.506	-			
• Adjustments to Budget Years	-	-	2.216	-	2.216
• Other Adjustments 1	-0.169	-0.033	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2013 Army			DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT C90: *Advanced Distributed Simulation*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
C90: *Advanced Distributed Simulation*	14.045	14.713	17.125	-	17.125	17.566	17.632	18.474	18.831	Continuing	Continuing

Note

Not applicable for this item.

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 program element support the Army science and technology Soldier portfolio.

Work in this PE complements and is fully coordinated with PE 0602785A (Manpower/Personnel/Training Technology), PE 0602787A (Medical Technology), PE 0603007A (Manpower, Personnel and Training Advance Technology) and PE 0603015A (Next Generation Training & Simulation Systems).

The cited work is consistent with the Assistant 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, Human Research and Engineering Directorate, Simulation and Training Technology Center (STTC), Orlando, FL.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
Title: Live, Virtual, Constructive (LVC) Simulations	3.607	3.949	4.533
Description: This effort investigates Live, Virtual and Constructive (LVC) training technologies (tools and methods) to inform an interactive, seamless training environment. Live training refers to personnel and systems performing an exercise mission on real terrain; virtual training refers to personnel using simulators; and constructive training refers to computer based models representing real world behaviors that introduce a wider control of virtual forces. Developed methods and technologies are transitioned to PE 0603015A/project S29.			
FY 2011 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2013 Army		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT C90: *Advanced Distributed Simulation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
Continued investigations in predictive technologies for behaviors and reasoning of computer generated forces; and completed development of real-time physics-based rendering of asymmetric forces in urban environments to support asymmetric warfare simulations in embedded training for LVC training. ***FY 2012 Plans:*** Investigate technologies to create visual and aural battlefield effects; will produce a more holistic sensory experience for a live training audience; and complete laboratory experiments of dynamic terrain/environment shared architecture, physics based algorithms in virtual and constructive simulations, as well as apply high performance computing in preparation for future advance technology demonstrations. ***FY 2013 Plans:*** Will investigate component level technologies to support advanced dynamic synthetic natural environments to include: advanced handheld environments, underground structures and cross domain interactions; matures and demonstrates rapid generation, scaling of appearance and behaviors for realistic, culturally-specific virtual humans able to interact with other virtual humans and trainees within local/distributed simulations and performs testing and user evaluations of the next generation collaborative training environments.			
Title: Modeling and Simulation Training Technologies ***Description:*** This effort investigates and evaluates the effectiveness of military medical simulation training technologies and ground platform training technologies. The effort also conducts applied research to develop training technologies and techniques for Soldiers operating with unmanned systems. ***FY 2011 Accomplishments:*** Investigated methods and technologies to emulate live tissue replacement, and conducted experiments to assess training effectiveness; initiated structured research and conduct testing with medical holograms and virtual patients; developed low-cost, rugged person-worn immersive systems for dismounted Soldier training as well as tracking systems and hand-held devices to support dismounted training exercises. ***FY 2012 Plans:*** Conduct human agent teaming research studies to improve collaboration with focus on improving team performance, confidence, multi-tasking and workload with unmanned systems in support of the ARL-Robotics Collaborative Technology Alliance(PE 0601104A, project H09); and investigate game engine and virtual world in terms of improving the human interfaces as well as developing new innovative training environments in accordance with the United States Army Learning Concept for 2015 document. ***FY 2013 Plans:***	3.820	3.969	3.165

Exhibit R-2A, RDT&E Project Justification: PB 2013 Army		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT C90: *Advanced Distributed Simulation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
Will assess weapon orientation measurement software and hardware for use in future unmanned system demonstrations; conduct applied research and assess realism of live tissue replacement technologies, as well as 3D visualization and enhanced representations of virtual humans to include more robust physiological and anatomical representations for future medical training.			
Title: Collaborative and Immersive Environment Technologies ***Description:*** This effort investigates adaptive tutoring and immersive learning environments with social simulations to conduct kinetic and non-kinetic training for individuals and teams. ***FY 2011 Accomplishments:*** Continued the development of infantry immersive simulation and learning environments to include intelligent tutoring feedback; developed the enhanced realism of simulation environment to support the battle command training and decision making; validateed algorithms and methodologies through user assessments; as well as investigated and developed virtual world and gaming technologies to accomplish multi-player, large scale, distributed training and learning; with evaluation of the technologies and the impact on human performance. ***FY 2012 Plans:*** Continue development of infantry immersive simulation and learning environments to include representing multi-party interpersonal interactions and the development of tools, so these simulation and learning environments can be readily created by others. ***FY 2013 Plans:*** Will conduct assessments to support trainee modeling, classification of trainee state and machine-based selection of instructional strategies; investigate methods for a computer-based intelligent tutor capable of assessing the cognitive state of trainees & adapting instruction to optimize individual and team performance across a variety of Dismounted Soldier training tasks; develop wrap-around immersive environment leveraging commercial technology; conduct world-wide challenge on emerging virtual environment technologies and evaluate critical elements necessary for specific types of virtual training.	6.618	6.795	9.427
Accomplishments/Planned Programs Subtotals	14.045	14.713	17.125

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2013 Army		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT C90: *Advanced Distributed Simulation*

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2013 Army			DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT D02: *MODELING & SIMULATION FOR TRAINING AND DESIGN*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
D02: *MODELING & SIMULATION FOR TRAINING AND DESIGN*	5.862	6.187	6.382	-	6.382	6.497	6.605	6.717	6.831	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

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 program element support the Army science and technology Soldier portfolio.

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

The cited work is consistent with the Assistant 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, Human Research and Engineering Directorate, Simulation and Training Technology Center (STTC), Orlando, FL.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
Title: Immersive Technology Environments	2.862	3.024	3.185
Description: Performs applied research that enable responsive and reconfigurable environments that immerse human senses such as sight, sound, and touch in mixed reality environments which also includes physical elements providing touch and feel to simulate objects such as obstacles and walls. The goal is to identify technologies which enhance realism for training and leader development. Developed technologies and techniques are transitioned for maturation and demonstration to PE 0603015A/Project S28.			
FY 2011 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2013 Army		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT D02: *MODELING & SIMULATION FOR TRAINING AND DESIGN*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
Investigated technologies to make mixed reality training,which combines real and imagined images as well as environments, more portable and affordable. ***FY 2012 Plans:*** Develop tools that allow others to easily create immersive environments; develop and integrate improved natural language capabilities into the multi-party conversational agent simulation to investigate improved contextual knowledge and understanding of events within the simulation. ***FY 2013 Plans:*** Will collaborate with the Army Medical Department (AMEDD) Center and School at Ft. Sam Houston to investigate and evaluate potential application of developed virtual worlds to supporting the therapy of veterans and active duty Soldiers for (i.e. PTSD) and examine effectiveness of immersive training on hand-held devices and tablets.			
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. ***FY 2011 Accomplishments:*** Investigated and developed technologies and techniques to implement high-quality video and interactive experiences on mobile hand-held devices; evaluated and developed research technologies and components for supporting interactive learning. ***FY 2012 Plans:*** Investigate tools for semi-automatically creating training materials based on rapid assimilation of actual experiences; and conduct analysis of pilot data from a complex negotiation/bargaining task to develop implementation of emotional behaviors in virtual humans. ***FY 2013 Plans:*** Will create training toolkits based on assimilation of actual experiences available for Army use; will develop improved data structures and methods (algorithms and software) for integration of scanned facial data into the Virtual Human Architecture for more human like representations and design tools for annotating transcripts with semantic information and speech acts to assist future social cultural training technologies.	3.000	3.163	3.197
Accomplishments/Planned Programs Subtotals	5.862	6.187	6.382

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2013 Army		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT D02: *MODELING & SIMULATION FOR TRAINING AND DESIGN*

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.