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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification									DATE: February 2010		
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 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
Total Program Element	18.205	27.330	20.582	0.000	20.582	18.128	18.481	18.814	21.135	0	163.257
C90: Advanced Distributed Simulation	10.867	11.405	14.503	0.000	14.503	11.931	12.168	12.390	14.607	Continuing	Continuing
D01: PHOTONICS RESEARCH	0.000	4.775	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
D02: MODELING & SIMULATION FOR TRAINING AND DESIGN	5.743	5.977	6.079	0.000	6.079	6.197	6.313	6.424	6.528	Continuing	Continuing
D14: Advanced Modeling and Simulation Initiatives (CA)	1.595	5.173	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
A. Mission Description and Budget Item Justification											
Efforts in this program element (PE) design and develop 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 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 is related to and fully coordinated with efforts in PE 0601104A (University and Industry Research Centers), PE 0602785 (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 Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan. Work in this PE is performed by the Research, Development, and Engineering Command (RDECOM), Simulation and Training Technology Center (STTC), Orlando, FL.											

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B. Program Change Summary (\$ in Millions)					
	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	21.778	17.473	17.753	0.000	17.753
Current President's Budget	18.205	27.330	20.582	0.000	20.582
Total Adjustments	-3.573	9.857	2.829	0.000	2.829
• Congressional General Reductions		-0.143			
• Congressional Directed Reductions					
• Congressional Rescissions		0.000			
• Congressional Adds		10.000			
• Congressional Directed Transfers					
• Reprogrammings	-3.056	0.000			
• SBIR/STTR Transfer	-0.517	0.000			
• Adjustments to Budget Years	0.000	0.000	2.829	0.000	2.829
Change Summary Explanation					
FY09 funding decrease is due to reprogramming of congressional interest item for proper execution.FY10 Congressionally directed increases.FY11 funding increases for Distributive Training technology efforts.					

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COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
C90: <i>Advanced Distributed Simulation</i>	10.867	11.405	14.503	0.000	14.503	11.931	12.168	12.390	14.607	Continuing	Continuing

A. Mission Description and Budget Item Justification

Efforts in this project develop 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 provide. The efforts in this project leverage and are coordinated with work at the Army Research Institute, the Army Research Laboratory, 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), Simulation and Training Technology Center (STTC), Orlando, FL.

B. Accomplishments/Planned Program (\$ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1 Live, Virtual, Constructive (LVC) Simulations: 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. In FY09, developed physics-based real-time dynamic situations for LVC training to provide realistic environments (lethality, causality assessment, mobility, etc.) by integrating live sensor components to enable live training and a virtual/constructive mission rehearsal capability onto both Soldier and combat vehicle embedded training devices; conducted laboratory experiments in an operational environment with an embedded training device to develop display technology for combat vehicle embedded training. In FY10, investigate use of predictive technologies and artificial intelligence in constructive training to provide behaviors and reasoning for computer-generated forces in asymmetric warfare simulations; continue technology improvements of sensor components for physics-based real-time dynamic environments for LVC training. In FY11, will continue investigations in predictive technologies for behaviors and reasoning of	4.711	3.130	3.716	0.000	3.716

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B. Accomplishments/Planned Program (\$ in Millions)					
	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
computer generated forces; will 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 2009 Accomplishments: FY 2009 FY 2010 Plans: FY 2010 Base FY 2011 Plans: FY 2011 Base OCO FY 2011 Plans: FY 2011 OCO					
Program #2 Modeling and Simulation Training Technologies: 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. In FY09, conducted tests with patient trauma demonstrators to assess Army medical training effectiveness; designed and developed a mobile immersive training environment that included the appropriate combination of man-worn systems, locomotion systems, intelligent tutors, human computer interfaces, and the ability to control autonomous systems for team training. In FY10, investigate methods and technologies to increase medical simulation capabilities for surgical training to include initial designs for a surgical simulator; develop simulations to support the safe operations of unmanned systems in complex environments. In FY11, will investigate methods and technologies to emulate live tissue replacement and conduct experiments to assess training effectiveness; will initiate structured research and conduct testing with medical holograms and virtual patients; will develop low-cost, rugged man-worn immersive systems for dismounted soldier training as well as tracking systems and hand-held devices to support dismounted training exercises.	3.903	3.887	3.969	0.000	3.969

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B. Accomplishments/Planned Program (\$ in Millions)						
		FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009						
FY 2010 Plans: FY 2010						
Base FY 2011 Plans: FY 2011 Base						
OCO FY 2011 Plans: FY 2011 OCO						
Program #3 Collaborative and Immersive Environment Technologies: This effort investigates adaptive learning environments with social simulations to conduct non-kinetic asymmetric warfare training. In FY09, conducted experiments utilizing game-based technologies to evaluate training methods and mission planning/rehearsal tools in a Joint, Interagency, Intergovernmental, Multi-National (JIIM) simulation environment; expanded multi-sensory capabilities in adaptive learning environments to enable virtual human and intelligent decision components to incorporate awareness of trainee actions; expanded training development tools to rapidly portray additional representative cultures; and expanded non-kinetic simulation capability to squad/team level for training. In FY10, continue development of JIIM environment for squad team level training using distributed simulations and after action reviews; develop immersive environments to support infantry training and mission rehearsal; investigate the algorithms and methodologies to enhance the realism of simulation environments for battle command training and decision making. In FY11, will continue development of infantry immersive simulation and learning environments to include intelligent tutoring feedback; will develop the enhanced realism of simulation environment to support the battle command training and decision making; will validate algorithms and methodologies through user assessments; will investigate and develop virtual world and gaming technologies		2.253	4.158	6.818	0.000	6.818

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B. Accomplishments/Planned Program (\$ in Millions)					
	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
to accomplish multi-player, large scale, distributed training and learning; will evaluate the technologies and the impact on human performance. FY 2009 Accomplishments: FY 2009 FY 2010 Plans: FY 2010 Base FY 2011 Plans: FY 2011 Base OCO FY 2011 Plans: FY 2011 OCO					
Program #4 Small Business Innovative Research/Small Business Technology Transfer Programs FY 2009 Accomplishments: FY 2009 FY 2010 Plans: FY 2010 Base FY 2011 Plans: FY 2011 Base OCO FY 2011 Plans: FY 2011 OCO	0.000	0.230	0.000	0.000	0.000

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<u>B. Accomplishments/Planned Program (\$ in Millions)</u>								
				FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Accomplishments/Planned Programs Subtotals				10.867	11.405	14.503	0.000	14.503
<u>C. Other Program Funding Summary (\$ in Millions)</u> N/A								
<u>D. Acquisition Strategy</u> N/A								
<u>E. Performance Metrics</u> 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.								

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APPROPRIATION/BUDGET ACTIVITY				R-1 ITEM NOMENCLATURE				PROJECT			
2040: Research, Development, Test & Evaluation, Army BA 2: Applied Research				PE 0602308A: Advanced Concepts and Simulation				D01: PHOTONICS RESEARCH			
COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
D01: PHOTONICS RESEARCH	0.000	4.775	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
<u>A. Mission Description and Budget Item Justification</u> Congressional Interest Item funding for applied research in Photonics.											
<u>B. Accomplishments/Planned Program (\$ in Millions)</u>											
							FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1 Compact Biothreat Rapid Analysis Concept. This is a Congressional Interest Item. FY 2009 Accomplishments: FY 2009 FY 2010 Plans: FY 2010 Base FY 2011 Plans: FY 2011 Base OCO FY 2011 Plans: FY 2011 OCO							0.000	4.775	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals							0.000	4.775	0.000	0.000	0.000

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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.		

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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 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
D02: MODELING & SIMULATION FOR TRAINING AND DESIGN	5.743	5.977	6.079	0.000	6.079	6.197	6.313	6.424	6.528	Continuing	Continuing
A. Mission Description and Budget Item Justification											
Efforts in this project develop training applications that 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 and then assess techniques and methods 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), Simulation and Training Technology Center (STTC), Orlando, FL.											
B. Accomplishments/Planned Program (\$ in Millions)											
							FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1 Immersive Technology Environments: 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 (consist of physical elements you can touch and feel (such as walls and obstacles) combined with virtual imagery). Developed technologies and techniques are transitioned for maturation and demonstration to PE 0603015A/project S28. In FY09, created a mixed-reality immersive environment that uses sensors to provide near real-time perspective of the surrounding real world allowing a user and the world model to share a common view of the environment for high fidelity training environments; designed and developed new and flexible display technologies for development of new training environments. In FY10, design and develop approaches for rapidly inserting virtual content into large-scale, real-world training environments that can be rapidly reconfigured. In FY11, will investigate technologies to make mixed reality training (combines real and imagined images) environments more portable and affordable.							2.700	2.710	2.916	0.000	2.916

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B. Accomplishments/Planned Program (\$ in Millions)					
	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009					
FY 2010 Plans: FY 2010					
Base FY 2011 Plans: FY 2011 Base					
OCO FY 2011 Plans: FY 2011 OCO					
Program #2 Immersive Technology Techniques: This effort develops tools, techniques and technologies for improving the immersion of human senses within simulation environments, creating enhanced realism. In FY09, explored techniques for developing distributed asymmetric warfare tutoring and coaching methods to support team training, performance assessment, and team after-action reviews; and investigated/developed methods and technologies to expand single student tutoring capabilities to distributed multi-student team assessments and after action reviews. In FY10, develop 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. In FY11, will investigate and develop technologies and techniques to implement high-quality video and interactive experiences on mobile hand-held devices; will evaluate developed research technologies and components for supporting interactive learning. FY 2009 Accomplishments: FY 2009	3.043	3.100	3.163	0.000	3.163

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B. Accomplishments/Planned Program (\$ in Millions)					
	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2010 Plans: FY 2010					
Base FY 2011 Plans: FY 2011 Base					
OCO FY 2011 Plans: FY 2011 OCO					
Program #3	0.000	0.167	0.000	0.000	0.000
Small Business Innovative Research/Small Business Technology Transfer Programs					
FY 2009 Accomplishments: FY 2009					
FY 2010 Plans: FY 2010					
Base FY 2011 Plans: FY 2011 Base					
OCO FY 2011 Plans: FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	5.743	5.977	6.079	0.000	6.079

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<p><u>C. Other Program Funding Summary (\$ in Millions)</u> N/A</p> <p><u>D. Acquisition Strategy</u> N/A</p> <p><u>E. Performance Metrics</u> 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.</p>		

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2040: Research, Development, Test & Evaluation, Army BA 2: Applied Research				PE 0602308A: Advanced Concepts and Simulation				D14: Advanced Modeling and Simulation Initiatives (CA)			
COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
D14: Advanced Modeling and Simulation Initiatives (CA)	1.595	5.173	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
A. Mission Description and Budget Item Justification											
Congressional Interest Item funding for applied research in Advanced Modeling and Simulation.											
B. Accomplishments/Planned Program (\$ in Millions)											
							FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1							1.595	2.785	0.000	0.000	0.000
Advanced Live, Virtual and Constructive (LWC) Training Systems. In FY09, evaluated different algorithms for geometric pairing using a cave environment and the use of intelligent tutoring to accelerate the scenario generation for live, virtual and constructive experimentation.											
FY 2009 Accomplishments: FY 2009											
FY 2010 Plans: FY 2010											
Base FY 2011 Plans: FY 2011 Base											
OCO FY 2011 Plans: FY 2011 OCO											
Program #2							0.000	0.796	0.000	0.000	0.000

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B. Accomplishments/Planned Program (\$ in Millions)					
	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Protective Gear Development through Man-In-Stimulant-Test Chamber. This is a Congressional Interest Item. FY 2009 Accomplishments: FY 2009 FY 2010 Plans: FY 2010 Base FY 2011 Plans: FY 2011 Base OCO FY 2011 Plans: FY 2011 OCO					
Program #3 Cognitive Based Modeling and Simulation for Tactical Decision Support. This is a Congressional Interest Item. FY 2009 Accomplishments: FY 2009 FY 2010 Plans: FY 2010 Base FY 2011 Plans: FY 2011 Base OCO FY 2011 Plans: FY 2011 OCO	0.000	1.592	0.000	0.000	0.000

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<u>B. Accomplishments/Planned Program (\$ in Millions)</u>								
				FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Accomplishments/Planned Programs Subtotals				1.595	5.173	0.000	0.000	0.000
<u>C. Other Program Funding Summary (\$ in Millions)</u> N/A								
<u>D. Acquisition Strategy</u> N/A								
<u>E. Performance Metrics</u> 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.								

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