

# ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2008

BUDGET ACTIVITY		PE NUMBER AND TITLE					
<b>3 - Advanced technology development</b>		<b>0603015A - Next Generation Training &amp; Simulation Systems</b>					
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
Total Program Element (PE) Cost	21561	22365	18881	20231	20477	20247	20724
HB5 IMMERSIVE ENVIRONMENTS DEMONSTRATIONS (CA)	1743	1987					
S28 INSTITUTE FOR CREATIVE TECH (ICT)- Adv Tech Dev	5089	4802	4880	5066	5148	5271	5397
S29 MODELING & SIMULATION - Adv Tech Dev	1649	3750	3891	3979	4062	3457	3550
S31 MATREX	10672	10037	10110	11186	11267	11519	11777
S33 TRAINING AND SIMULATION SYSTEMS INITIATIVES (CA)	2408	1789					

**A. Mission Description and Budget Item Justification:** This program element (PE) matures and demonstrates advanced technology for the next generation training and simulation systems of the Future Force (FF), and where feasible, the Current Force. Work is focused in three projects. The Institute for Creative Technology project S28 incorporates advanced modeling and simulation (M&S) and training and leader development technology into immersive training demonstrations that have an emphasis on urban operations. The Modeling & Simulation project S29 demonstrates a framework for future embedded training and simulation systems for the FF to include the Future Combat System (FCS) and dismounted warrior systems. The MATREX project S31 develops, integrates, and demonstrates an overarching M&S architecture that incorporates multi-resolution entity-based models, simulations, and tools which facilitate systems of systems-scale integration to support Network-Centric Warfare (NCW) M&S capability. The MATREX project also uses a building block approach to integrate interoperable components for engineering-level simulations and models over a distributed network to support decision points across the entire acquisition life cycle. Projects HB5 and S33 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 0602308A, (Advanced Concepts and Simulation), and PE 0603007A, (Manpower, Personnel, and Training Adv Technology). 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 (RDE Command), System of Systems Integration (SOSI), Fort Belvoir, VA and the Simulation and Training Technology Center, Orlando, FL.

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<u><b>B. Program Change Summary</b></u>	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2008/2009)	20863	18723	19002
Current BES/President's Budget (FY 2009)	21561	22365	18881
Total Adjustments	698	3642	-121
Congressional Program Reductions		-158	
Congressional Rescissions			
Congressional Increases		3800	
Reprogrammings	1282		
SBIR/STTR Transfer	-584		
Adjustments to Budget Years			-121

Three FY08 congressional adds totaling \$3800 were added to this PE.

- (\$800) Experiential Technologies for Urban Warfare and Disaster Response
- (\$1000) Vigilant Auto-ID and Access Control System
- (\$2000) Joint Fires and Effects Training System (JFETS)

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<b>BUDGET ACTIVITY</b> <b>3 - Advanced technology development</b>		<b>PE NUMBER AND TITLE</b> <b>0603015A - Next Generation Training &amp; Simulation Systems</b>					<b>PROJECT</b> <b>S28</b>	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
S28 INSTITUTE FOR CREATIVE TECH (ICT)- Adv Tech Dev	5089	4802	4880	5066	5148	5271	5397	

**A. Mission Description and Budget Item Justification:** This project matures and demonstrates 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 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 program element 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 uses advanced modeling, simulation, and leadership development techniques to leverage the emerging immersive technologies that are created at the Institute of Creative Technologies (ICT) University Affiliated Research Center (UARC) at the University of Southern California to formulate training demonstrations with an emphasis on urban operations and asymmetric warfare. The ICT's collaboration with its entertainment partners, the Research, Development, and Engineering Command, and the Army Training and Doctrine Command creates 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.

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, Orlando, FL.

<b><u>Accomplishments/Planned Program:</u></b>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Immersive Techniques: In FY07, assessed and refined the integration of pedagogical and situational aspects of rapid scenario development techniques into immersive environments; assessed and refined the integration of intelligent mentoring capabilities into a single user immersive simulation learning environment; demonstrated methods to integrate political, religious, and cultural traits into immersive environments; demonstrated the integration of specific immersive environments that each enables critical urban characteristics. In FY08, develop, assess, and refine immersive training methods such that they are more representative and supportive of military action within complex political, religious, and cultural environments; demonstrate methods to integrate cultural traits into avatars operating in interactive environments; create visualizations of the complex urban environment to support both immersive training and command and control concepts. In FY09, will integrate photorealistic representations of complex terrain and rendering of specific individual facial features onto interactive avatar models operating in an asymmetric environment to support more realistic training; will demonstrate methods to extend the immersive environment to large format applications that support multi-player and team training; will demonstrate methods to support computer generated after action reviews, computer avatar-based mentoring, and computer directed scenario adaptation based on multi-player distributed training challenges.	5089	4668	4880
Small Business Innovative Research/Small Business Technology Transfer Programs		134	

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BUDGET ACTIVITY <b>3 - Advanced technology development</b>	PE NUMBER AND TITLE <b>0603015A - Next Generation Training &amp; Simulation Systems</b>		PROJECT <b>S28</b>
Total		5089	4802

4880

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<b>BUDGET ACTIVITY</b> <b>3 - Advanced technology development</b>	<b>PE NUMBER AND TITLE</b> <b>0603015A - Next Generation Training &amp; Simulation Systems</b>					<b>PROJECT</b> <b>S29</b>	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
S29 MODELING & SIMULATION - Adv Tech Dev	1649	3750	3891	3979	4062	3457	3550

**A. Mission Description and Budget Item Justification:** This project matures and demonstrates affordable next generation training and simulation systems that focus on integrating virtual threats, asymmetric warfare, network-centric operations, and embedding training capabilities and technologies into operational go-to-war Future Force (FF) systems to include dismounted warrior systems. This project uses 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 enrich the Army's training capabilities and readiness. It provides Soldiers, crews, and small unit leaders whose operational systems are located at home-station or deployed to remote locations worldwide with the ability to use those systems as training and mission rehearsal tools. This project creates 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 contains 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 provides 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. This program provides enhanced capabilities in intelligent tutoring and advanced immersive dismounted training technologies. Demonstrations include technologies that form a framework for future training applications for the range of FF operations such as robotic control and other sensor operations; mission planning and rehearsal; command, control, and maneuver; Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) network analysis to support distributed simulations; and vehicle system interface requirements.

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, Orlando, FL.

<b>Accomplishments/Planned Program:</b>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Embedded Techniques: In FY07, conducted analysis of current force vehicles to determine display and control requirements to support embedded training; analyzed training software components-suitability to provide individual crew and collective embedded training; demonstrated human-terrain annotation for representation of cultural characteristics in military constructive simulation. In FY08, conduct experiments with embedded training common components and develop user interfaces to support deployable mission planning and rehearsal; mature and demonstrate the use of instructional development tools for adaptive learning environments. In FY09, will demonstrate an embedded training mission rehearsal capability on current force vehicles and dismounted Soldiers to mitigate embedded training technology risks for these systems as well as for Future Forces; will mature common embedded training technologies supporting all target vehicles and Soldiers.	1649	3645	3891
Small Business Innovative Research/Small Business Technology Transfer Programs		105	
<b>Total</b>	<b>1649</b>	<b>3750</b>	<b>3891</b>

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COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
S31 MATREX	10672	10037	10110	11186	11267	11519	11777	

**A. Mission Description and Budget Item Justification:** The project Modeling Architecture for Technology, Research, and Experimentation (MATREX) provides the foundation for the distributed modeling and simulation (M&S) environment employed to reduce program cost, schedule, and technical risk across the Army's acquisition programs. MATREX provides a unifying M&S architecture, supporting tools, and infrastructure that ease the integration and use of multi-resolution live, virtual, and constructive (LVC) applications. MATREX provides capabilities to support the examination of Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) concepts and system-of-systems (SoS) solutions at the entity level to facilitate studies and technology demonstrations that assess the operational impact of Network-Centric Warfare (NCW) concepts and technologies. MATREX creates a simulation environment that models the Current and Future Force tactical network systems, the information that flows through that network (communications representation), and the impact of this information on force effectiveness. Efforts include the creation of a continuously available secure Distributed Virtual Laboratory (DVL) that is used for collaborative design, development, integration, test, and execution of simulation experiments, studies, and analyses with geographically dispersed command elements and Cross Command Collaboration Effort (3CE) network partners. These partners include the Research, Development, and Engineering Command (RDECOM), Army Test and Evaluation Command (ATEC), and the Army Training and Doctrine Command (TRADOC). MATREX supports the development and selection of "best of breed" high-resolution engineering-level models to support the evaluation of Future Force (FF) concepts to include dismounted warrior systems. Integration of high-resolution engineering-models within the MATREX architecture provide the framework to operate a true multi-resolution environment that can scale to the FF brigade combat team operations, enhancing the user's ability to study the measures of effectiveness. This project supports the partnership with the other 3CE members in the development and use of MATREX to establish a common environment that supports development, training, and testing within the community for the development and evaluation.

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 led by the Research, Development, and Engineering Command (RDECOM), Systems of Systems Integration (SOSI), Fort Belvoir, VA, and executed across the Command.

<b>Accomplishments/Planned Program:</b>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
MATREX: In FY07, delivered MATREX interoperable environment and integrated tool suite to TRADOC and ATEC; integrated Maneuver Command and Control, Logistics, and environment capabilities into the MATREX architecture; enhanced the ability for end-to-end analysis in an environment that integrates Network Centric Warfare capabilities to support decision making; implemented more robust system-level verification and validation of MATREX; transitioned existing MATREX One Semi-Automated Forces (OneSAF) Testbed Baseline based capabilities to an OneSAF Objective System capability. In FY08, extend MATREX capabilities to fully implement the TRADOC Integrated Process 3 (Networked Fires; Intelligence, Surveillance, and Reconnaissance; Battle Command; etc.) operational thread, and fully integrate weather, chemical-biological effects with complimentary human-behavior enabled Battle Command. In FY09, will increase MATREX scalability across all capabilities to model a FF brigade combat team; will address event management by updating Simulation Initialization capability to shorten event setup time and execution; will implement a cross command data collection and analysis tools capability to provide an integrated acquisition support capability for Army decision making.	10672	9756	10110

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Small Business Innovative Research/Small Business Technology Transfer Programs		281	
<b>Total</b>	10672	10037	10110