Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
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 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	22.070	20.582	20.933	-	20.933	21.291	21.629	21.778	22.073	Continuing	Continuing
C90: *Advanced Distributed Simulation*	11.125	14.503	14.736	-	14.736	14.978	15.205	15.251	15.435	Continuing	Continuing
D02: *MODELING & SIMULATION FOR TRAINING AND DESIGN*	5.771	6.079	6.197	-	6.197	6.313	6.424	6.527	6.638	Continuing	Continuing
D14: *Advanced Modeling and Simulation Initiatives (CA)*	5.174	-	-	-	-	-	-	-	-	Continuing	Continuing

Note
 FY10 funding realigned to higher priority efforts.
 FY12 funding increase for Large Scale Distributive Training.

A. Mission Description and Budget Item Justification

This program element (PE) develops enabling technologies to create effective training capabilities for the Warfighter. The PE 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). The Advanced Distributed Simulation project (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. The Modeling and Simulation for Training and Design (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. Photonics Research and Advanced Modeling and Simulation Initiatives (projects D01 and D14) fund congressional special interest items.

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).

Projects D01 and D14 fund Congressional Interest Items.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Exhibit R-2, **RDT&E Budget Item Justification:** PB 2012 Army	**DATE:** February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602308A: *Advanced Concepts and Simulation*

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

B. Program Change Summary ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**
Previous President's Budget	27.330	20.582	18.128	-	18.128
Current President's Budget	22.070	20.582	20.933	-	20.933
Total Adjustments	-5.260	-	2.805	-	2.805
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-4.775	-			
• SBIR/STTR Transfer	-0.485	-			
• Adjustments to Budget Years	-	-	2.805	-	2.805

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army									**DATE:** February 2011	
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 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
C90: *Advanced Distributed Simulation*	11.125	14.503	14.736	-	14.736	14.978	15.205	15.251	15.435	Continuing	Continuing

Note
Not applicable for this item.

A. Mission Description and Budget Item Justification

This project develops enabling technologies for advancing distributed interactive simulation in synthetic environments such as networking of models, complex data interchange, and collaborative training. The project researches and develops the ability to create a virtual representation of combined arms environments, with the Warfighter-in-the-loop that constructive (event driven) simulation cannot simulate. Efforts in this project are fully integrated with the Army Research Laboratory (ARL) since the realignment of STTC to ARL, and coordinated with work at the Army Research Institute and the Medical Research Materiel Command.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Live, Virtual, Constructive (LVC) Simulations	3.130	3.716	3.949
Description: This effort investigates the combination of Live, Virtual and Constructive (LVC) training technologies into a seamless event. Live training refers to personnel and systems performing an exercise mission; virtual training refers to personnel using simulators; and constructive training refers to computer-aided simulations that introduce a wider control of virtual forces. Developed methods and technologies are transitioned to PE 0603015A/project S29. **FY 2010 Accomplishments:** Investigated use of predictive technologies and artificial intelligence in constructive training to investigate behaviors and reasoning for computer-generated forces in asymmetric warfare simulations; continued technology improvements of sensor components for physics-based real-time dynamic environments for LVC training. **FY 2011 Plans:**			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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 2010	FY 2011	FY 2012
Continue investigations in predictive technologies for behaviors and reasoning of computer generated forces; and complete 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:* Will investigate technologies to create visual and aural battlefield effects; will produce a more holistic sensory experience for a live training audience; and will 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.			
Title: Modeling and Simulation Training Technologies *Description:* This effort investigates and evaluates military medical training technologies and their effectiveness. The effort also conducts applied research to develop training technologies and techniques for Soldiers with unmanned systems. *FY 2010 Accomplishments:* Investigated methods and technologies to increase medical simulation capabilities for surgical training to include initial designs for a surgical simulator; developed simulations to support the safe operations of unmanned systems in complex environments. *FY 2011 Plans:* Investigate methods and technologies to emulate live tissue replacement, and conduct experiments to assess training effectiveness; initiate structured research and conduct testing with medical holograms and virtual patients; develop 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:* Will 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 will 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.	3.887	3.969	3.969
Title: Collaborative and Immersive Environment Technologies *Description:* This effort investigates adaptive learning environments with social simulations to conduct non-kinetic asymmetric warfare training. *FY 2010 Accomplishments:*	4.108	6.818	6.818

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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 2010	FY 2011	FY 2012
Continued development of Joint, Interagency, Intergovernmental, Multi-National (JIIM) environment for squad team level training using distributed simulations and after action reviews; developed immersive environments to support infantry training and mission rehearsal; as well as investigated algorithms and methodologies to enhance the realism of simulation environments for battle command training and decision making. ***FY 2011 Plans:*** Continue the development of infantry immersive simulation and learning environments to include intelligent tutoring feedback; develop the enhanced realism of simulation environment to support the battle command training and decision making; validate algorithms and methodologies through user assessments; as well as investigate and develop 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:*** Will 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.			
Accomplishments/Planned Programs Subtotals	11.125	14.503	14.736

C. Other Program Funding Summary ($ in Millions)

   N/A

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.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army									DATE: February 2011	

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 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
D02: *MODELING & SIMULATION FOR TRAINING AND DESIGN*	5.771	6.079	6.197	-	6.197	6.313	6.424	6.527	6.638	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project develops 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.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Immersive Technology Environments	2.710	2.916	3.034
Description: This effort performs research and develops technologies that enable responsive and reconfigurable simulations that immerse human senses such as sight, sound, and touch in mixed reality environments consisting of physical elements providing touch and feel, objects such as obstacles and walls in combination with virtual imagery. Developed technologies and techniques are transitioned for maturation and demonstration to PE 0603015A/project S28. *FY 2010 Accomplishments:* Designed and developed approaches for rapidly inserting virtual content into large-scale, real-world training environments that can be rapidly reconfigured. *FY 2011 Plans:* Investigate technologies to make mixed reality training,which combines real and imagined images as well as environments, more portable and affordable. *FY 2012 Plans:*			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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 2010	FY 2011	FY 2012
Will develop tools that allow others to easily create immersive environments; will 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.			
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 2010 Accomplishments:* Developed software tools for rapidly creating automated tutoring systems that can be tailored to multiple training applications/ needs and support team training, performance assessment, and team after-action reviews. *FY 2011 Plans:* Investigate and develop technologies and techniques to implement high-quality video and interactive experiences on mobile hand-held devices; evaluate and develop research technologies and components for supporting interactive learning. *FY 2012 Plans:* Will investigate tools for semi-automatically creating training materials based on rapid assimilation of actual experiences; and will conduct analysis of pilot data from a complex negotiation/bargaining task to develop implementation of emotional behaviors in virtual humans.	3.061	3.163	3.163
Accomplishments/Planned Programs Subtotals	5.771	6.079	6.197

C. Other Program Funding Summary ($ in Millions)
   N/A

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.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army										DATE: February 2011	

APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT D14: *Advanced Modeling and Simulation Initiatives (CA)*

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
D14: *Advanced Modeling and Simulation Initiatives (CA)*	5.174	-	-	-	-	-	-	-	-	Continuing	Continuing

Note
   Not applicable for this item.

A. Mission Description and Budget Item Justification
   Congressional Interest Item funding for applied research in Advanced Modeling and Simulation.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Advanced Live, Virtual and Constructive (LWC) Training Systems. *Description:* This is a Congressional Special Interest Item *FY 2010 Accomplishments:* Investigated technology options for software tools and simulators which would support training in immersive virtual environments.	2.786	-	-
Title: Protective Gear Development through Man-In-Stimulant-Test Chamber. *Description:* This is a Congressional Special Interest Item *FY 2010 Accomplishments:* Investigated technology options for testing protective gear concepts.	0.796	-	-
Title: Cognitive Based Modeling and Simulation for Tactical Decision Support. *Description:* This is a Congressional Special Interest Item *FY 2010 Accomplishments:* Explored cognitive map-based modeling and simulation to support tactical decision-making by military planners in training and operation scenarios.	1.592	-	-
Accomplishments/Planned Programs Subtotals	5.174	-	-

Exhibit R-2A, **RDT&E Project Justification:** PB 2012 Army		**DATE:** February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602308A: *Advanced Concepts and Simulation*	**PROJECT** D14: *Advanced Modeling and Simulation Initiatives (CA)*

C. Other Program Funding Summary ($ in Millions)

   N/A

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.