

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

February 2007

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 2006 Actual	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	24855	20863	18723	19002	20375	20623	20385	20856
HB5 IMMERSIVE ENVIRONMENTS DEMONSTRATIONS (CA)	2396	1780						
S28 INSTITUTE FOR CREATIVE TECH (ICT)- Adv Tech Dev	4929	5251	4833	4911	5102	5185	5307	5431
S29 MODELING & SIMULATION - Adv Tech Dev	1444	1702	3774	3916	4007	4091	3481	3573
S31 MATREX	10478	11141	10116	10175	11266	11347	11597	11852
S33 TRAINING AND SIMULATION SYSTEMS INITIATIVES (CA)	5608	989						

**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 will demonstrate 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 and demonstrates the overarching M&S architecture that facilitates force-on-force modeling, supports the play of systems models, and provides access to measures of effectiveness. The MATREX project will also enable interoperable component engineering-level simulations and models that conform to the architecture specification to support and augment testing and training of the FF. Projects HB5 and S33 fund congressional special interest items. Work in this PE is related to and fully coordinated with efforts in PE 0602308A, project C90 (Advanced Distributed Simulation); PE 0602308A, project D02 (Modeling and Simulation for Training and Design); and PE0601104A, project J08 (Institute for Creative Technology). This work does not duplicate any effort within the military Departments. 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), Simulation and Training Technology Center, Orlando, FL, and Fort Belvoir, VA.

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<b><u>B. Program Change Summary</u></b>	FY 2006	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2007)	27927	18296	20319	20436
Current BES/President's Budget (FY 2008/2009)	24855	20863	18723	19002
Total Adjustments	-3072	2567	-1596	-1434
Congressional Program Reductions		-80		
Congressional Rescissions				
Congressional Increases		2800		
Reprogrammings	-3072	-153		
SBIR/STTR Transfer				
Adjustments to Budget Years			-1596	-1434
<p>FY06 funds decreased to support higher priority efforts.</p> <p>Two FY07 congressional adds totaling \$2683 (after adjustment for Congressional undistributed reductions) were added to this PE.</p> <p>(\$1725) ICT-Joint Fires &amp; Effects Training Systems                      (\$958) Vigilant Auto ID &amp; Access Control System</p>				

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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 2006 Actual	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	4929	5251	4833	4911	5102	5185	5307	5431	

**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 enable transition of basic and applied research resulting from PE0601104A, project J08 (Institute for Creative Technology) and PE 0602308A, project D02 (Modeling and Simulation for Training and 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 (RDECOM), Simulation and Training Technology Center, Orlando, FL.

<b><u>Accomplishments/Planned Program:</u></b>	<b><u>FY 2006</u></b>	<b><u>FY 2007</u></b>	<b><u>FY 2008</u></b>	<b><u>FY 2009</u></b>
Immersive Techniques: In FY06, matured artificial intelligence and immersive technologies to enable mentoring capabilities. Demonstrated a training and mission rehearsal environment that includes real and synthetic objects. Matured interfaces to support interoperability of virtual human environments with military simulations. Developed leaning environment prototype integrating mentoring and rapid scenario generation techniques. In FY07, assess and refine the integration of pedagogical and situational aspects of rapid scenario development techniques into immersive environments. Assess and refine the integration of intelligent mentoring capabilities into a single user immersive simulation learning environment. Demonstrate methods to integrate political, religious, and cultural traits into immersive environments. Demonstrate the integration of specific immersive environments that each enables critical urban characteristics. In FY08, will assess and refine methods to integrate political, religious, and cultural traits into immersive environment terrain. Will demonstrate methods to integrate cultural traits into avatars operating in interactive environments. Will assess and refine the integration of specific immersive environments that each enables critical urban characteristics. Will 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 larger 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.	4929	5103	4833	4911

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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>		
Small Business Innovative Research/Small Business Technology Transfer Programs		148		
<b>Total</b>	4929	5251	4833	4911

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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 2006 Actual	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	1444	1702	3774	3916	4007	4091	3481	3573	

**A. Mission Description and Budget Item Justification:** This project will mature and demonstrate 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 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 home-station 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 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 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. This project was established 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 (RDECOM), Simulation and Training Technology Center, Orlando, FL.

<b><u>Accomplishments/Planned Program:</u></b>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Embedded Techniques: In FY06, matured and demonstrated an integrated mounted and dismounted embedded training system that includes collaborative mission planning, rehearsal, and After Action Review capabilities. In FY07, create an embedded prototype capability supporting future systems demonstrating a live, virtual, and constructive training and mission rehearsal capability. Demonstrate human-terrain annotation for representation of cultural characteristics in military constructive simulation. In FY08, will conduct experiments with embedded training common components and will develop user interfaces to support deployable mission planning and rehearsal. Will mature and demonstrate the use of instructional development tools for adaptive learning environments. In FY09, will demonstrate an embedded training mission rehearsal capability using on current force vehicles and dismounted Soldiers in field exercise to mitigate risks associated with fielding embedded training in Future Force, Current Force, and ground Soldier systems. Will develop technologies associated with common embedded training components to provide a common implementation strategy.	1444	1654	3774	3916
Small Business Innovative Research/Small Business Technology Transfer Programs		48		
<b>Total</b>	<b>1444</b>	<b>1702</b>	<b>3774</b>	<b>3916</b>

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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>S31</b>		
COST (In Thousands)	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
S31 MATREX	10478	11141	10116	10175	11266	11347	11597	11852	

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

<b><u>Accomplishments/Planned Program:</u></b>	<b><u>FY 2006</u></b>	<b><u>FY 2007</u></b>	<b><u>FY 2008</u></b>	<b><u>FY 2009</u></b>
MATREX: In FY06, delivered MATREX to TRADOC including incremental updates that represent Network Effects Command and Control capabilities and Human-Centered Information Distribution to support evaluation of Network Centric Warfare. Supported FF development of Network, Effects, Maneuver, and Intelligence, Surveillance, and Reconnaissance (ISR) capability critical to the development of FF Integration and Verification Phase I architecture and milestones Advanced cross-Army M&S capability and re-use by maturing initial common data definitions. Developed a transition plan toward an interoperable cross-command and LSI environment for M&S. In FY07, deliver MATREX interoperable environment and integrated tool suite to TRADOC and ATEC. Integrate Maneuver Command and Control, Logistics, and environment capabilities. Enhance capability for end-to-end analysis in an environment that integrates NCW capabilities to support decision making. Implement more robust system-level verification and validation (V&V) of MATREX. Transition existing MATREX One Semi-Automated Forces (OneSAF) Testbed Baseline (OTB) based capabilities to an OneSAF Objective System (OOS) capability. In FY08, will extend MATREX capabilities to fully implement the TRADOC Integrated Process 3 (IP03) (Networked Fires, ISR, 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	10478	10831	10116	10175

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model a FF brigade combat team. Will update Simulation Initialization capability to shorten event setup time. Will implement a cross command data collection and analysis tools capability to provide an integrated acquisition support capability for Army decision making.				
Small Business Innovative Research/Small Business Technology Transfer Programs		310		
<b>Total</b>		<b>10478</b>	<b>11141</b>	<b>10116</b>

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