ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)

June 2001

BUDGET ACTIVITY
2 - APPLIED RESEARCH

PE NUMBER AND TITLE
0602308A - Advanced Concepts and Simulation

COST (In Thousands)		FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost		32650	36181	20579	0	0	0	0	0	0	0
C90	ADVANCED DISTRIBUTED SIMULATION	13966	11486	10872	0	0	0	0	0	0	0
C99	ADVANCED CONCEPTS & TECH II (ACT II)	13911	11853	0	0	0	0	0	0	0	0
D01	PHOTONICS RESEARCH	4773	4965	0	0	0	0	0	0	0	0
D02	MODELING & SIMULATION FOR TRAINING AND DESIGN	0	7877	6994	0	0	0	0	0	0	0
D03	JOINT MODELING & SIMULATION SYSTEM (JMASS)	0	0	2713	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification:

PLEASE NOTE: This administration has not addressed FY2003-2007 requirements. All FY 2003-2007 budget estimates included in this book are notional only and subject to change.

This program element (PE) funds modeling and simulation technology research and applies it to the development, testing and training of the Future Combat Systems and the Objective Force. It develops standards, architecture and interfaces essential to realizing the DoD/Army vision of creating a verified, validated and accredited synthetic "electronic battlefield" environment which can be used to investigate and refine new warfighting concepts, including generation of tactics, doctrine, training techniques, soldier support, systems and system upgrades. It directs and stimulates advances in those technologies required for real time interactive linking within and among constructive, virtual and live simulation and training. U.S. Army Simulation Training and Instrumentation Command (STRICOM), located at Orlando, FL is responsible for Projects AC90, D02 and D03. Project AC90 develops technologies for advanced distributed interactive simulation. Work is performed by the broadest range of the nation's industrial and academic communities. Project DO2 represents a restructure from Project AC90 starting in FY01. This project enables the rapid transfer and development of simulation and training technology research results to the Army from the Institute for Creative Technologies (ICT) at the University of Southern California, Los Angeles, California. In August, 1999, ICT was designated as a University Affiliated Research Center (UARC) to leverage the entertainment and game industries in advancing the Army's modeling and simulation technology and applications. This project will ensure the transition of the results of the basic research component of the UARC, sponsored through PE 0601104A/Project J08, into the Army tech base and future Army training products. In Project D03, STRICOM will develop components for the Joint Modeling and Simulation system, which is a flexible simulation system that assists model developers, engineers, and analysts in the development of digital models, configuration and execution of simulations, and analysis of simulation results - all at the engineering and engagement levels. These programs are fully coordinated with other Army applied research programs, Defense Advanced Research Projects Agency (DARPA), Defense Modeling and Simulation Office, TRADOC and DoD Project Reliance, with oversight provided by the Joint Directors of

Laboratories. Work in these projects is related to and fully coordinated with efforts in PE 0604715A (Non-System Training Devices - Engineering Development). Project D01, Photonics Research, is a Congressionally directed project which funds research conducted at the Boston University Photonics Center. Applications include technology for night vision and imaging equipment and devices to enable communications while on the move.
The cited work is consistent with the Army Science and Technology Master Plan (ASTAMP), the Army Modernization Plan and Project Reliance. The program element contains no duplication with any effort within the Military Departments. Work is performed by the U.S. Army Simulation, Training, and Instrumentation Command (STRICOM). This program line supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

B. Program Change Summary	FY 2000	FY 2001	FY 2002	FY 2003
Previous President's Budget (FY2001 PB)	29677	30479	28172	0
Appropriated Value	29955	36479	0	
Adjustments to Appropriated Value	0	0	0	
a. Congressional General Reductions	0	0	0	
b. SBIR / STTR	-776	0	0	
c. Omnibus or Other Above Threshold Reductions	-119	0	0	
d. Below Threshold Reprogramming	3749	0	0	
e. Rescissions	-159	-335	0	
Adjustments to Budget Years Since FY2001 PB	0	0	-7593	
Current Budget Submit (FY 2002/2003 PB)	32650	36144	20579	0

Change Summary Explanation: Funding - FY 2001: Congressional adds were received for: Project D01, Photonics Research (+5000); and Project C90, for STRICOM On-line contract document management (+1000).
-(+5000) D01, Photonics Research to address Army needs in bio-agent detection, and sensitive sensors for imaging and laser sources.

FY 2002/2003 funding for Advanced Concepts and Technology II (ACT II) was terminated and realigned to higher priority efforts.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602308A - Advanced Concepts and Simulation**	**C90**

COST (In Thousands)		FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
C90	ADVANCED DISTRIBUTED SIMULATION	13966	11486	10872	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: This program researches and applies enabling technologies for advancing distributed interactive simulation in the synthetic environment. C90 provides the representation of the battlefield needed to support the use of modeling and simulation as an acquisition and training evaluation tool. C90 provides a virtual representation of a lethal combined arms environment with the warfighter-in-the-loop that closed-form analysis cannot provide. The environment permits new system concepts, tactics and doctrine and test requirements to be evaluated with a warfighter-in-the-loop in a combined arms battlefield throughout the acquisition life cycle at a reduced cost and time compared to the traditional approach. The research being conducted includes embedded simulation, intelligent forces representation, rapid and cost-effective generation of synthetic environments, simulation interface and linkage technologies, and complex data modeling and interchange. This system supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 980 Implemented an Advanced Tactical Engagement Simulations (A-TES) framework with simulation-intensive R&D of soldier-fired indirect fire weapons.
- 3800 Conducted in-vehicle High Level Architecture (HLA) experiments in cooperation with Tank-Automotive Research Development Engineering Center (TARDEC) using Vehicle Electronics Suite.
- 846 Implemented intelligent behavioral capabilities and substantiated significantly increased capabilities for scaleable and configurable Computer Generated Forces (CGF) representation.
- 3841 Tested and evaluated a prototype distributed architecture in the STRICOM Technology Development Center (TDC) to provide networked services for an integrated synthetic environment utilizing HLA, wireless network, and high fidelity model data compression techniques.
- 800 Prototyped dismounted soldier Virtual Environment (VE) night vision/sensor capability. Evaluated and refined Military Operations on Urbanized Terrain (MOUT) VE training methods. Tested and evaluated an advanced control system for locomotion simulator. Prototyped dismounted soldier VE voice recognition system.
- 800 Established common processes in order to evaluate a prototype infrastructure to build an integrated, interoperable, and reusable Synthetic Natural Environment (SNE).

FY 2000 Accomplishments (Continued)

- 2899 Conducted research for intelligent agents at the Institute for Creative Technologies.

Total 13966

FY 2001 Planned Program

- 980 Enhance the Advanced Tactical Engagement Simulations (A-TES) virtual integration testbed with hybrid simulation and hardware-in-the-loop experiments.
- 2500 Establish an Embedded Simulation System (ESS) using a Mobile Crew Station Surrogate (MCSSL) at Ft Knox. Establish a testbed for Embedded Training for Future Combat Systems (FCS) in the areas of SNE, intelligent tutoring and robotics behavioral simulation.
- 870 Study intelligent behavioral approaches related to FCS robotics. Evaluate prototype capabilities and address technology transfer and implementation issues.
- 2028 Extend the distributed architecture to promote interoperability of Army simulation systems including Close Combat Tactical Trainer (CCTT), Warfighters' Simulation (WARSIM), and One Semi-Automated Force (OneSAF).
- 900 Prototype dismounted soldier virtual environment gesture recognition system. Evaluate effectiveness of night operations simulation.
- 1000 Test and evaluate reduced development time/cost for an interoperable SNE.
- 700 Construct Medical Simulations to evaluate an Advanced Trauma Patient Simulation (ATPS) system triage and After Action Review (AAR) to promote improved readiness for Army medics.
- 800 Prototype a web-based, distributed simulation capability to support training of Field Artillery Officers in the employment of indirect fire assets as part of a combined arms team or as a stand-alone training tool using Advanced Distributed Learning (ADL).
- 1000 The objective of this one-year Congressional special interest effort is to implement an online contract document management system for STRICOM.
- 400 Management support for Institute of Creative Technology
- 308 Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.

Total 11486

FY 2002 Planned Program

- 895 Optimize results from the Hardware-in-the-Loop experiments for smaller size, better form factor, and improved interfaces with other systems.
- 1300 Test established metrics to assess the environment development process; test methodology to assess interoperability of linked virtual, constructive, and live systems.
- 900 Prototype Intelligent Tutoring Systems to provide student "individualized' instructional support of cognitive training tasks in the web-based environment.
- 800 Complete prototype of the Advanced Trauma Patient Simulator (ATPS) and create an experiment to substantiate that the improved system increases core competency levels. Establish metrics to assess system functionality and the methodology to assess the system's interoperability.
- 2277 Construct/extend the distributed simulation environment for FCS to promote improved Course of Action Analysis (COAA) and Force Projection Logistics (FPL) capabilities.
- 1889 Construct/extend computer generated forces technology and prototype robotics simulation and training testbed for Future Combat System (FCS)
- 1411 Construct/extend immersive simulation technology for distributed simulation networks in support of Objective Force training.
- 1000 Modeling and Simulation for MOUT, Communication and Control (C2), and Human Behavior representation in support of Objective Force training
- 400 Modeling and Simulation support for the Institute for Creative Technologies.

Total 10872

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June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602308A - Advanced Concepts and Simulation**	**D02**

COST (In Thousands)		FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
D02	MODELING & SIMULATION FOR TRAINING AND DESIGN	0	7877	6994	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: This project is a restructure from Project AC90 and enables the rapid transfer and development of simulation and training technology research results to the Army from the Institute for Creative Technologies (ICT) at the University of Southern California, Los Angeles, California. ICT was designated in August 1999 by DDR&E as a University Affiliated Research Center (UARC) to support Army training and readiness through research into simulation and training technology such as mission rehearsal, leadership development, and distance learning. ICT actively engages industry (multimedia, location-based simulation, interactive gaming) to exploit dual-use technology. ICT serves as a means for the military to learn about, and benefit from entertainment technologies, and enable their transfer into military systems. ICT works with creative talent from industry in order to adapt their concepts of story and character to increasing the degree of immersion experienced by participants in synthetic experiences, and to improving the utility of the outcomes of these experiences. In return, industry leverages the DoD sponsored research being done by the advanced Modeling and Simulation UARC. This project ensures the transition of the research into the Army tech base and future Army training products. Creating a true synthesis of creativity and technology and harnessing the capabilities of industry and the R&D community, it revolutionizes military training and mission rehearsal by making it more effective in terms of cost, time, the types of experiences that can be trained or rehearsed, and the quality of the result. It allows the United States to maintain dominance in simulation and training technologies. The US Army Simulation Training and Instrumentation Command (STRICOM) in Orlando, Florida, develops new Army training systems from the transitioned technology. STRICOM is collaborating with the Battle Command Battle Laboratory (BCBL) at Ft. Leavenworth, Kansas, which is working on the Training, Leadership Development, and Soldier Support (TLS) issues for contingency forces and operations. Funding for this program was enhanced in FY 2001 to support applied research on more effective and immersive synthetic environments. This system supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

Program not funded in 2000.

FY 2001 Planned Program

•	7643	Develop large-scale virtual environment technology to create a photo-realistic environment, advance the emotion and speech synthesis algorithms to create more realistic virtual humans to populate the virtual environment, and develop algorithms and techniques for lighting virtual environments and objects that are later placed in the environments. Integrate all these technologies into a concept demonstration to establish areas needing additional research. These virtual worlds directly support training and mission planning and rehearsal for Army Transformation and preparing the Objective Force for future operations.
•	234	Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.
Total	7877	

FY 2002 Planned Program

•	2994	Develop techniques and methods for integrating different sensory cues like smell and sound into virtual environments. Provide concept demonstrations to enhance the education and learning experiences possible through advanced immersive techniques. These environments will impact education and training systems for the legacy and Objective Force.
•	4000	- Accelerate at the University of Southern California's Institute for Creative Technologies (ICT) the exploitation of products from partnership with academia and the entertainment industry, with emphasis on game based training. - Accelerate at the ICT the development of mission rehearsal technologies for Stability and Support Operations (SASO).
Total	6994	

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June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602308A - Advanced Concepts and Simulation**	**D03**

COST (In Thousands)		FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
D03	JOINT MODELING & SIMULATION SYSTEM (JMASS)	0	0	2713	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: STRICOM will develop Army-specific components for the Joint Modeling and Simulation System (JMASS) for use in modeling and simulation and application in advanced concepts, research and development, test and evaluation, and analysis. JMASS threat models are developed and validated by the intelligence community. DoD testers and decision makers will be able to use the same JMASS models for system evaluation and milestone decisions, as were used during system development. This will reduce the time required for milestone preparation and will increase the probability of a successful milestone decision by eliminating the inconsistent results often obtained when different models are used for development and testing. JMASS models are modular and can easily be modified to meet specific user requirements, thus reducing the need to develop new models. STRICOM will create a Synthetic Environment that supports analysis and real-time simulation. Currently there is no real-time implementation of the JMASS. Establish a real-time simulation framework using the building blocks and toolkits provided by the JMASS with its collection of defined, documented interface standards to which a model should be built. This framework uses real-time distributed standards - Institute for Electrical and Electronic Engineers (IEEE) distributed simulation standards and draft International Standards Organization (ISO) Modeling and Simulation Data Representation Standards. This flexible entity based framework supports correlated multi-sensor real-time environment allowing simulations, which can sustain acquisition; as well as the development of tactics, techniques and procedures for the Future Combat System. This system supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

Program not funded in 2000

FY 2001 Planned Program

Program not funded in 2001

FY 2002 Planned Program

- 2713 Research and develop baseline for real-time simulation using JMASS models and prior basic research to ensure compatibility and interoperability for multi-sensor real-time simulations.

Total 2713