

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2005

BUDGET ACTIVITY
2 - Applied Research

PE NUMBER AND TITLE
0602784A - MILITARY ENGINEERING TECHNOLOGY

COST (In Thousands)	FY 2004 Actual	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	55531	52500	47046	48188	49685	50176	50612	50987
855 TOP,IMAGE INTEL&SPACE	14480	10521	11094	11894	12231	12363	12469	12561
H71 ATMOSPHERIC INVESTIG	5874	6504	6574	6757	6788	6923	6983	7035
T40 MOB/WPNS EFF TECH	16306	17094	16370	16542	17388	17472	17623	17752
T41 MIL FACILITIES ENG TEC	4620	4854	4904	5068	5148	5199	5245	5284
T42 COLD REGIONS ENGR TECH	3921	4269	4421	4540	4649	4701	4744	4780
T45 ENERGY TEC APL MIL FAC	2635	3123	3683	3387	3481	3518	3548	3575
T48 CENTER FOR GEOSCIENCES & ATMOSPHERIC RESEARCH	1753	1727	0	0	0	0	0	0
T49 UNIVERSITY PARTNERING FOR OPERATIONAL SUPPORT	2532	2492	0	0	0	0	0	0
T52 STATIONARY POWER AND ENERGY APPLIED RESEARCH (CA)	2435	958	0	0	0	0	0	0
T53 MILITARY ENGINEERING APPLIED RESEARCH (CA)	975	958	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: The objective of this applied research program element is to provide military engineering technologies in support of the Future Force and, where feasible, exploit opportunities to enhance Current Force capabilities. Research is conducted that supports special requirements for battlefield visualization, tactical decision aids, weather intelligence products, and capabilities to exploit space assets. Results are tailored to support the materiel development, test, and operations communities in evaluating the impacts of weather, terrain, and atmospheric obscurants on military materiel and operations. Major research efforts focus on: advanced distributed simulation including networking of models, complex data interchange, and collaborative training; military engineering including improving airfields and pavements, sustainment and cold regions engineering, vehicle mobility modeling, and reduced logistics footprint at base camps; facilities engineering including simulation of infrastructure capabilities for force projection, protection, and readiness; and battlespace environments including terrain awareness. This research will improve the efficiency and cost effectiveness of supporting the training/readiness/force projection missions in garrison and force sustainment missions in theaters of operation. Research is transitioned to PE 0603734A (Military Engineering Advanced Technology), PE 0603125A (Combating Terrorism, Technology Development), and to Project Managers (PM) such as PM Force Projection and Project Director, Combat Terrain Information Systems. The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army

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Modernization Plan, and the Defense Technology Area Plan (DTAP). Work in this program element is performed by the U.S. Army Engineer Research and Development Center that is headquartered at Vicksburg, Mississippi, and the Army Research Laboratory located at Aberdeen, Maryland.

<u>B. Program Change Summary</u>	FY 2005	FY 2006	FY 2007
Previous President's Budget (FY 2005)	47152	49693	51215
Current Budget (FY 2006/2007 PB)	52500	47046	48188
Total Adjustments	5348	-2647	-3027
Net of Program/Database Changes			
Congressional Program Reductions	-682		
Congressional Rescissions			
Congressional Increases	6400		
Reprogrammings			
SBIR/STTR Transfer	-370		
Adjustments to Budget Years		-2647	-3027

Change Summary Explanation:

Four FY05 Congressional adds totaling \$6400 were added to this PE.

FY05 Congressional adds with no R-2A:

(\$958) Distribute Transportable Synthetic Fuel Manufacturing Modules, Project T52: The purpose of this one year Congressional add is to fund research in transportable synthetic fuel manufacturing modules.

(\$1728) Geoscience and Atmospheric Research, Project T48: The objective of this one year Congressional add is to develop and transition technologies for enhanced operational effectiveness in Army and Air Force atmospheric science programs. No additional funding is required to complete this project.

(\$958) Modeling and Analysis of Response of Structures, Project T53: The purpose of this one year Congressional add is to fund research in the

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<p>modeling and analysis of response of structures. No additional funding is required to complete this project.</p> <p>(\$2493) University Partnership for Operational Support, Project T49: The objective of this one year Congressional add is to continue research in the area of atmospheric sciences for the purpose of providing operational solutions to environmental problems as identified by Army and Air Force users. No additional funding is required to complete this project.</p>		

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BUDGET ACTIVITY 2 - Applied Research			PE NUMBER AND TITLE 0602784A - MILITARY ENGINEERING TECHNOLOGY			PROJECT 855				
COST (In Thousands)			FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
855	TOP,IMAGE INTEL&SPACE		14480	10521	11094	11894	12231	12363	12469	12561
<p>A. Mission Description and Budget Item Justification: This project provides advanced technologies for storing, transforming, updating, and disseminating extremely large volumes of terrain and weather effects data at, or near, real-time and dynamic analysis and reasoning of this data to enable Future Force Command and Control Systems with superior knowledge of the battlespace terrain and environment. Work in this project significantly enhances the Army's geospatial data management and dissemination capabilities. Weather and atmospheric data is provided for this project through the Army Research Laboratory efforts funded in Project H71. 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 U.S. Army Engineer Research and Development Center that is headquartered at Vicksburg, Mississippi.</p>										
Accomplishments/Planned Program						FY 2004	FY 2005	FY 2006	FY 2007	
Data Generation – In FY04, tested, demonstrated and delivered capabilities to identify targets and characterize terrain, including urban terrain, using hyperspectral and Lidar data exploitation. In FY05 develop methods to generate features from multispectral imagery, soils, and collect data from wireless devices in theater; develop prototype capabilities that convert geographic information within intelligence messages or other non-structured data into geospatial data for spatial analyses. In FY06, will develop capabilities to geo-encode non-spatial sources to support planning and military decision-making process. In FY07, will develop tactical sensing capabilities to detect and geolocate chemical and biological agents, and other critical battlespace environment features.						3975	2256	1786	2555	
Data Management – In FY04, developed models and other capabilities to rapidly incorporate new terrain data into a geospatial database that will improve the analysis of time-sensitive geospatial information. In FY05 develop and release tools that automate the fusion of elevation data from various sources and registration of imagery from multiple sensors. In FY06, will complete end-to-end testing of geospatial data management methods and tools and transition tools to Army systems/services. In FY07, will develop tools to correlate and integrate/fuse geospatial data from various heterogeneous sources (including tactical sensors and other sources) into a common geospatial database that supports multiple applications.						6675	4680	4699	4425	

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Accomplishments/Planned Program (continued)			FY 2004	FY 2005	FY 2006	FY 2007
Data Analysis – In FY04, developed terrain reasoning tools that incorporate dynamic battlespace environmental effects prediction into commander's course-of-action (COA) analysis; transitioned terrain reasoning tools to the Commercial Joint Mapping Tool Kit (CJMTK) and Maneuver Command and Control (MC2); developed initial information models to assist aviators perform air maneuver route network planning. In FY05, develop and experiment with tactical bandwidth compatible terrain reasoning tools; develop information models and algorithms to solve multi-variable helicopter air maneuver route planning based on terrain, weather, and sensor effectiveness; develop initial spatial-temporal information constructs and terrain analysis capabilities for urban tactical battlespace environment planning. In FY06, will develop prototype situation and threat analysis tools that will incorporate time-sensitive COA information for Future Force applications addressing unit of action operations; will develop algorithms to solve maneuver route planning for helicopters and unmanned aerial vehicles. In FY07, will develop urban terrain reasoning tools that incorporate the effects of natural, man-made features and human activities into urban COA planning tools.			3830	3585	4609	4914
Totals			14480	10521	11094	11894

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BUDGET ACTIVITY 2 - Applied Research			PE NUMBER AND TITLE 0602784A - MILITARY ENGINEERING TECHNOLOGY				PROJECT H71			
COST (In Thousands)			FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
H71 ATMOSPHERIC INVESTIG			5874	6504	6574	6757	6788	6923	6983	7035
<p><u>A. Mission Description and Budget Item Justification:</u> The objective of this project is to perform the applied research for tactical weather and atmospheric effects algorithms, and for the integration of battlefield atmospheric environments simulations. The Army's transformation plan to the Future Force will require capabilities for battlefield commanders to make decisions based on tactical weather technology and impacts. This weather intelligence data will have to be not only accurate and timely, but distributed down to the lowest levels of command, which may include the individual soldier. This project accomplishes this mission by transitioning technology to the Project Director Integrated Meteorological System (PD-IMETS), and in the future to the Program Manager, Distributed Common Ground Station-Army (DCGS-A), through support to the Project Manager for Target Identification and Meteorological Systems (PM-TIMS) for field artillery systems, and to the Department of Defense (DoD) modeling community. It provides detailed model applications for various effects of the atmosphere on electro-optical and acoustic target detection, location and identification. This project devises both physics-based decision aids and rule-based expert systems for assessing the impacts of weather on a very broad spectrum of friendly and threat weapons systems, sensors, platforms, and operations. These can be applied for mission planning, battlefield visualization, optimum weather sensor and Reconnaissance Surveillance Target Acquisition (RSTA) sensor placement; route planning to maximize stealth and efficiency, tactical decision aids and modeling and simulation of weather impacts for combat simulations and war games. This project supports the Army's transformation to the Future Force and FCS through future applications and platforms that support echelons at Brigade and below, down to the individual soldier, and Defense Technology Objectives, Weather/Atmospheric Impacts on Sensor Systems, and On-Scene Weather Sensing and Prediction Capability. 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 Army Research Laboratory.</p>										

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PROJECT
H71

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0602784A - MILITARY ENGINEERING TECHNOLOGY	H71
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H71

Accomplishments/Planned Program	FY 2004	FY 2005	FY 2006	FY 2007
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FY 2005

FY 2006

FY 2007

2251

2399

2442

<p>Mature a new high resolution, short-range forecasting capability based on integrating new battlefield meteorological data sources (non-conventional meteorological sensors such as UAVs, robotic sensors, etc) into model initialization which will directly impact nowcast/very short-range forecast accuracy over the target area & provide much higher resolutions over the theater of operations. Implement a research version of an operational forecast/meteorological model that can ingest data from met satellites, UAV, and ground-based sensors. Research & verify the capability to host the model on battlefield processors, including battlefield fire support systems, to allow for autonomous generation of artillery meteorological message & production of near real time decision aids. In FY04, evaluated & modified model packages that include a micro-scale diagnostic model for very fine resolution combined with a meso-scale predictive model. Completed & evaluated a preliminary set of artillery-tailored decision aids. Modified & evaluated a research model for its ability to accept and process data from local and non-traditional sensors. Provided support to the PM TIMS for the developmental & operational test of artillery meteorological systems for fire support. In FY05, evaluate models with the most complete set(s) of modifications for insertion of meteorological data from non-traditional sources that are likely to exist on the future network-centric battlefield. Evaluate the modified research model for operation on processors that simulate those likely to be available to the network-centric future forces. In FY06, implement modifications based on field test results and complete a preliminary version of the research model that can ingest data from non-traditional sources. In FY07, implement & evaluate a combined set of atmospheric models that can produce analyses & nowcasts at very fine scales for urban & complex terrain regions and are capable of assimilating non-traditional data.</p>	2213	2251	2399	2442
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TECHNOLOGY**

PROJECT
H71

Accomplishments/Planned Program (continued)

Investigate critical value thresholds for weather impacts on friendly & threat systems for the rule-based Integrated Weather Effects Decision Aids & develop physics-based atmospheric effects models for operational combat mission planning, simulations & war games, and for sensor/weapon development. Mature the Acoustic Battlefield Aid (ABFA) and tri-service Target Area Weapons Software as key acoustic & EO decision aids. Integrate distributed client applications on mobile devices for "first in" decision aids & for "over watch" of lower echelons. Devise access to weather on embedded soldier & system processors. Integrate vegetation & terrain effects and infrasonic frequencies into ABFA to support intelligence analysis. In FY04, compression techniques for acoustic & infrasonic data retrieval were implemented. Analyzed acoustic and infrasonic signatures to characterize and identify the source. Completed/evaluated a set of artillery-tailored decision aids. Integrated atmospheric propagation into models for natural, nocturnal & artificial illumination to improve characterization of urban environment effects on signatures & target acquisition. Integrated weather impacts on signatures using the Weather & Atmospheric Visualization Effects for Simulation (WAVES) model suite. In FY05, create 3D acoustic propagation model for handling dynamic atmospheric inputs & complex ground surfaces to produce high-fidelity simulated signals & realistic environmental impact for acoustic sensors. Devise optical turbulence blur/feature distortion effects models to simulate performance differences & tradeoffs in sensor optics, detector spectral responses & signal processing methods. In FY06, integrate acoustic & seismic decision aid into a library of analysis modules tailored for user applications. Integrate a polarized radiative transport module in WAVES. In FY07, integrate route planning decision aids based on effects of winds, terrain, & weather hazards on platform performance.

FY 2004	FY 2005	FY 2006	FY 2007
1758	1930	2102	2148

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NG	PROJECT H71
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2 - Applied Research

0602784A - MILITARY ENGINEERING TECHNOLOGY	H71
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H71

Integrate high resolution boundary layer meteorological measurements with models to improve quantifying combat conditions in urban/complex terrains. Enable the continuous assimilation of real time, 3D Light Detection And Ranging (LIDAR) remotely sensed wind data into micro-scale urban wind models for near real time, 3D picture of the current atmosphere over urban/complex terrain. Devise weather satellites' data applications to improve battlefield sensing. Apply new data compression standards to demonstrate 25:1 or greater compression of 2D, 3D and 4D meteorological databases to reduce bandwidth requirements. Quantify the value added of additional battlefield surface observations & vertical profiles to improve objective analysis, short-term forecasts and decision aids. Devise/verify algorithms for optimum meteorological sensor placement. Perform detailed measurements of the urban meteorological environment for model development/verification. In FY04, completed research on laser-based techniques for aerosol detection/classification using polarization scattering for aggregate particles. In FY05, improve remote laser-based techniques for aerosol detection/classification. Investigate pattern classification techniques of background aerosols for class differentiation. Show the fusion of LIDAR urban wind measurements with a 3D urban wind model. In FY06, show urban aerosol characterization using remote sensing for identification/verification with in situ collected data. Measure, characterize & analyze meteorological data over urban/complex terrain. Investigate automation techniques for sorting aerosol particles by optical signatures to identify threat agents. In FY07, show a prototype automated MetSpaces information service with agents to collect/manage battlefield meteorological data & distribute model based products between echelons. Investigate the use of super-continuum LIDAR for remote spectral identification of chem/bio threat agents.

1903

2323

2073

2167

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BUDGET ACTIVITY 2 - Applied Research			PE NUMBER AND TITLE 0602784A - MILITARY ENGINEERING TECHNOLOGY				PROJECT T40			
COST (In Thousands)			FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
T40	MOB/WPNS EFF TECH		16306	17094	16370	16542	17388	17472	17623	17752
<p>A. Mission Description and Budget Item Justification: The objective of this project is to mature technology for rapid upgrading, construction, and repair of in-theater airfields; for overcoming battlespace gaps through prediction, definition, avoidance, or defeat; for expedient force protection during contingency operations; and for rapid port enhancement. This research supports development of the Future Combat Systems (FCS) and Future Force by providing physics-based representations of mobility, obstacle and barrier placement, survivability, and weapons effects in urban terrain modeling and simulation. Additionally, the project will mature technologies that will increase the survivability of critical assets from conventional and terrorist weapons, and maneuver support of deployed forces, while reducing their logistical footprint. 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 U.S. Army Engineer Research and Development Center that is headquartered at Vicksburg, Mississippi.</p>										

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PROJECT
T40

Accomplishments/Planned Program

Force Protection - In FY04, developed guidance for rapid construction of survivability and fighting positions tailored to urban environments to increase probability of survival of personnel and critical assets in urban structures by a minimum of 30% from enhanced blast and fragmentation weapons; evaluated expedient protective concepts for PATRIOT and Joint Tactical Ground Station in support of the Program Executive Office for Air, Space and Missile Defense. In FY05, increase the number of structural types that can be rapidly assessed from 13 to 20 structural types; develop protection upgrades for a variety of forward facilities. In FY06, will deliver algorithms for assessing the effectiveness of blast/fragment protection upgrades to structures in contingency environments that will increase the resistance of structures by 90% to 200% above current minimal protection. In FY07, will develop algorithms for survivability design and assessment tools, will develop low-cost, threat specific modular protective systems for large areas at about 1/5th the cost per square foot of advanced composite and ceramic armors.

FY 2004 FY 2005 FY 2006 FY 2007

4619 5000 4899 4667

Weapons Effects and Structural Response – In FY04, completed methodology to predict blast effects on structures protected by barriers, conducted experiments measuring airblast from adjacent buildings. In FY05, develop algorithms for predicting penetration of Army weapons into multiple thin construction layers; define mechanical properties of urban construction materials; estimate lethality and collateral damage for range of urban target structures using existing weapons effects prediction methods. In FY06, will start creation of appropriate analysis algorithms to fill gaps in MOUT lethality modeling. In FY07, will finalize analytical procedures for predicting multi-threat objective projectile/target performance; will produce predictive capability for scaleable weapons effects on structures.

2145 1481 1266 1180

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TECHNOLOGY**

PROJECT
T40

Accomplishments/Planned Program (continued)

Force Projection/Joint Rapid Airfield Construction - In FY04, completed characterization of unbound pavement materials and selected assessment technologies for rapid airfield construction. In FY05, complete modeling of thawing pavement foundations. In FY06, will develop integrated site selection tools. In FY07, will determine rapid repair techniques, shear-resistant stabilizers, and dust control materials for C-17 capable contingency airfields. Rapid Port Enhancement - In FY04, performed coastal throughput assessment for rapid force projection and sustainment operations for a particular theater of operation, including assessment of capabilities to meet force projection demands associated with the Army Transformation; tested database methodology for current Theater Support Vessel design capabilities and provided parameters affecting throughput for development of the Small Port Throughput Simulation Model. In FY05, integrate the Small Port Throughput Simulation Model into larger-scaled modeling systems and applications; conduct intermediate-scale experiments for the Lightweight Modular Causeway System (LMCS). In FY06, will finalize design of LMCS and complete the Small Port Throughput Simulation Model.

FY 2004	FY 2005	FY 2006	FY 2007
4672	4823	4585	3982

Maneuver Support/Gap Defeat – In FY04, identified and evaluated technologies for physically measuring critical terrain gap parameters to improve gap reconnaissance techniques. In FY05, evaluate concepts for defeating gaps less than four meters wide through simulation and analyses; determine mobility performance attributes for advanced vehicle platforms such as small unmanned ground vehicles; create hydrologic decision analysis capability for wet gaps to provide rapid in-theater maneuver assessment for the warfighter. In FY06, will integrate reconnaissance technologies for characterizing critical features of terrain gaps less than 4 meters wide and conduct evaluations of gap crossing technologies in simulated environments; will create a force response element that represents the soil/snow for any motion system operating in real time simulated environments. Future Force Breaching - In FY05, conduct experiments that define breaching effectiveness for hand-placed and standoff demolitions against structures. In FY06, will experimentally evaluate wall breaching capabilities of specific ARDEC candidate demolition devices. In FY07, will produce capability to predict the performance of hand-placed and standoff demolition devices on structures.

3100	3900	3904	2242
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<u>Accomplishments/Planned Program (continued)</u>			FY 2004	FY 2005	FY 2006	FY 2007
Battlespace Environment Support - In FY04, created innovative common maneuver information products for entity and aggregate level maneuver networks such as Battlespace Terrain Reasoning and Awareness (BTRA) and the OneSAF Objective System (OOS) constructive, entity-level simulation; matured solutions for predicting future performance of roads, bridges, and naturally occurring static obstacles to expedite throughput assessment over enhanced maneuver networks; created logistics support models for timing, resourcing, and deconfliction over tactical routes. In FY05, mature unique scaling and adaptive algorithms between entity and aggregate level maneuver networks including procedures to correlate and modify data structures between BTRA and OOS; develop a data model schema and structure with broader community applicability for simulation to C4ISR interoperability; mature advanced throughput models for intelligent maneuver decisions including bypass options, route planning, resourcing, and management tools, determine combined effects of static and dynamic obstacles on maneuver planning tools, provide functional components to create a common integrated obstacle overlay capability; advance tactical analyses of urban terrain and population as they pertain to the spectrum of military operations. In FY06, will develop capability for transferring additional high-priority BTRA maneuver-related information products to OOS and other applications, will introduce extensions for computer-generated forces behaviors supporting training and course of action development and analysis. In FY07, will develop and refine products/procedures for interoperability; will expand scaling as required based on set of BTRA information products; will incorporate additional behaviors and related components as necessary to support training and course of action development and analysis.			1770	1890	1716	1523
Remote Assessment/Rapid Analysis – In FY07, begin to develop technologies for infrastructure reconnaissance for urban operations, for rapid target/structural characterization, and for remote battle damage assessment for fixed assets.			0	0	0	2948
Totals			16306	17094	16370	16542

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BUDGET ACTIVITY 2 - Applied Research			PE NUMBER AND TITLE 0602784A - MILITARY ENGINEERING TECHNOLOGY				PROJECT T41			
COST (In Thousands)			FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
T41	MIL FACILITIES ENG TEC		4620	4854	4904	5068	5148	5199	5245	5284
<p>A. Mission Description and Budget Item Justification: The objective of this project is to perform applied research necessary to deliver sustainable, cost efficient and effective facilities; and provide installation operations required to support the Future Force. The project focuses on advanced facilities and operations technologies directly supporting training, readiness, force projection, force protection, homeland security and forward basing. In addition, planned facility enhancements will achieve cost reduction in the Army facility life cycle process (infrastructure planning, assessment, design, construction, revitalization, sustainment, and disposal), and the supporting installation operations. This work will improve the ability of installations to support forces to meet transformation goals and to enhance security of soldiers, families and civilians. Technologies evolving from this work include integrated planning and design tools for CONUS facilities and forward bases, models predicting airborne dispersed chemical, biological, and radiological (CBR) effects on facilities and occupants; sustainable facility management; and collaborative decision support. 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 U.S. Army Engineer Research and Development Center that is headquartered at Vicksburg, Mississippi.</p>										

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PROJECT
T41

Accomplishments/Planned Program

Facility Engineering – In FY04, completed development and recommended rehabilitation procedures for seismic upgrades to roofing diaphragms; developed innovative strategies and business practices for life cycle commissioning of facilities to support CBR protection. In FY05, complete initial beta version of model to depict CBR airborne dispersion rates in military facilities, and establish performance related requirements for building envelopes, and complete forward facility planning tools. In FY06, will complete a forward facility site selection decision aid that will enable the Unit of Employment to quickly establish forward operating locations. In FY07, will complete protocols for determining boundary conditions (building exterior and interior) and boundary condition models for use by facility designers and operators to protect DoD facilities from air borne chemical and biological agents.

FY 2004 FY 2005 FY 2006 FY 2007

2336 3000 4904 5068

Facility Modeling and Simulation/Fort Future – In FY04, delivered to USACE and ACSIM a decision support environment that used modeling and simulation to test and validate the ability of installation infrastructure investments to meet future force deployments, training readiness, facilities and anti-terrorism requirements. In FY05, validate prediction and optimization algorithms for installation capability to support Army Installation Transformation; extend force projection algorithms to cover multiple, regional installations.

2284 1854 0 0

Totals

4620 4854 4904 5068

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COST (In Thousands)			FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
T42	COLD REGIONS ENGR TECH		3921	4269	4421	4540	4649	4701	4744	4780
<p>A. Mission Description and Budget Item Justification: This project provides warfighters with an accurate and timely understanding of the battlespace environment's effect on personnel, platforms, sensors, and systems in order to develop improved tactics, techniques, procedures, and plans that ensure information superiority, situational awareness, and force projection. Specifically, this project seeks solutions for minimizing or eliminating the adverse effects of dynamically changing terrain states on sensing capabilities, engineer construction, and tactical maneuver conducted by the Army. To achieve this, effective decision-making tools such as models, simulations, and mission planning and rehearsal factors are required that accurately predict the state of the ground, near-surface atmospheric conditions, and system performance in complex environments. 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 U.S. Army Engineer Research and Development Center that is headquartered at Vicksburg, Mississippi.</p>										

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PROJECT
T42

Accomplishments/Planned Program

Terrain State – In FY04, advanced terrain state modeling and incorporated region/area specific probability detection functions defining background clutter impact on sensor performance for Battlespace Terrain Reasoning and Awareness tactical decision aids; completed assessments for strengthening indigenous soils during thaw periods for rapid all-season construction of forward theater airfields, and extended finite element modeling of tire-terrain interactions to these materials. In FY05, develop models and tactical decision aids for incorporating weather impacts on terrain into the Future Combat Systems commander's mobility analysis and course-of-action decision tools; establish initial suite of remote site assessment, evaluation and selection decision aids for Joint Rapid Airfield Construction; mature and transition to the U.S. Army Tank Automotive Research, Development and Engineering Center vehicle simulator, high resolution 3-dimensional vehicle-terrain interaction algorithms for simulating terrain surfaces of snow, semi-frozen and thawing soils at the Ethan Allen Firing Range test track in Vermont. In FY06, will complete formulation for all-season, all-terrain, 3-dimensional soil modeling for input to ground platform and terrain mechanics simulations; will complete model parameterization for vegetation and ground surface processes for tactical terrain analysis. In FY07, will formulate new model of energy and mass exchange for exterior urban surfaces to support target surveillance and reconnaissance; will validate models of radiant temperatures of urban exterior surfaces.

FY 2004	FY 2005	FY 2006	FY 2007
3086	3409	3351	3405

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BUDGET ACTIVITY 2 - Applied Research		PE NUMBER AND TITLE 0602784A - MILITARY ENGINEERING TECHNOLOGY			PROJECT T42	
<u>Accomplishments/Planned Program (continued)</u>			FY 2004	FY 2005	FY 2006	FY 2007
Signature Physics – In FY04, developed tactical complex terrain thermal modeling tools for urban and complex features; completed assessment of acoustic propagation in forested terrain and established a methodology for modeling propagation in complex/urban environments; initiated high-fidelity acoustic propagation simulation and dynamic acoustic vehicle signature model and established basis for developing generic performance criteria for unattended seismic ground sensor tactical decision aids in support of the Networked Sensors for the Future Force (NSfFF) program. In FY05, complete high-fidelity acoustic propagation simulation and dynamic acoustic vehicle signature model and mature algorithms to self adapt unattended ground sensors for local geologic effects in support of NSfFF; develop query and subscription based incorporation of signature physics tool set (e.g., weather induced terrain state) with the Command and Control in Complex and Urban Terrain program collaboration tools. In FY06, will complete wide area infrared targeting template based on terrain-weather phenomena for wide range of targets and backgrounds. In FY07, will formulate new approaches to multi-sensor fusion (e.g., acoustic and seismic) and optimization based on propagation phenomenology in a complex battlespace environment.			835	860	1070	1135
Totals			3921	4269	4421	4540

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)						February 2005				
BUDGET ACTIVITY 2 - Applied Research			PE NUMBER AND TITLE 0602784A - MILITARY ENGINEERING TECHNOLOGY				PROJECT T45			
COST (In Thousands)			FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
T45 ENERGY TEC APL MIL FAC			2635	3123	3683	3387	3481	3518	3548	3575
<p>A. Mission Description and Budget Item Justification: The objective of this project is to provide technologies necessary for secure, energy efficient, sustainable military installations, emphasizing energy and utility systems protection from, and in response to, evolving threats such as chemical, biological, and radiological (CBR) attacks. Advanced energy technologies and processes are also applied to the Army's industrial base to maintain its cost-effective readiness for munitions production, and in the theater of operations to reduce logistical footprint. 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 U.S. Army Engineer Research and Development Center that is headquartered at Vicksburg, Mississippi.</p>										
Accomplishments/Planned Program							FY 2004	FY 2005	FY 2006	FY 2007
Energy and Utility Systems Response to Threats – In FY04, analyzed supply and demand technologies allowing for an integrated building control system that provides for a highly reliable platform for chemical and biological protection and energy efficiency. In FY05, develop indoor performance analysis tools for building mechanical systems consistent with chemical and biological protection needs, and complete initial beta version of model to depict chemical and biological water borne dispersion rates in water systems. In FY06, will validate CBR analysis tools in a controlled test facility. In FY07, will compare tool analyses to an instrumented Army facility using simulated chemical and biological agents.							1245	1943	2171	3387
Installation Modeling and Simulation/Fort Future – In FY04, matured dynamic risk models to analyze supply and demand of energy/environment distribution systems to include CBR terrorist threat scenarios for critical military facilities. In FY05, develop integrated tools for judging suitability of energy infrastructure to support power projection, readiness, threat assessment, and sustainability requirements. In FY06, will extend simulations for power, water, and fuel infrastructure analysis to forward staging areas.							1390	1180	1512	0
Totals							2635	3123	3683	3387