ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE
3 - Advanced technology development	**0603015A - Next Generation Training & Simulation Systems**

	COST (In Thousands)	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
	Total Program Element (PE) Cost	0	15658	18072	20736	21063	23212	23249
HB5	IMMERSIVE ENVIRONMENTS DEMONSTRATIONS (CA)	0	3161	0	0	0	0	0
S28	INSTITUTE FOR CREATIVE TECHNOLOGY (ICT)-ATD	0	251	1641	5206	5202	5208	5206
S29	MODELING & SIMULATION - ATD	0	2248	2908	2032	2375	4502	4548
S30	JOINT VIRTUAL BATTLESPACE	0	3517	0	0	0	0	0
S31	RDEC FEDERATION	0	3517	13523	13498	13486	13502	13495
S33	TRAINING AND SIMULATION SYSTEMS INITIATIVES (CA)	0	2964	0	0	0	0	0

A. Mission Description and Budget Item Justification: This program element matures and demonstrates advanced technology for the next generation training and simulation systems of the Future Force (FF), and where feasible, the Current Force. Technology demonstration is focused in four major areas. First, the Immersive Training Demonstrations project incorporates advanced modeling and simulation (M&S) and training and leader development technology into training demonstrations that have an emphasis on urban operations. Second, the Modeling & Simulation project will demonstrate a framework for future embedded training and simulation systems for the FF to include Future Combat Systems (FCS) and dismounted warrior systems. Third, the Joint Virtual Battlespace (JVB) project develops and demonstrates the overarching M&S architecture that facilitates force-on-force modeling, supports the play of systems models, provides access to measures of effectiveness, and contributes to and works within the total FF. Fourth, the Research Development and Engineering Command (RDEC) Federation project will provide operational instances of interoperable component engineering-level simulations and models that conform to the JVB architecture specification to support and augment testing and training of the FF. Work in this program element is related to and fully coordinated with efforts in PE 0603238A, Project 177 (JT ALS PS DEMO); PE 0602308A, PE0603001A, Project 545 (Force Projection Logistics); and PE0601104A, Project J08 (Institute for Creative Technology). This PE was established to transition maturing technology from PE0601104A, Project J08 (Institute for Creative Technology) and PE 0602308A, Project C90 (Advanced Distributed Simulation) and Project D02 (Modeling and Simulation for Training and Design) into demonstration efforts. The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). Work in this PE is performed by the Research Development and Engineering Command (RDE Command), Orlando, FL, (S28 & S29), and Fairfax, VA (S30 & S31).

B. Program Change Summary	FY 2003	FY 2004	FY 2005
Previous President's Budget (FY 2004)	0	18649	20379
Current Budget (FY 2005 PB)	0	15658	18072
Total Adjustments	0	-2991	-2307
Congressional program reductions		-9133	
Congressional rescissions			
Congressional increases		6200	
Reprogrammings		-58	
SBIR/STTR Transfer			
Adjustments to Budget Years			-2307

Significant Change Explanation.
FY04 - This PE received two FY04 Congressional adds totaling $6200 and FY04 Congressional reductions totaling $9133.
FY05 - Funds realigned to higher priorities.

FY04 Congressional Adds with no R-2A:
($3069) Immersive Simulation and Training Research/ICT, Project HB5: The purpose of this one year Congressional add is to demonstrate immersive technology research environments at Fort Sill. No additional funding is required to complete this project.

($2878) CAVE Automated Virtual Environment, Project S33: The purpose of this one year Congressional add is to mature research in the use of the Cave Automated Virtual Environment to support simulation modeling for acquisition, requirements and training for new system development and test. No additional funding is required to complete this project.

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced technology development	**0603015A - Next Generation Training & Simulation Systems**	**S28**

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
S28	INSTITUTE FOR CREATIVE TECHNOLOGY (ICT)-ATD	0	251	1641	5206	5202	5208	5206

A. Mission Description and Budget Item Justification: This project will mature and demonstrate affordable immersive technologies that include the application of photo-realistic synthetic environments, multi-sensory interfaces, virtual humans, and training applications on low-cost game platforms. Immersive technologies will enrich the Army's capabilities and readiness by expanding the types of experiences that can be trained or rehearsed, and by improving the effectiveness of the experience and the quality of the result. The synergy between these immersive technologies and the embedded training advanced technology maturation within Project S29 (Modeling and Simulation) of this PE will provide units with a set of complementary embedded and deploy-on-demand systems that provide just-in-time, dynamic, realistic training and mission rehearsal capabilities. This project will use advanced modeling, simulation, and leadership development techniques to leverage the emerging immersive technologies that are being created at the Institute of Creative Technologies (ICT) University Affiliated Research Center (UARC) at the University of Southern California to formulate training demonstrations that will have an emphasis on urban operations and asymmetric warfare. The ICT's collaboration with its entertainment partners and the Army Training and Doctrine Command (TRADOC) will create a true synthesis of creativity and technology that harnesses the capabilities of industry and the R&D community to advance the Army's ability to train and practice military skills across the full spectrum of conflict. This project was set up to transition basic and applied research from PE0601104A, Project J08 (Institute for Creative Technology) and PE 0602308A, Project D02 (Modeling & Simulation for Training & Design). The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). Work in this project is performed by the Research Development and Engineering Command (RDE Command), Orlando, FL.

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February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced technology development	**0603015A - Next Generation Training & Simulation Systems**	**S28**

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Immersive Techniques. In FY04, investigate approaches to integrate immersive evaluation techniques into training and leader development technology demonstrations. Demonstrations will incorporate advanced artificial intelligence techniques for after action review and enhanced sound capability for individual soldier simulations. In FY05, will use immersive environments created for training and simulation systems to facilitate the integration of new algorithms and techniques into the after action review processes allowing self-assessment of mission accomplishment. Will demonstrate a prototypical highly immersive multi-sensory environment that provides mixed reality (real and synthetic) objects for training and mission rehearsal.	0	243	1641
Small Business Innovative Research/Small Business Technology Transfer Programs	0	8	0
Totals	0	251	1641

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February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced technology development	**0603015A - Next Generation Training & Simulation Systems**	**S29**

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
S29	MODELING & SIMULATION - ATD	0	2248	2908	2032	2375	4502	4548

A. Mission Description and Budget Item Justification: This project will mature and demonstrate affordable next generation training and simulation systems that focus on virtual threats, asymmetric warfare, network-centric operations, and embedding training capabilities and technologies into operational go-to-war Future Force (FF) systems to include Future Combat Systems (FCS) and the dismounted warrior systems. This project will use simulation techniques and tools that include computer generated forces, virtual terrain databases, and small image generators to create virtual training environments that include virtual opposing forces that can be detected and engaged by operators of go-to-war systems. Embedding simulation based training technologies into combat vehicles and dismounted soldier systems will enrich the Army's training capabilities and readiness. It will provide soldiers, crews, and small unit leaders whose operational systems are located at homestation or deployed to remote locations worldwide with the ability to use those systems as training and mission rehearsal tools. This project will create a joint environment by synchronizing virtual and constructive simulated forces with the next generation and current training systems from the Army, Navy, Air Force and Marine Forces. These next generation training systems will contain embedded wireless technologies that connect mounted and dismounted soldiers and other weapon systems to support distributed combined arms team training. The synergy between these embedded training capabilities and the immersive training advanced technology development in Project S28 (Immersive Training Demonstrations) of this PE will provide Army units with a set of complementary embedded and deploy on-demand systems that provide just-in-time, dynamic, realistic training and mission rehearsal capabilities. Demonstrations will include technologies that form a framework for future training applications for the range of FCS operations such as robotic control and other sensor operations; mission planning and rehearsal; command, control, and maneuver; C4ISR network analysis to support distributed simulations; and vehicle system interface requirements. This project was set up to transition basic and applied research from PE 0602308A, Project C90 (Advanced Distributed Simulation). The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). Work in this project is performed by the Research Development and Engineering Command (RDE Command), Orlando, FL.

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Embedded Techniques. In FY04, develop an embedded computer generated force simulation concept to support embedded training and mission planning and rehearsal. Conduct an exercise with live and virtual training systems demonstrating robotics asset control to provide increased mission capabilities. Mature and experiment with simulations of C4ISR networks that will accommodate both operational and training network traffic. In FY05, integrate mounted and dismounted soldier embedded training systems to demonstrate and assess capabilities for small unit training and rehearsal. Demonstrate an intelligent tutor to provide instructional assessment and feedback to individual crew members utilizing embedded training system. Optimize computer generated force software to reduce demand for tactical bandwidth.	0	1732	2427
Transformational Training. In FY04, integrate and demonstrate technology for constructive and virtual simulation from joint armed services to demonstrate the learning and training needed to significantly increase the training capability of the joint forces. In FY05, interface with Joint Forces Command's (JFCOM) Distributed Continuous Experimentation Environment and conduct experiments to provide feedback on the performance and training effectiveness of the next generation simulation systems in a joint training context.	0	451	481
Small Business Innovative Research/Small Business Technology Transfer Programs	0	65	0
Totals	0	2248	2908

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February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced technology development	**0603015A - Next Generation Training & Simulation Systems**	**S30**

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
S30	JOINT VIRTUAL BATTLESPACE	0	3517	0	0	0	0	0

A. Mission Description and Budget Item Justification: Projects S30 (Joint Virtual Battlespace) and S31 (RDEC Federation) will provide the foundation for the MATREX modeling and simulation (M&S) architecture. This architecture integrates live, virtual, and constructive simulations in a distributed joint battle space. This enables the determination of the best and most cost effective system-of-systems designs as compared to individual component solutions. The integrated M&S architecture supports the examination of joint C4ISR concepts and system-of-systems solutions by facilitating studies and demonstrations that assess the operational impact of joint Network-Centric Warfare (NCW) force concepts through a simulation environment that adequately models the Future Force (FF) tactical network systems, the information that flows through that network, and the impact of this information on force effectiveness. These assessments are needed for smart and timely acquisition decisions on FF and Future Combat Systems (FCS) component technologies. In FY05, the unity of effort essential to ensure compatibility among the complementary inter-related technologies of Projects S30 and S31 will be achieved when Project S30's core integrated modeling and simulation architecture development efforts are merged with Project S31's collaborative environment and M&S component development efforts to create a single integrated MATREX development effort within Project S31. The core integrated modeling and simulation architecture development efforts of Project S30 include Enterprise Services, middleware tools, standardized component interfaces, command and control structures, terrain, weather, and battlefield emissions propagation and sensing advanced technology development efforts as well as the integration of the "best of breed" high-resolution engineering-level component models developed in Project S31. In combination, these technologies provide the user with a tailorable, scalable, distributed M&S system that addresses both human and hardware-in-the-loop C4ISR centric force-on-force scenarios that will also serve as an integral part of a future Army Collaborative Environment under the auspices of the Simulation and Modeling for Acquisition, Requirements and Training (SMART) initiative. In FY03 this effort was funded in PE 0603238, Project 177 (JT ALS PS Demo). The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). Work in this project is performed by the Research Development and Engineering Command (RDE Command), Fairfax, VA.

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Modeling Architecture for Technology, Research, and EXperimentation (MATREX). In FY04, enhance the architecture through the integration of the lethality, vulnerability, armament, and environmental servers and the enhancement of the sensors and human factors models and the command, control, and communications grid. Develop enhanced tools for accelerating the integration of new component capabilities to assist in system-of-systems design trade-offs. Provide software Version 0.5 to the FCS Lead System Integrator (LSI) for integration in the System of Systems Virtual Framework (SVF) environment. Further develop architecture to support NCW simulation to include a common operational picture, intelligence effects, communication effects, command & control, and platform modeling.	0	3415	0
Small Business Innovative Research/Small Business Technology Transfer Programs	0	102	0
Totals	0	3517	0

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February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced technology development	**0603015A - Next Generation Training & Simulation Systems**	**S31**

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
S31	RDEC FEDERATION	0	3517	13523	13498	13486	13502	13495

A. Mission Description and Budget Item Justification: Projects S30 (Joint Virtual Battlespace) and S31 (RDEC Federation) will provide the foundation for the Modeling Architecture for Technology, Research, and EXperimentation (MATREX) modeling and simulation (M&S) architecture. This architecture integrates live, virtual, and constructive simulations in a distributed joint battle space. This enables the determination of the best and most cost effective system-of-systems designs as compared to individual component solutions. The integrated M&S architecture supports the examination of joint C4ISR concepts and system-of-systems solutions by facilitating studies and demonstrations that assess the operational impact of joint Network-Centric Warfare (NCW) force concepts through a simulation environment that adequately models the Future Force (FF) tactical network systems, the information that flows through that network, and the impact of this information on force effectiveness. These assessments are needed for smart and timely acquisition decisions on FF and Future Combat Systems (FCS) component technologies. In FY05, the unity of effort essential to ensure compatibility among the inter-related technologies of Projects S30 and S31 will be achieved when Project S30's core integrated modeling and simulation architecture development efforts and its associated funding are merged with Project S31's collaborative environment and M&S component development efforts to create a single integrated MATREX development effort within Project S31. Through FY04 and beyond, Project S31's development efforts include the creation of a distributed virtual laboratory that will be used to conduct collaborative distributed simulation experiments, studies, and analysis to facilitate acquisition decisions using the Simulation and Modeling for Acquisition, Requirements and Training (SMART) process, as well as the development and selection of "best of breed" high-resolution engineering-level simulation model components to support the evaluation of Joint Forces and FF concepts to include FCS and dismounted warrior systems. Integration of high-resolution engineering-models within the MATREX architecture will provide the framework to operate a true multi-resolution environment that can scale to the FCS Unit of Action (UA) within the context of a Unit of Employment (UE), enhancing the user's ability to study the Measures of Effectiveness of interest. Additionally, MATREX will develop a Distributed Virtual Laboratory (DVL) to network geographically dispersed M&S assets, and therefore reduce the Army's cost of test, integration, and experimentation. The DVL will provide a continuously available secure M&S environment that facilitates technical and subject matter experts working together from remote, distributed labs. The core integrated modeling and simulation architecture development efforts of Project S30 that will be merged with Project S31 in FY05 include Enterprise Services, middleware tools, standardized component interfaces, command and control structures, terrain, weather, and battlefield emissions propagation and sensing advanced technology development efforts as well as the integration of the "best of breed" engineering-level component models developed in Project S31. In combination, these technologies provide the user with a tailorable, scalable, distributed M&S system that addresses both human and hardware-in-the-loop C4ISR centric force-on-force scenarios that will also serve as an integral part of a future Army Collaborative Environment under the auspices of the SMART initiative. In FY03 this effort was funded in PE 0603238, Project 177 (JT ALS PS Demo). The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). Work in this project is performed by the Research Development and Engineering Command (RDE Command), Fairfax, VA.

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Modeling Architecture for Technology, Research, and EXperimentation (MATREX). In FY04, establish a Distributed Virtual Laboratory (DVL) environment to enable all sites to connect through a secure distributed network. Enhance human performance and command and control modeling and facilitate collaboration with the logistics community, Army Test and Evaluation Command (ATEC), Army Training and Doctrine Command (TRADOC), and other Services. In FY05, will integrate tactical sensors, command and control, and propagation servers. Will conduct Joint experiments, assess and incorporate interfaces for additional high-resolution, component level models and simulations, and continue development of methodologies to incorporate asymmetric warfare. Will deliver software Version 1.0 to FCS Lead System Integrator (LSI) for integration in the System of Systems Virtual Framework (SVF) environment for the evaluation of emerging tactical systems.	0	3415	13523
Small Business Innovative Research/Small Business Technology Transfer Programs	0	102	0
Totals	0	3517	13523