

UNCLASSIFIED

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)	DATE February 2000
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602308A Advanced Concepts and Simulations
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COST (<i>In Thousands</i>)	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	20917	29677	30479	28172	30822	34748	39477	Continuing	Continuing
AC90 Advanced Distribution Simulation	8231	10219	10592	10831	10926	12249	13113	Continuing	Continuing
AC99 Advanced Concepts & Technology	10278	14553	11937	14361	15927	17542	20419	Continuing	Continuing
AD01 Photonics Research	2408	4905	0	0	0	0	0	0	7408
AD02 Modeling & Simulation for Training and Design	0	0	7950	2980	3969	4957	5945	Continuing	Continuing

A. Mission Description and Justification: Work in this program element (PE) advances the generation and use of modeling and simulation, including Advanced Distributed Simulation (ADS), related to Army-specific experiments/demonstrations and industry participation at the U. S. Army Training and Doctrine Command (TRADOC) Battle Labs, Army’s Force XXI, and Army After 2010 and beyond experiments. It develops standards, architecture and interfaces essential to realizing the DoD/Army vision of creating a verified, validated and accredited synthetic “electronic battlefield” environment. The electronic battlefield is used to investigate and show 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.

U.S. Army Simulation Training and Instrumentation Command (STRICOM), located at Orlando, FL is responsible for Project AC90, which provides and demonstrates enabling technologies for advanced distributed interactive simulation to support shared synthetic environments. Work is performed by the broadest range of the nation’s industrial and academic communities. Contractors include: Natural Selection, La Jolla, CA; Acusoft, Orlando, FL; Pathfinder Systems, Lakewood, CO; SAIC, San Diego, CA; University of Central Florida, Institute for Simulation and Training, Orlando, FL; Veda Incorporated, Orlando, FL; Perceptronics, Inc., Woodland Hills, CA; Lockheed Martin, Orlando, FL.

STRICOM is also responsible for Project DO2, which 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. 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 will serve as a means for the military to learn about and benefit from entertainment technologies, and enable their transfer into military systems. 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. Creating a true synthesis of creativity and technology and of the capabilities of industry and the R&D community will revolutionize 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 will also allow the U.S. to maintain dominance in simulation and training technologies. STRICOM will develop new Army training systems from the transitioned technology.

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The Army Research Office-Washington, Alexandria, VA is responsible for Project AC99. Work is performed by the broadest range of the nation's industrial and academic communities. This project supports the Advanced Concepts and Technology (ACT) II Program. ACT II uses a yearly Broad Agency Announcement (BAA) to industry and academia, and provides a low overhead, timely mechanism for the displaying of mature, commercial off-the-shelf (COTS) technologies, prototypes, software, and /or systems for assessment by the TRADOC Battle Labs. Contractors include: Center for Photonics Research, Boston, MA; Chain Reactions, Gold River, CA; FFE International, Alexandria, VA; Harris Corporation, Rochester NY; Hughes, Tucson, AZ; Lockheed Martin, Pomona, CA; Lockheed Martin, Dallas, TX; Lucent Technologies, McLeansville, NC; Boeing, Huntington Beach, CA; McDonnell Douglas, Huntsville, AL; Mobile Datacom, Clarksburg, MD; Monterey Bay, Columbia, MD; Morris Brown College, Atlanta, GA; Mystech Associates, Falls Church, VA; Northrop Grumman, Baltimore, MD; Research Triangle Institute, Research Triangle Park, NC; Rolands & Associates, Monterey, CA; Syracuse Research, Syracuse, NY.

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.

These programs are fully coordinated with other Army applied research exploratory development programs, Defense Advanced Research Projects Agency (DARPA), Defense Modeling and Simulation Office, TRADOC and DoD Project Reliance agreements on conventional air/surface weaponry, with oversight provided by the Joint Directors of Laboratories. Work in these projects are related to and fully coordinated with efforts in PE 0604715A (Non-System Training Devices - Engineering Development). There is no duplication of effort within the Army or Department of Defense.

<u>B. Program Change Summary</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
Previous President's Budget (<u>FY 2000 PB</u>)	21494	24955	24799
Appropriated Value	21653	29955	
Adjustments to Appropriated Value			
a. Congressional General Reductions	-159		
b. SBIR / STTR	-548		
c. Omnibus or Other Above Threshold Reductions		-119	
d. Below Threshold Reprogramming	+57		
e. Rescissions	-86	-159	
Adjustments to Budget Years Since <u>FY 1999 PB</u>			+8223
New Army Transformation Adjustment		TBD	-2543
Current Budget Submit (<u>FY 2000 / 2001 PB</u>)	20917	29677	30479

Change Summary Explanation: Funding – FY 01: Projects C90 and C99 were decremented to reflect the new Army Transformation. Project D02 was enhanced in FY 2001 (+6000K) to support applied research on more effective and immersive synthetic environments.

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BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602308A Advanced Concepts and Simulations				PROJECT AC90		
COST (In Thousands)	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost	
AC90 Advanced Distribution Simulation	8231	10219	10592	10831	10926	12249	13113	Continuing	Continuing	
<p>Mission Description and Justification: This program provides and demonstrates enabling technologies for advancing distributed interactive simulation in the synthetic environment. AC90 provides the representation of the battlefield needed to support the use of modeling and simulation as an acquisition and training development tool. AC90 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.</p> <p>FY 1999 Accomplishments:</p> <ul style="list-style-type: none"> • 3349 - Addressed CGF (Computer Generated Forces) system architectural composability. Demonstrated advanced behavioral technology. <ul style="list-style-type: none"> - Tailored and integrated standard Embedded Simulation components to M1A2 SEP Tank program. With TRADOC, developed prototype training scenarios and databases. • 4882 - Developed and enhanced the synthetic environment to support an Echelon Above Corps (EAC) sized battlefield. Developed and evaluated open object-oriented architecture, including methods for model definition and VV&A of networked simulations. <ul style="list-style-type: none"> - Developed the Advanced Tactical Engagement Simulations (A-TES) framework with virtual integration capability and authoritative information center. - Developed a prototype capability for individual and small unit synthetic forces that represent doctrinally correct Army behaviors. Identified high payoff small unit leader training applications. <p>Total 8231</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 4326 - Implement the Advanced Tactical Engagement Simulations (A-TES) framework with simulation-intensive R&D of soldier-fired indirect fire weapons. <ul style="list-style-type: none"> - Conduct in-vehicle High Level Architecture (HLA) experiments in cooperation with TARDEC using Vehicle Electronics Suite. - Develop intelligent behavioral implementations and demonstrate significantly increased capabilities for scaleable and configurable CGF representation. • 5641 - Develop and test 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. <ul style="list-style-type: none"> - Develop prototype dismounted soldier Virtual Environment (VE) night vision/sensor capability. Evaluate and refine MOUT VE training methods. - Develop and evaluate advanced control system for locomotion simulator. Develop prototype dismounted soldier VE voice recognition system. 										
Project AC90	Page 3 of 8 Pages				Exhibit R-2A (PE 0602308A)					

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ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)		DATE February 2000
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602308A Advanced Concepts and Simulations	PROJECT AC90
<p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> - Develop common processes in order to demonstrate a prototype infrastructure to build an integrated, interoperable, and reusable Synthetic Natural Environment (SNE). - Foster the transition of products of basic research at the Institute for Creative Technologies into applied research programs. <ul style="list-style-type: none"> • 252 -Small Business Innovative Research/Small Business Technology Transfer Programs (SBIR/STTR) <p>Total 10219</p> <p>FY 2001 Planned Program:</p> <ul style="list-style-type: none"> • 4350 - Enhance the Advanced Tactical Engagement Simulations (A-TES) virtual integration testbed with hybrid simulation and hardware-in-the-loop experiments. - Demonstrate an Embedded Simulation System (ESS) using a Mobile Crew Station Surrogate (MCSSL) at Ft Hood with M1A2 SEP platoon. - Study intelligent behavioral approaches. Demonstrate prototype capabilities and address technology transfer and implementation issues. • 6242 - Extend the distributed architecture to promote interoperability of Army simulation systems including CCTT, WARSIM, and OneSAF. - Develop prototype dismounted soldier virtual environment gesture recognition system. Evaluate effectiveness of night operations simulation. - Experiment and demonstrate reduced development time/cost for a common interoperable Synthetic Natural Environment (SNE). <p>Total 10592</p>		
Project AC90	Page 4 of 8 Pages	Exhibit R-2A (PE 0602308A)

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BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602308A Advanced Concepts and Simulations				PROJECT AC99		
COST (In Thousands)	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost	
AC99 Advanced Concepts & Technology	10278	14553	11937	14361	15927	17542	20419	Continuing	Continuing	
<p>Mission Description and Justification: This project supports the Advanced Concepts and Technology (ACT) II Program. It evaluates new concepts through soldier in the loop, constructive and virtual simulations electronic battlefield demonstrations and field tests, and modeling and simulations in real time. Specific areas of interest include: battlespace management and battlefield synchronization, depth and attack operations, lethality, survivability and mobility; command, control, communications, and computers (to include interoperability); force sustainment; and doctrine and leader development. All projects support and complement the Army computer technical architecture tenets. The Act II goal is to advance a warfighter need such as Command and Control on the Move and Battlefield Digitalization from concept to demonstration to the soldier in one year. ACT II uses a yearly Broad Agency Announcement (BAA) to industry and academia, and provides a low overhead, timely mechanism for the exhibition of mature, commercial off-the-shelf (COTS) technologies, prototypes, software, and /or systems for assessment by the TRADOC Battle Labs.</p> <p>FY 1999 Accomplishments:</p> <ul style="list-style-type: none"> • 10278 Conducted technology demonstrations and experiments in support of the Army Training and Doctrine Command's Battle Labs, including: Less-than-lethal munitions for peace keeping operations; advanced communications prototype; night vision system; integrated command bridge system; and advanced computing capabilities. Industry/academia participants include Northrop Grumman, Illinois; Northwest University, Signatron Technology Corporation, Massachusetts; CANVS Corporation, Florida; Optimetrics Inc., Michigan; Lockheed Martin Federal Systems, New York; Sperry Marine Inc, Virginia; and Colt's Manufacturing Co., Inc, Connecticut. Technical accomplishments include: <ul style="list-style-type: none"> - Direct image projection on the human retina. - Innovative less-than-lethal ammunition. - Novel chemical/biological detection techniques. <p>Total 10278</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 14161 Conduct technology demonstrations and experiments in support of Battle Labs. Projects include passive/active surveillance, cognitive decision aids, non-dedicated common battlefield sensors and shooter, tactical networking, information dissemination management, skill performance measures, and audio voice translators. Some of the industry/academia participants include TRW Inc., California; Science Applications International Corporation, Florida; Sterling Software, Inc., Virginia; Southwest Research Institute, Texas; Research Triangle Institute, North Carolina; and Cubic Defense Systems, California. <p>392 Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.</p> <p>Total 14553</p>										
Project AC99			Page 5 of 8 Pages				Exhibit R-2A (PE 0602308A)			

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602308A Advanced Concepts and Simulations	PROJECT AC99
FY 2001 Planned Program:		
•	11937 Conduct demonstrations and experiments in support of Battle Labs. This effort includes the following activities: (1) Release BAA to solicit Battle Lab related concepts and technologies from the nation's industrial and academic communities (2) Select, within resource constraints, high payoff and innovative efforts for displaying of warfighting capabilities. (3) Analyze and evaluate the results of FY 2000 efforts; identifying candidates for streamlined acquisitions. (4) Approve BAA topics for new ACT II projects to satisfy future Army and DoD needs not being addressed by existing programs.	
Total	11937	
<p>Project AC99</p> <p align="center"><i>Page 6 of 8 Pages</i></p> <p align="right">Exhibit R-2A (PE 0602308A)</p>		

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ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)							DATE February 2000		
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602308A Advanced Concepts and Simulations				PROJECT AD01	
COST (In Thousands)	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
AD01 Photonics Research	2408	4905	0	0	0	0	0	0	7408
<p>Mission Description and Justification: This is a Congressionally funded program. This project supports photonics projects at the Boston University Photonics Center for Army smart imaging and communications applications. Key areas include magnetic and optical devices, silicon micromechanical optical components, and bio-photonics materials. Investigation of these materials and technologies, which have application in communications, data modulation, optoelectronics, and optical control of microwaves, will be leveraged with commercial developments. Potential Army applications include technology for night vision and imaging equipment and devices to enable communications while on-the-move.</p> <p>FY 1999 Accomplishments:</p> <ul style="list-style-type: none"> • 2408 Investigated magnetic and optical devices, silicon micromechanical optical components, and bio-photonics materials at the Boston University Photonics Center. <p>Total 2408</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 4773 - Complete investigations of fiber lasers, silicon micromechanical optical and fluid valve components, quenched fluorescence for biodetection, Raman scattering for chemical agent detection in water, wide band gap modulators and lasers, and enhanced detection in the infrared at ARL and the Boston University Photonics Center. • 132 Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs. <p>Total 4905</p> <p>FY 2001 Planned Program: Program not funded in FY01.</p>									
Project AD01	<i>Page 7 of 8 Pages</i>					Exhibit R-2A (PE 0602308A)			

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BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602308A Advanced Concepts and Simulations				PROJECT AD02	
COST (In Thousands)	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
AD02 Modeling & Simulation for Training and Design	0	0	7950	2980	3969	4957	5945	Continuing	Continuing
<p>Mission Description and 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 will actively engage industry (multimedia, location-based simulation, interactive gaming) to exploit dual-use technology. ICT will serve as a means for the military to learn about, and benefit from entertainment technologies, and enable their transfer into military systems. ICT will also work 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 will leverage the DoD sponsored research being done by the Modeling and Simulation UARC. This project will ensure the transition of the research into the Army tech base and future Army training products. Creating a true synthesis of creativity and technology and of the capabilities of industry and the R&D community will revolutionize 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 will also allow the United States to maintain dominance in simulation and training technologies. The US Army Simulation Training and Instrumentation Command (STRICOM) in Orlando, Florida, will develop 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 through PBD 203C in FY 2001 to support applied research on more effective and immersive synthetic environments.</p> <p>FY 1999 Accomplishments: Program not funded in FY 1999.</p> <p>FY 2000 Planned Program: Program not funded in FY 2000.</p> <p>FY 2001 Planned Program:</p> <ul style="list-style-type: none"> • 7950 - Generate and test a prototype for a specific training application that uses entertainment technology commercial application as a basis for one specific stimuli. - Develop an immersive, pre-visualization tool to aid in conceptualizing the Future Combat Systems (FCS) in support of the new Army Vision/Transformation. - Create an immersive virtual environment for mission training and rehearsal. <p>Total 7950</p>									
Project AD02	Page 8 of 8 Pages					Exhibit R-2A (PE 0602308A)			