

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

**February 2006**

BUDGET ACTIVITY

PE NUMBER AND TITLE

**3 - Advanced technology development**

**0603015A - Next Generation Training & Simulation Systems**

COST (In Thousands)	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
Total Program Element (PE) Cost	26888	27927	18296	20319	20436	20700	20973
HB5 IMMERSIVE ENVIRONMENTS DEMONSTRATIONS (CA)	2396	2464	0	0	0	0	0
S28 INSTITUTE FOR CREATIVE TECH (ICT)- Adv Tech Dev	1571	5069	5310	5321	5320	5427	5535
S29 MODELING & SIMULATION - Adv Tech Dev	2784	1485	1720	3803	3923	4007	4091
S31 MATREX	12950	13142	11266	11195	11193	11266	11347
S33 TRAINING AND SIMULATION SYSTEMS INITIATIVES (CA)	7187	5767	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. 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 Future Combat Systems (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 program element 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 an 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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	FY 2005	FY 2006	FY 2007
<b><u>B. Program Change Summary</u></b>			
Previous President's Budget (FY 2006)	26900	19982	20710
Current BES/President's Budget (FY 2007)	26888	27927	18296
Total Adjustments	-12	7945	-2414
Congressional Program Reductions		-123	
Congressional Rescissions		-282	
Congressional Increases		8350	
Reprogrammings	-12		
SBIR/STTR Transfer			
Adjustments to Budget Years			-2414

FY 07 decrease of -2.4 million attributed to realignment of funding to higher priority requirements.

Four FY06 Congressional adds totaling \$8350 were added to this PE.

FY06 Congressional adds with no R-2A (appropriated amount is shown):  
 (\$4000) CAVE Automatic Virtual Environment - Desert Research Institute  
 (\$2500) Institute for Creative Technologies Joint Fires and Effects Trainer System  
 (\$1350) Medical Combined Arms Tactical Trainer - Hospital Based (MedCATT-HB)  
 (\$500) Vigilant Auto ID and Access Control System

# ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

**February 2006**

<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 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
S28	INSTITUTE FOR CREATIVE TECH (ICT)- Adv Tech Dev	1571	5069	5310	5321	5320	5427	5535

**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 & 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 (RDECOM), Simulation and Training Technology Center, Orlando, FL.

<b>Accomplishments/Planned Program</b>	<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>
Immersive Techniques - In FY05, integrated new algorithms and techniques for scenario development and execution into an immersive environment created for training. Developed the design for the single user environment that will integrate the techniques for coaching, mentoring and rapid scenario generation. In FY06, mature initiatives in artificial intelligence and immersive technologies that enable intelligent agent mentoring and coaching capabilities. Demonstrate a prototypical highly immersive multi-sensory environment that provides mixed reality (real and synthetic) objects for training and mission rehearsal. Mature the techniques and interfaces to support interoperability between the virtual human enabled immersive environment and the One Semi-Automated Forces system; develop single user immersive leaning environment prototype integrating techniques for coaching, mentoring and rapid scenario generation. Establish framework to insert cultural models into immersive environments to increase realism of training. In FY07, will demonstrate and assess the integration of rapid scenario development techniques, virtual humans and intelligent agent mentoring and coaching capabilities in a single user immersive simulation learning environment. Will develop the multi-user immersive leaning environment prototype that integrates the techniques for coaching, mentoring and rapid scenario generation. Will integrate cultural models into asymmetric immersive environment supporting training associated with the Global War on Terrorism.	1571	5069	5310
<b>Total</b>	1571	5069	5310

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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 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	
S29 MODELING & SIMULATION - Adv Tech Dev	2784	1485	1720	3803	3923	4007	4091	

**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 systems to include the Future Combat System (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 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 FCS 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.

<u>Accomplishments/Planned Program</u>	<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>
Embedded Techniques. - In FY05, developed and demonstrated an integrated prototype of mounted and dismounted soldier embedded training systems for small unit training and mission rehearsal while identifying interoperability issues with embedded training for vehicles and dismounted soldiers. Developed mounted and dismounted embedded training system prototype with integrated dismounted command and control system to identify issues related to adding C2 into future embedded training designs. Developed and demonstrated an initial distributed embedded After Action Review and mission rehearsal demonstration supporting the network-centric warfare concept. In FY06, mature and demonstrate an integrated mounted and dismounted embedded training system that includes collaborative mission planning, rehearsal and After Action Review capabilities. In FY07, will create a fully embedded soldier prototype capability supporting future Soldier systems demonstrating a man wearable, integrated live, virtual, and constructive training and mission rehearsal capability. Will develop distributed simulation environment with asymmetric human behavior representation and complex environment conditions and initiate integration of asymmetric immersive environment with combat unit training and instruction to include coalition forces.	2784	1485	1720
<b>Total</b>	<b>2784</b>	<b>1485</b>	<b>1720</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 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
S31 MATREX	12950	13142	11266	11195	11193	11266	11347

**A. Mission Description and Budget Item Justification:** This project provides the foundation for the Modeling Architecture for Technology, Research, and EXperimentation (MATREX) modeling and simulation (M&S) architecture which includes core integrated modeling and simulation architecture development efforts and associated collaborative environment and M&S component development efforts. The MATREX 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 Current and Future Force (FF) tactical network systems, the information that flows through that network, and the impact of this information on force effectiveness. Efforts include the creation of a MATREX-enabled Distributed Virtual Laboratory (DVL) that will be used to conduct collaborative distributed simulation experiments, studies, and analyses to facilitate acquisition decisions using the Simulation and Modeling for Acquisition, Requirements and Training (SMART) process. The DVL also will support 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 Future Combat System (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 Brigade Combat Team (BCT) within the context of a Unit of Employment (UE), enhancing the user's ability to study the Measures of Effectiveness of interest. The DVL will network geographically dispersed M&S assets, and therefore reduce the Army's cost of developmental testing, 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 Cross Command Collaboration Effort (3CE) will establish a common development, training, and testing environment to support the development and evaluation of FCS for PM FCS BCT by leveraging the MATREX DVL to bring together the M&S and networks of RDECOM component organizations, Army Test & Evaluation Command (ATEC), and Army Training and Doctrine Command (TRADOC). 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), Fort Belvoir, VA.

<b><u>Accomplishments/Planned Program</u></b>	<b><u>FY 2005</u></b>	<b><u>FY 2006</u></b>	<b><u>FY 2007</u></b>
- Modeling Architecture for Technology, Research, and EXperimentation (MATREX). In FY05, delivered MATREX (classified) to Future Combat System Lead Systems Integrator (FCS LSI) establishing environment for Simulation Virtual Framework; established MATREX-enabled Distributed Virtual Laboratory among Army S&T Modeling & Simulation (M&S) community; established baseline simulation environment for Current Force Modularity, FCS Spin-Outs, and Future Force experimentation, integration, and evaluation; initiated support of M&S architecture interoperability development across RDECOM, ATEC, & TRADOC. In FY06, deliver MATREX to FCS LSI, FCS Program Office and TRADOC including incremental updates that implement and integrate Network Effects Command & Control capabilities and Human-Centered Information Distribution to support evaluation of Network Centric Warfare (NCW); support FCS development of Network, Effects, Maneuver, and ISR for current, future, and Spin-Out 1 by delivering simulation infrastructure and capability critical to the development of FCS Integration & Verification Phase I architecture and necessary to support critical FY06 and FY07 FCS LSI milestones; advance cross-Army M&S capability and re-use by maturing initial Common Object Model; provide capabilities to FCS LSI in direct support of the FCS Program; develop a transition plan toward an interoperable cross-command and LSI environment for M&S. In FY07, will transition interoperable environment and integrated tool suite to support TRADOC and ATEC; will	12950	13142	11266

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integrate Maneuver Command & Control, Logistics, and environment capabilities; will deliver a capability that demonstrates end-to-end analysis in an environment that integrates NCW capabilities to support programmatic decisions throughout concept exploration, design, integration, logistics, and training.				
<b>Total</b>		12950	13142	11266