ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2004

BUDGET ACTIVITY
2 - Applied Research

PE NUMBER AND TITLE
0602784A - MILITARY ENGINEERING TECHNOLOGY

	COST (In Thousands)	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
	Total Program Element (PE) Cost	54562	51577	47152	49693	51215	50932	51916
855	TOP,IMAGE INTEL&SPACE	9699	10174	10786	11796	12103	12147	12372
H71	ATMOSPHERIC INVESTIG	6211	5891	6619	6837	6960	6824	7016
T40	MOB/WPNS EFF TECH	16331	16318	17345	18289	19123	18979	19310
T41	MIL FACILITIES ENG TEC	4496	4624	4881	4942	5060	5010	5097
T42	COLD REGIONS ENGR TECH	3924	3949	4315	4446	4523	4515	4600
T45	ENERGY TEC APL MIL FAC	2849	2971	3206	3383	3446	3457	3521
T48	CENTER FOR GEOSCIENCES & ATMOSPHERIC RESEARCH	1142	1743	0	0	0	0	0
T49	UNIVERSITY PARTNERING FOR OPERATIONAL SUPPORT	3240	2517	0	0	0	0	0
T52	STATIONARY POWER AND ENERGY APPLIED RESEARCH (CA)	6670	2421	0	0	0	0	0
T53	MILITARY ENGINEERING APPLIED RESEARCH (CA)	0	969	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, exploits 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 support 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; Command, Control, Communications and Computers (C4) technology, including terrain awareness, Command and Control (C2) software, communications software and components; and Intelligence, Surveillance and Reconnaissance (ISR) technology, including signal processing, automatic target recognition, and Radio Frequency (RF) sensors/devices. This research will improve the efficiency and cost effectiveness as it relates to supporting the training/readiness/force projection missions in garrison and force sustainment missions in theaters of operation.

Research is transitioned to program element 0603734A (Military Engineering Advanced Technology), program element 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 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.

B. Program Change Summary	FY 2003	FY 2004	FY 2005
Previous President's Budget (FY 2004)	55304	45407	46034
Current Budget (FY 2005 PB)	54562	51577	47152
Total Adjustments	-742	6170	1118
Congressional program reductions		-488	
Congressional rescissions			
Congressional increases		7900	
Reprogrammings	-742	-1242	
SBIR/STTR Transfer			
Adjustments to Budget Years			1118

Significant Change Explanation:
FY04 - Five FY04 Congressional adds totaling $7900 were added to this PE.

Projects with no R-2As:
- ($1691) Geosciences 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.
- ($2442) 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.

- ($1410) DoD Stationary Fuel Cell Incentive Progam, Project T52: The objective of this one year Congressional add is to support the development and commercialization of domestic stationary fuel cell systems. No additional funding is required to complete this project.
- ($939) Advanced Power and Energy Program, Project T52: The objective of this one year Congressional add is to investigate fuel flexibility for solid oxide fuel cells (SOFCs), develop hybrid fuel cell concepts utilizing SOFCs, and investigate future power generation options for the military. No additional funding is required to complete this project.
- ($940) Shuttle Radar Topography Mission Data Evaluation, Project T53: The objective of this one year Congressional add is to validate the data accuracy and quality of Shuttle Radar Topography Mission elevation data to satisfy Army high resolution requirements. No additional funding is required to complete this project.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602784A - MILITARY ENGINEERING TECHNOLOGY**	**855**

COST (In Thousands)	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
855 TOP,IMAGE INTEL&SPACE	9699	10174	10786	11796	12103	12147	12372

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 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 project H71 in this program element. 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 located at Vicksburg, Mississippi.

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Data Generation – In FY03, developed algorithms and demonstrated capability to identify targets and classify terrain using hyperspectral data exploitation. In FY04, test, demonstrate and deliver capabilities to identify targets and classify terrain using hyperspectral data exploitation. In FY05, will develop methods to detect and quantify small geomorphic features, estimate surface moisture, and delineate drainage features that impact FCS mobility. Will adopt and modify Commercial Off-The-Shelf (COTS) or Government Off-The-Shelf (GOTS) software that converts intelligence messages or other non-structured data into geospatial data for spatial analyses. Will transition these developments to Project Director, Combat Terrain Information System to support tactical analysis and decision making.	3782	2818	2481
Data Management – In FY03, developed automated multi-feature registration capability from multiple sensors that doubled the positional accuracy of the data. This capability was transitioned to ten government programs from various Army and Defense agencies. In FY04, develop 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, will develop and release tools that automate the fusion of elevation data from various sources and registration of imagery from multiple sensors.	1746	4629	5393

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Data Analysis – In FY03, developed geospatial tools and temporal terrain reasoning tools, which provide the capability to extract the fundamental elements of course-of-action (COA) analysis. In FY04, develop terrain reasoning tools that incorporate dynamic battlespace environmental effects prediction into commander's COA analysis. Transition terrain reasoning tools into the Commercial Joint Mapping Tool Kit and Maneuver Command and Control (MC2). In FY05, will create terrain reasoning capability that incorporates time-sensitive COA information for Future Force applications addressing unit of action operations. Will develop an air maneuver network route planning capability that combines the use of terrain, weather, and sensor effectiveness using methods that can be coordinated with ground maneuver planning. Will transition these developments into the Commercial Joint Mapping Tool Kit, MC2, and Digital Topographic Support System.	2328	2616	2912
Data Representation - In FY03, developed an environmental data model for the Urban Tactical Planner using the Common Data Model framework.	1843	0	0
Small Business Innovative Research/Small Business Technology Transfer Programs	0	111	0
Totals	9699	10174	10786

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602784A - MILITARY ENGINEERING TECHNOLOGY**	**H71**

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
H71	ATMOSPHERIC INVESTIG	6211	5891	6619	6837	6960	6824	7016

A. Mission Description and Budget Item Justification: 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), 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 the weather data from forecast/nowcast models, the distributed four dimensional (4D) weather database, and the weather decision aids that use this data for the digital battlefield commander by 1) applying advanced computer techniques, 2) incorporating new technology in meteorological sensor and system designs, 3) researching data fusion techniques to horizontally integrate data from advanced weather sensors and non-weather sensors into decision aids for enhanced combat power on the battlefield and enhanced effectiveness of field artillery and deep attack assets. 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.

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Mature a new high resolution, short-range forecasting capability based on integrating new battlefield meteorological data sources (non-conventional meteorological sensors such as Unmanned Aerial Vehicles, Unattended Ground Sensors, and robotic sensors) into model initialization, which will directly impact nowcast/very short-range forecast accuracy especially over the target area, and provide much higher resolutions over the theater of operations. In FY03, applied a test set of methods for integration of non-traditional meteorological data sources to Army meteorological forecast models. This allows for the comprehensive utilization of disparate data sources available within the confines of the battlefield to improve the decision-making and execution cycles. Began evaluation of the modified models with emphasis on target areas and short-term forecasts that will lead to enhanced lethal deployment of munitions within the target area. In FY04, evaluate and modify as needed model packages that include a microscale diagnostic model for very fine resolutions nested in a mesoscale predictive model. In FY05, evaluate models with a complete set of modifications for insertion of likely sources of meteorological data from the battlefield. Evaluate model package for very fine scale analysis that uses data from non-traditional sources likely to exist on the net-centric battlefield.	1997	1855	2112
Implement a research version of a “state of the art” operational meteorological model that has software for ingesting data from meteorological satellites, Unmanned Aerial Vehicles, and distributed ground-based sensors. Research and test the capability to host the model on battlefield fire support platforms to allow for fully autonomous artillery meteorological message generation during battle. In FY03, completed modification of the model (MM5) to accept weather data from local and non-traditional sensors for improved meteorological data collection and utilization. Served as the subject matter experts and evaluated artillery improvement algorithms using the research model. These reviews have led to a focused development and fielding of artillery specific meteorological systems. In FY04, complete and evaluate a set of artillery-tailored decision aids. Modify and evaluate the research model for its ability to accept and process data from local and non-traditional sensors. Serve as subject matter experts for developmental and operational test of meteorological systems for fire support. In FY05, evaluate the modified research model for operation on processors that simulate those likely to be available in the net centric future forces. Evaluate the gain in accuracy of the modified model.	1195	1151	1300

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Integrate distributed weather client applications and database connectivity with the Army Battle Command System or other Command, Control, Communications, Computing and Intelligence (C4I) systems identified for Future Combat Systems Command and Control "on the move" in order to utilize new weather effects decision aid technology at lower echelons through hand-held visualization devices such as Personal Digital Assistants (PDAs). Incorporate sets of weather algorithms that can be integrated into existing soldier and system embedded processors describing basic information for the individual soldier on current terrain and weather conditions, weather forecasts, weather warnings, heat stress, canteen use, and meteorological satellite imagery. In FY03, augmented the capability of the PDA to accept and process data from "reachback" databases that has led to increased capability and timeliness. Upgraded the number and application of the PDA software for weather effects decision aids providing a capability for commanders at all echelons to have immediate and timely support for the decision making and execution cycles. In FY04, mature an upgraded capability to access and process data from other battlefield processors that will have applicability to the Future Force. Evaluate the PDA software in tests that evaluate its effectiveness. In FY05, implement software on the PDA that can be used as part of a package of software for the wearable computer for soldier.	629	644	817

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Increase effectiveness of target acquisition in urban and other domains by applying advances in optical characterization research for atmospheric effects on modern small aperture sensors and lasers, and new models for the effects of nighttime light scattering due to urban light pollution on night sensors into advanced tactical decision aids for use in Reconnaissance, Surveillance and Target Acquisition (RSTA) planning, special operations, and Future Force Warrior. Integrate hyperspectral and polarimetric imagery to extend target signature analysis, improve target acquisition capabilities and evaluate polarimetric imaging techniques, including improved imager performance against camouflage and decoys. Incorporate these polarimetric imaging techniques into sensor platforms being devised for the Future Combat Systems. In FY03, evaluated environmental effects on polarimetric imaging for support of Army missile systems. Completed approximately 3,000 new rule thresholds for various weapons systems, both friendly and threat, that will be used in creating new generation of physics-based tactical decision aids. Interfaced enhanced weather effects into Army Warfare System/Joint Warfare System (AWARS/JWARS) war games for a more realistic depiction of real-time atmospheric effects on operations and systems. In FY04, integrate atmospheric propagation effects with models for natural, nocturnal and artificial illumination to improve characterizing the effects of urban environments on signatures and target acquisition; integrate direct weather impacts on signatures by using the Weather and Atmospheric Visualization Effects for Simulation suite of models. In FY05, devise optical turbulence blur and feature distortion effects models to simulate performance differences and tradeoffs in sensor optics, detector spectral responses and signal processing methods under different environments.	1069	1006	1119
Measure single particle fluorescence spectra and scattering signatures of biological and natural aerosols in the atmospheric boundary layer. In FY03, created algorithms to use these measurements to improve chemical/biological aerosol characterization capability. Characterized the natural background by using rapid aerosol agent detection techniques. In FY04, research laser based techniques for aerosol detection/classification using polarization scattering for aggregate particles. In FY05, improve other laser-based techniques for aerosols detection/classification including broadband Light Detection and Ranging (LIDAR) for size distribution and concentrations.	944	902	928

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Integrate the effects of vegetation and terrain on acoustic propagation into a battlefield decision aid and extend the acoustic decision aids to infrasonic frequencies for intelligence operations. In FY03, established an infrasound test site and devised an infrasonic signature database that will be used in the enhancement of tactical decision aids that will provide commanders with the capabilities to utilize acoustic technology for not only detection of enemy placements, but also to hide troop movements. In FY04, implement high compression techniques for acoustic and infrasonic data retrieval. Analyze acoustic and infrasonic signatures to characterize and identify the source. In FY05, create a first principle, three dimensional (3D) propagation model capable of handling dynamic atmospheric inputs and complex ground surfaces to produce high-fidelity simulated signals and realistic environmental impact for acoustic sensors.	377	320	343
Small Business Innovative Research/Small Business Technology Transfer Programs	0	13	0
Totals	6211	5891	6619

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602784A - MILITARY ENGINEERING TECHNOLOGY**	**T40**

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
T40	MOB/WPNS EFF TECH	16331	16318	17345	18289	19123	18979	19310

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; overcoming battlespace gaps through prediction, definition, avoidance, or defeat; expedient protection for the warfighter during contingency operations; and rapid port enhancement. This research supports development of the Future Combat Systems (FCS) and Future Force by providing physics-based representation of mobility, obstacle and barrier creation, 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.

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Force Protection - In FY03, developed systematic procedures to identify construction methods and characterize their material properties. This development will characterize buildings world-wide based on 20 structural types. In FY04, develop guidance for rapid construction of survivability and fighting positions tailored to urban environments. This effort will increase probability of survival of personnel and critical assets in urban structures by a minimum of 30% from enhanced blast and fragmentation weapons. Evaluate 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, will increase the number of structural types that can be rapidly assessed from 13 to 20 structural types. Will develop protection upgrades for facilities supporting Air and Missile Defense assets.	1960	4732	5203
Weapons Effects and Structural Response – In FY03, produced methods for predicting blast effects on unprotected structures and ground shock effects in different rock types, and improved techniques for predicting high velocity penetration into structural materials, such as concrete. In FY04, complete methodology to predict blast effects on structures protected by barriers. Conduct experiments measuring airblast from adjacent buildings. In FY05, will conduct investigations of one-stop breaching methods. Will produce algorithms for predicting penetration of Army weapons into multiple thin construction layers.	2613	2285	2602

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Materials and Criteria for Protective Construction – In FY03, matured elastomeric polymer structural retrofit capabilities for protection of conventional construction.	1960	0	0
Force Projection/Joint Rapid Airfield Construction - In FY03, integrated advanced construction technologies to enhance airfield construction productivity. In FY04, demonstrate improved construction techniques and C-130 capable technology. In FY05, will develop advanced stabilization techniques to reduce cure time from 30 days to 1-2 days while reducing logistical footprint. Rapid Port Enhancement - In FY03, modified the Coastal Integrated Throughput Model to include attributes and capabilities of the Theater Support Vessel and rapid port enhancement products. Determined rapid force projection and sustainment Sea Port of Debarkation enhancement requirements for future sealift operational scenarios; produce initial suite of overall port enhancement design concepts including application of “hydro-beam” technologies and integration of coastal climatological database system; produced Coastal Integrated Throughput Model Version III, including stochastic modeling capability. In FY04, perform coastal throughput assessment for rapid force projection and sustainment operations for a particular theater of operation to include assessment of capabilities to meet force projection demands associated with the Army Transformation; test database methodology for final Theater Support Vessel design capabilities and provide parameters affecting throughput to the Coastal Integrated Throughput Model. In FY05, will integrate Coastal Integrated Throughput Model into larger-scaled modeling systems and applications; conduct intermediate-scale experiments for "hydro-beam" causeway and near-shore breakwater.	3593	4569	4510
Maneuver Support – In FY03, evaluated solutions for rapidly assessing condition and predicting future performance of roads and bridges in theater of operations to expedite route planning. In FY04, identify and evaluate technologies for physically measuring critical terrain gap parameters to improve gap reconnaissance techniques. In FY05, will evaluate concepts for defeating gaps less than four meters wide through simulation and analyses. Will determine mobility performance requirements for advanced vehicle platforms such as FCS. Will quantify maneuverability within urban environments on the future battlefield. Will create hydrologic decision analysis capability for wet gaps to provide rapid in-theater maneuver assessment for the warfighter.	4082	2937	3122

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Battlespace Environment Support - In FY03, developed realistic mobility portrayals as a function of short-term changes in the ground-state to support unit movement evaluation. Provided digital reconnaissance applications to allow rapid remote main supply route assessments via TeleEngineering. In FY04, create innovative common maneuver information products for entity and aggregate level maneuver networks such as Battlespace Terrain Reasoning and Awareness (BTRA) and the One Semi-Automated Forces (OneSAF) constructive model. Mature solutions for predicting future performance of roads, bridges, and naturally occurring static obstacles to expedite throughput assessment over enhanced maneuver networks. Create logistics support models for timing, resourcing, and deconfliction over tactical routes. In FY05, will mature unique scaling and adaptive algorithms between entity and aggregate level maneuver networks including procedures to correlate and modify data structures between BTRA and OneSAF. Will mature advanced throughput models for intelligent maneuver decisions including bypass options, route planning, resourcing, and management tools. Will determine combined effects of static and dynamic obstacles on maneuver planning tools. Will provide functional components to create a common integrated obstacle overlay capability.	2123	1795	1908
Totals	16331	16318	17345

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602784A - MILITARY ENGINEERING TECHNOLOGY**	**T41**

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
T41	MIL FACILITIES ENG TEC	4496	4624	4881	4942	5060	5010	5097

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 project 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.

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Facility Modeling and Simulation/Fort Future – In FY03, simulated force projection flow through the installation in order to provide a local optimization tool and to enable a risk-based approach to investing in mission-critical infrastructure. Developed an Installation Mission Essential Task List requirements process to directly tie resource decisions to unit mission. Modeled facility requirements to produce rapid parametric cost estimates, thereby optimizing facility programming decisions. In FY04, deliver a decision support environment that will use modeling and simulation to test and validate the ability of installation infrastructure investments to meet Future Force force projection, training readiness, facilities and anti-terrorism requirements. In FY05, will validate prediction and optimization algorithms for installation capability to support Army Installation Transformation. Will extend force projection algorithms to cover multiple, regional installations.	2203	2265	1855
Facility Engineering – In FY03, generated analytical models and design guidance for seismic rehabilitation of reinforced concrete frames with masonry infill to comply with current seismic criteria. In FY04, complete the development and recommend rehabilitation procedures for seismic upgrades to roofing diaphragms. Develop innovative strategies and business practices for life-cycle commissioning of facilities to support CBR protection. In FY05, will complete initial beta version of model to depict CBR airborne dispersion rates in military facilities, and establish performance related requirements for building envelopes. Will complete forward facility planning tools.	2293	2358	3026
Small Business Innovative Research/Small Business Technology Transfer Programs	0	1	0
Totals	4496	4624	4881

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602784A - MILITARY ENGINEERING TECHNOLOGY**	**T42**

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
T42	COLD REGIONS ENGR TECH	3924	3949	4315	4446	4523	4515	4600

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.

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Terrain State – In FY03, developed realistic winter mobility portrayal of terrain conditions as a function of short-term changes in the ground state to support unit movement projections. Completed a site assessment methodology and established criteria for the remedy of high moisture content soils for assault airfield construction. Developed all-season material models that simulate the mechanical behavior of different terrain materials (freezing/thawing soil), ice, and snow to improve simulation of vehicle-terrain interaction in support of the High Fidelity Ground Platform and Terrain Mechanics Modeling program. In FY04, advance terrain state modeling and incorporate region/area specific probability detection functions defining background clutter impact on sensor performance for Battlespace Terrain Reasoning and Awareness tactical decision aids. Complete assessments for strengthening indigenous soils during thaw periods for rapid all-season construction of forward theater airfields. Extend finite element modeling of tire-terrain interactions to these materials. In FY05, will 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. Will establish initial suite of remote site assessment, evaluation and selection decision aids for Joint Rapid Airfield Construction. Will 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.	3100	3099	3452

Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Signature Physics – In FY03, finalized high fidelity seismic propagation modeling. Modified terrain thermal model to include a wider range of manmade materials in support of the Army Research Laboratory (ARL) Command and Control in Complex and Urban Terrain program. In FY04, develop tactical complex terrain thermal modeling tools for urban and complex features. Complete assessment of acoustic propagation in forested terrain and establish a methodology for modeling propogation in complex/urban environments. Initiate high-fidelity acoustic propogation simulation and dynamic acoustic vehicle signature model and establish 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) ATD. In FY05, will 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. Will develop query and subscription based incorporation of signature physics tool set (e.g., weather induced terrain state) with the ARL Command and Control in Complex and Urban Terrain program collaboration tools.	824	824	863
Small Business Innovative Research/Small Business Technology Transfer Programs	0	26	0
Totals	3924	3949	4315

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

February 2004

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602784A - MILITARY ENGINEERING TECHNOLOGY**	**T45**

COST (In Thousands)	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
T45 ENERGY TEC APL MIL FAC	2849	2971	3206	3383	3446	3457	3521

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). 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.

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Installation Modeling and Simulation/Fort Future – In FY03, adapted utility distribution system software models to military scenarios including mobilization (Force Projection) and response to terrorist threats such as chem/bio contamination (Force Protection). In FY04, mature 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, will develop integrated tools for judging suitability of energy infrastructure to support power projection, readiness, threat assessment, and sustainability requirements.	1852	1908	2095
Energy and Utility Systems Response to Threats – In FY03, crafted energy control system architecture and protocol compatible with facility technologies to optimize building energy performance and worker comfort and productivity. In FY04, adapt supply and demand technologies allowing for an integrated building control system that provides for a highly reliable platform for CBR protection and energy efficiency. In FY05, will mature performance requirements for building mechanical systems consistent with CBR protection metrics, and complete initial beta version of model to depict CBR water borne dispersion rates in water systems.	997	1027	1111
Small Business Innovative Research/Small Business Technology Transfer Programs	0	36	0
Totals	2849	2971	3206