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

June 2001

BUDGET ACTIVITY
2 - APPLIED RESEARCH

PE NUMBER AND TITLE
0602784A - Military Engineering Technology

COST (In Thousands)		FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost		46886	55332	42850	0	0	0	0	0	0	0
855	TOP,IMAGE INTEL&SPACE	9286	9611	9795	0	0	0	0	0	0	0
H71	ATMOSPHERIC INVESTIG	6051	6304	5997	0	0	0	0	0	0	0
T40	MOB/WPNS EFF TECH	14781	15392	15781	0	0	0	0	0	0	0
T41	MIL FACILITIES ENG TEC	3936	4165	4498	0	0	0	0	0	0	0
T42	COLD REGIONS ENGR TECH	5157	5200	3932	0	0	0	0	0	0	0
T45	ENERGY TEC APL MIL FAC	2425	2771	2847	0	0	0	0	0	0	0
T46	CLIMATE CHANGE FUEL CELL TECHNOLOGY	2386	0	0	0	0	0	0	0	0	0
T49	UNIVERSITY PARTNERING FOR OPERATIONAL SUPPORT	2864	3963	0	0	0	0	0	0	0	0
T52	DOD FUEL CELL TEST AND EVALUATION CENTER	0	4954	0	0	0	0	0	0	0	0
T53	THERMOELECTRIC POWER GENERATION FOR MILITARY APPS	0	2972	0	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification:

PLEASE NOTE: This administration has not addressed FY2003-2007 requirements. All FY 2003-2007 budget estimates included in this book are notional only and subject to change.

The objective of this program element (PE) is to provide technologies in direct support of critical warfighter functions of mobility, countermobility, survivability, sustainment engineering, and topography needed to transform the force. Research is conducted that supports special requirements for battlefield visualization, tactical decision aids, weather intelligence products, and capabilities to exploit space assets. Key operational science & technology is provided to Army units under PE 0603734A (Military Engineering Advanced Technology). Results are tailored to support the materiel development, test, and operations communities in evaluating the impacts of weather, terrain, and atmospheric obscurants on military operations. Research provides and exploits a wide range of innovative technologies and applies them to Defense unique planning, acquisition, revitalization, and sustainment processes. 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. The work in this PE is aligned with the Army's vision for the Objective Force and adheres to Defense Reliance Agreements on Civil Engineering and Battlespace Environments with oversight provided by the Joint Directors of

Laboratories and Joint Engineers. The cited work is also consistent with the Army Science and Technology Master Plan (ASTMP) and the Army Modernization Plan. The PE contains no duplication with any effort within the Military Departments. Work is performed by the U.S. Army Engineer Research and Development Center (ERDC) and the U.S. Army Research Laboratory.

B. Program Change Summary	FY 2000	FY 2001	FY 2002	FY 2003
Previous President's Budget (FY2001 PB)	47639	42344	44571	0
Appropriated Value	47885	55844	0	
Adjustments to Appropriated Value	0	0	0	
a. Congressional General Reductions	0	0	0	
b. SBIR / STTR	-583	0	0	
c. Omnibus or Other Above Threshold Reductions	-90	0	0	
d. Below Threshold Reprogramming	-170	0	0	
e. Rescissions	-156	-512	0	
Adjustments to Budget Years Since FY2001 PB	0	0	-1721	
Current Budget Submit (FY 2002/2003 PB)	46886	55332	42850	0

In FY01, Congressional adds were received for (T52) DoD Fuel Cell Test and Evaluation Center ($5000), (T42) Cold Regions Base Camps ($1500), (T49) University Partnering for Operational Support ($4000) and (T53) Thermoelectric Power Generation for Military Applications ($3000).

No additional funds are required to complete these projects.
- ($5000) DoD Fuel Cell Test and Evaluation Center to demonstrate and validate fuel cell technology for military and commercial applications.
- ($1500) Cold Regions Base Camps continues research supported by previous Congressional adds to investigate impacts of cold environments on Objective Force capabilities.
- ($4000) University Partnering for Operational Support continues research supported by previous Congressional adds that enhances operational, fine-scale forecast models of basic meteorological variables.
- ($3000) Thermoelectric Power Generation for Military Applications to investigate use of thermoelectric technology to recover energy from boiler and industrial exhaust streams.

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

June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602784A - Military Engineering Technology**	**855**

COST (In Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
855 TOP,IMAGE INTEL&SPACE	9286	9611	9795	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: The objective of this project is to develop technology that will help those who move, shoot, and communicate on the battlefield to "fight smarter" through superior knowledge of the total battlefield terrain and environment. Development efforts will enable the commander to locate and position enemy and friendly forces in day/night all-weather conditions, provide crucial terrain data for command and control systems (C2) as well as modeling and simulation systems, and enhance the speed and accuracy of maneuver and weapon systems. The technology being developed will enhance the tactical commander's lethality, survivability, and mobility capabilities through the exploitation of combat relevant intelligence as a force multiplier to conduct and win operations with a smaller, lighter, and more agile force. Information dominance is a critical technology enabler for the Objective Force; Future Combat Systems (FCS); and Army Vision, Joint Vision 2020 concepts. Using tactical/strategic/space sensor data, together with terrain data bases as input, the technology program emphasizes automating the processes of detecting change on the battlefield, identifying battle significant features, exploiting space-based/remote sensing information (especially for deep operations and over denied areas), and integrating the impacts of the battlefield environment to significantly improve combat planning and operations. Work in this project significantly enhances the Army's geospatial data management and dissemination capabilities by providing advanced technologies for storing, transforming, updating and disseminating extremely large volumes of terrain data at, or near, real-time. Weather/atmospheric effects data is provided for this project by the U.S. Army Research Laboratory project H71 in this program element. This project is managed by the U.S. Army Engineer Research and Development Center (ERDC). This project supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 9286 - Incorporated automated feature extraction techniques from spectral, synthetic aperture radar and electro-optical sources into the digital stereo photogrammetric workstation to improve the accuracy and time required to create digital databases.
  - Demonstrated a capability to manage, disseminate and integrate topographic point, line and area feature data using advanced on-line warehouse technology.
  - Extended physics-based models and visualization capability to passive and active millimeter wave for target acquisition.
  - Completed design of a concept model for a low cost wheeled vehicle tactical navigator for improved battlefield positional capability.
  - Identified performance baseline criteria and completed initial design of appropriate spectral/spatial algorithms for terrain characterization.

FY 2000 Accomplishments (Continued)

- Developed and implemented a thorough test and evaluation protocol for algorithms used to generate slope information from elevation data.

- Delivered validated terrain analytics to Joint Terrain Analysis Tool (JTAT) and reengineered tactical decision aids to Combat Terrain Information System (CTIS).

Total 9286

FY 2001 Planned Program

• 9445 - Develop capability for automated feature attribution using knowledge-based rules to provide better knowledge of the battlefield for FCS and the Objective Force.

- Extend advanced geospatial data management technology to support rapid update of terrain information using best available sources.

- Integrate model derived from infrared and millimeter wave sensor performance overlays into 3D visualization for enhanced visualization of theater characteristics.

- Complete implementation of spectral/spatial algorithms for detection and identification of terrain features and conditions.

- Extend the spatial analysis tool to support course of action analysis for ground order of battle.

- Deliver enhanced analytical terrain-reasoning tools to Army Battle Command System's All-Source Analysis System (ASAS) and CTIS.

- Build concept model of a low cost wheeled vehicle tactical navigator and assess when available for improved battlefield vehicle position/navigation (POS/NAV).

• 166 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.

Total 9611

FY 2002 Planned Program

•	9795	- Develop initial terrain reasoning capability to provide time-sensitive course-of-action information for Objective Force applications.
		- Develop improved geospatial data access and distribution tools for more efficient dissemination of digital data.
		- Implement 3D dynamic multi-spectral synthetic scene into force-on-force simulation.
		- Develop prototype of a low cost wheeled tactical navigator for improved battlefield vehicle POS/NAV.
		- Integrate new multi-sensor exploitation software into the digital stereo photogrammetric workstation for quicker and more efficient digital database construction.
		- Develop prototype for common environment database repository resulting in one integrated database for mission planning and rehearsal, modeling and simulation and common operating picture of the battlefield.
		- Complete spatial analysis software to support course of action analysis for ground order of battle.
		- Prototype rapid distributed data insertion software to tactical units for increased situational awareness to improve capability to provide time-sensitive course-of-action information.
		- Develop data exploitation software for new data sources to improve analysis of time-sensitive geospatial information.
Total	9795	

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

June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602784A - Military Engineering Technology**	**H71**

COST (In Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
H71 ATMOSPHERIC INVESTIG	6051	6304	5997	0	0	0	0	0	0	0

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 Objective 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 Program Manager for Night Vision/Reconnaissance Surveillance and Target Acquisition (PM-NV/RSTA) for field artillery systems, and to the Department of Defense (DoD) modeling community. It provides the weather data from forecast/nowcast models, the distributed 4D weather database, and the weather decision aids that use this data for the digital battlefield commander by applying advanced computer techniques; incorporating new technology in meteorological sensor and system designs; 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 Objective Force 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. This program supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 6051 - Completed improved numerical weather prediction and high resolution forecast modeling capabilities to enhance the assessment of environmental effects on operations.

  - Delivered integrated IMETS applications to PD-IMETS and prepared version for inclusion into Army Battle Command System (ABCS) 6.1 for demonstration in Joint Contingency Force exercise including weather data visualization, rule-based and physics-based weather impact models as client applications that provides an interactive capability for Battlefield Functional Area C4I systems to retrieve data on demand from IMETS meteorological databases.

  - Modified current smoke models to generate 3D smoke fields for simulations, virtual testing, and analysis.

  - Completed a preliminary neural network method for retrieval of wind profiles from meteorological satellite sounder data that, when validated and implemented, will allow near real-time wind data to be obtained over target areas for more effective use of smart munitions and submunitions.

FY 2000 Accomplishments (Continued)

- Delivered Meteorological Kernel (firing table) software with documentation to the ARDEC for enhanced fire support effectiveness.
- Completed installation of model software on a computer at the ARL High Performance Computer facility for verifying the capability of the Army's Battlescale Forecast Model (BFM) to forecast weather hazards in the lowest levels of the atmosphere through comparison with two university weather prediction models and with current Navy and Air Force larger scale models.
- Completed a preliminary combined temperature retrieval method that uses data from a ground-based microwave radiometer and meteorological satellite sounders for more accurate remotely sensed temperature soundings along a projectile trajectory.
- Incorporated Acoustic Battlefield Aid (ABFA) output over a 3D terrain for high-resolution acoustic target acquisition calculations.

Total 6051

FY 2001 Planned Program

• 6249
- Integrate joint weather impacts into decision aids for the Army's First Digitized Division weather capability.
- Upgrade Weather Impact Decision Aid models with the characteristics and the impacts of weather on threat platforms, weapons, sensors and operations to forecast the deltas between threat and friendly systems.
- Complete a 3D atmospheric propagation and simulation model that includes the effects of absorption, scattering, and radiative transfer, turbulence, clouds, aerosols, and smoke for improved simulations, virtual testing and analysis.
- Expand the EOSAEL model suite with an acoustics model, complete with documentation, for improved military analysis studies and wargames.
- Incorporate turbulent scattering into scanning acoustic wave propagation models for enhanced acoustic target acquisition.
- Couple Acoustic Battlefield Aid (ABFA) with an Acoustic Target Recognition database and quantify the impacts on prediction of sensor performance.
- Conduct verification and validation of neural network method for retrieval of wind profiles from met satellite sounder data and integrate combined temperature retrieval method to prototype MMS-Profiler processors to achieve better temperature sounding capability for improved artillery accuracy.
- Conduct verification and validation of BFM modules for critical target area forecast parameters such as temperature, wind speed and wind direction, that will lead to more effective use of smart munitions and sub-munitions in the target areas.

• 55
- Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.

Total 6304

FY 2002 Planned Program

•	5997	- Incorporate full complex terrain/turbulent scattering acoustic propagation model into next generation weather decision aid systems.
		- Evaluate polarimetric imaging techniques for incorporation into sensor platforms for the Future Combat Systems (FCS).
		- Modify the BFM to accept weather data from local and RSTA sensors for improved meteorological information collection and utilization.
		- Evaluate techniques for effectively compressing meteorological data for distribution over low bandwidth networks.
		- Investigate methods for delivering meteorological information to FCS in compressed form to conserve limited bandwidth.
		- Investigate weather effects software to provide accurate artillery-tailored weather effects decision aids for trajectory analysis, targeting, and go/no-go forecasts to the fire control databases.
		- Evaluate non-hydrostatic mesoscale forecast model for more accurate battlefield moisture forecasts.
		- Verify the new Cumulus Parameterization Scheme for estimating convective precipitation for transition into IMETS and field artillery meteorological models.
		- Assess utility of prototype fluorescent particle sensor as part of a sensor suite for hazard detection and identification.
		- Prepare an on-scene weather nowcast capability that can integrate ground-truth weather observations from non-conventional meteorological sensors such as Unmanned Aerial Vehicles (UAV), surface observations, and robotic sensors, with the current long-term forecasts generated at higher echelons to provide full spectrum weather support to the Army's Objective Force.
		- Prepare distributed weather client applications for push/pull of forecasts and weather impact decision aids to lower echelons of the Objective Force, including Brigade Combat Weather Teams and soldier level interactive displays.
Total	5997	

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

June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602784A - Military Engineering Technology**	**T40**

COST (In Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
T40 MOB/WPNS EFF TECH	14781	15392	15781	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: The objective of this project is to provide technologies for prediction and mitigation of coastal effects on logistics-over-the-shore (LOTS) operations; rapid construction and repair of forward airfields; rapid establishment and repair of lines of communications; and expedient protection of forward deployment operations. These technologies directly support the Chief of Staff of the Army's initiative to transform the Army into a more responsive, deployable, agile, versatile, lethal, survivable, and sustainable force. The research focuses on technologies that support the deployment of a brigade in 96 hours, a division in 120 hours, and five divisions in 30 days. The research provides technologies that assist in the development of the Future Combat Systems (FCS) by accurate assessment of battlefield mobility for materiel developers during virtual prototyping; and factual representation of mobility, obstacle and barrier creation, survivability, and weapons effects in future modeling and simulation in force development and training. The research will provide technologies that will increase the survivability and sustainability of deployed forces, while reducing their logistical footprint. This will allow them to be more responsive, deployable, and agile through material and technique development for expedient base camp and theater missile defense protection; camouflage, concealment, and deception by signature manipulation; terrorist protection from asymmetric threats; and breaching for Military Operations in Urban Terrain operations. The work is managed by the U.S. Army Engineer Research and Development Center (ERDC). This project supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 13839 - Identified infrared signature manipulation techniques for use in expedient decoy construction; developed protective concepts for key assets in forward logistic nodes.

  - Derived methodologies to provide lighter, more survivable protection by predicting down axis ground shock from detonation partially above and in burster slab; developed and validated methods for retrofitting walls to resist terrorist mortars from an asymmetric threat.

  - Completed first version of Coastal Integrated Throughput Model to ensure more reliable assessment of force projection and sustainment throughput; developed methodology for hydrologic modeling of watersheds worldwide to enable more accurate assessments of maneuver/counter maneuver options in training/operational exercises.

  - Analyzed methodologies for making short-term forecasts of soil strength based on predicted weather changes for more accurate assessment of mobility requirements for the FCS.

FY 2000 Accomplishments (Continued)

- Integrated Improved Bridge Assessment Rehabilitation and Repair (IBARR) software with road assessment algorithms; established criteria for off-road/bypass evaluation around damaged road networks for increased situational awareness.

- Used physics-based models to incorporate multiple-wheel interaction and rate dependent response analysis into an advanced pavement analysis model that will accurately assess airfield and LOC performance for reliable throughput predictions.

- Initiated contract to test and evaluate the Computer Aided Earthmoving System to enable rapid airfield construction necessary for current force projection requirements.

• 942 - Developed software containing selected infrastructure and initial damage predictions from a terrorist attack.

Total 14781

FY 2001 Planned Program

• 14307 - Develop analytical prediction methodology for forced-entry design criteria; evaluate protective concepts for base clusters and forward logistic nodes.

- Select analytic methodologies to provide lighter, more survivable protection by predicting down-axis ground shock from detonation partially in and below burster slab; complete dynamic experiments and analyses for enhanced survivability using square concrete structural components with intermediate span to thickness ratios; develop methods for retrofitting roofs to resist terrorist mortars from asymmetric threats.

- Complete second version of Coastal Integrated Throughput Model and validate improved, robust basin delineation computer sub-routines in a tactical planning exercise.

- Derive operational unit level movement algorithms for rapid, accurate and reliable representation of future force maneuver in Army models and simulations.

- Develop rapid construction, maintenance, and repair techniques and materials for roads and bridges to enable rapid force projection, and develop physics-based damage models to predict roadway damage from future vehicle interactions during rapid force projection.

- Incorporate fracture concepts into the pavement performance model; incorporate realistic performance/damage concepts into the advanced pavement analysis model to ensure accurate and reliable damage assessments on airfields during rapid force projection.

- Finalize test and evaluation of Computer Aided Earthmoving System for initial assessment of rapid airfield construction capability.

• 1000 - Add capability to the vulnerability assessment software to predict damage from an asymmetric terrorist attack to a selected infrastructure.

• 85 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.

Total 15392

FY 2002 Planned Program

•	14781	- Provide ballistic and low-signature protection for base camps, increasing their survivability from weapons threats; provide database structure and building wizard for regional-specific material properties and construction practices suitable for vulnerability assessments. - Develop validated techniques to provide lighter, more survivable protection by predicting ground shock and structure-media interaction for square structures with length/thickness ratio of 5; develop analytic methodology to predict ground shock range to effect from fully coupled detonation in limestone; develop procedures to assess the vulnerability of structures used by deployed forces and methods to reduce blast stand-off distances from terrorist weapons. - Determine mobility performance requirements for advanced vehicle platforms such as FCS. - Evaluate hydrology model for effect/assessment on maneuver/counter maneuver during rapid force projection in worldwide scenarios. - Complete coastal throughput assessment for rapid force projection and sustainment operations for a particular theater of operations. - Develop methods for evaluating the effects of weather on engineer effort in rapid repair/construction of roadways during future force projection and sustainment operation scenarios. - Develop residual strength assessment methodology for assessing bridges to increase the situational awareness for the Objective Force. - Complete development of advanced pavement design and analysis model for rapid, accurate and reliable prediction of airfield performance using current and future aircraft. - Assess materials and methods for rapid airfield construction that emphasize speed of construction and reliability of performance with a reduction in logistical tail during construction and maintenance of airfields. - Incorporate cross-beach Coastal Integrated Throughput Model into improved mobility models for accurate assessment of maneuver and throughput during rapid force projection and sustainment operations.
•	1000	- Complete development of vulnerability assessment software for protection of the selected critical infrastructure from asymmetric terrorist attacks.

Total 15781

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

June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602784A - Military Engineering Technology**	**T41**

COST (In Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
T41 MIL FACILITIES ENG TEC	3936	4165	4498	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: The objective of this project is to provide technology necessary for efficient and effective facilities and installation operations required to support the Objective Force in its evolving mission. The project focuses on advanced technologies for the continuum of facilities and operations by assuring cost efficient and effective infrastructure and processes for training, readiness, power projection, and forward basing. These innovative developments also achieve a critically needed cost reduction in the Army facility life cycle process (infrastructure planning, assessment, design, construction, revitalization, sustainment, and disposal), and the supporting installation operations. Additionally the improved facility quality provided by this work improves soldier quality of life and enhances soldier retention. Examples of innovative technologies evolving from this work include composite rehabilitation materials, concurrent engineering, collaborative decision support, multi-hazard mitigation, knowledge processing and electromagnetic shielding. Under the DoD Project Reliance initiative, the Army is responsible for managing the conventional facilities research and development needs of all the military services through the U.S. Army Engineer Research and Development Center (ERDC). This project supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 3826 - Developed advanced structural integrity monitoring algorithms to provide information for assessing structural health, safety and remaining service life.
  - Modeled corrosion degradation mechanisms for coated steel.
  - Characterized diaphragm design deficiencies in existing Army buildings under earthquake loading.
  - Developed analytical model and improved seismic design guidance with anchor details for cold-formed steel.
  - Improved facility life cycle processes provided by Modular Design System.

Total 3826

FY 2001 Planned Program

•	4130	- Complete development of an integrated corrosion control selection guide for selecting and using corrosion control materials and technologies.
		- Develop predictive service life tests and criteria for roofing membrane materials.
		- Complete final building composer integrated with the collaborative mechanisms of the "Totally Integrated Project Delivery" framework.
•	35	- Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.
Total	4165	

FY 2002 Planned Program

•	4498	- Complete seismic vulnerability evaluation guidance for building diaphragms in Army facilities.
		- Develop a prototype model to apply process driven rational approach of reliability-centered maintenance for Army infrastructure.
		- Conduct integration tests and develop methodologies utilizing model-based engineering processes for the facility life cycle.
Total	4498	

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

June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602784A - Military Engineering Technology**	**T42**

COST (In Thousands)		FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
T42	COLD REGIONS ENGR TECH	5157	5200	3932	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: This project is the only Department of Defense (DoD) applied research effort focused on the knowledge base and engineering principles for achieving Objective Force capabilities in seasonal conditions and in cold regions of the world. The Objective Force and Future Combat Systems (FCS) must have expert knowledge of the battlespace environment to obtain desired lethality, survivability and mobility. Advances in sensing and target acquisition capabilities critical to FCS require greater fidelity and more accurate forecasts of state of the terrain. Research provides the basis for extending the operability of the Objective Force in all seasons through application of physics-based models for predicting state of the terrain, and the effects of the environment on target and target background signatures. To achieve superior mobility and enable required strategic, operational, and tactical maneuver in all seasons, the Objective Force requires non-materiel advances in military engineering capabilities. Research provides for advances in planning and assessment tools, innovative construction materials, and techniques and procedures to reduce dependence on ports and airfields. The work is managed by the U.S. Army Engineer Research and Development Center (ERDC). This project supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 5157 - Formulated an integrated seismic/acoustic signature simulation model that will generate acoustic and seismic signatures for heavy tracked and wheeled vehicles in a variety of terrains.

  - Confirmed application of physics-based models and visualization to support weapons selection and mission rehearsal for weapon systems equipped with infrared targeting sensors.

  - Provided winter climate index characterization manual for snow and soil freezing effects.

  - Originated model for predicting the effect of moisture and temperature gradients on pavement strength and roughness during freezing and thawing for airfields and pavements in cold regions.

  - Enhanced technologies for forecasting winter/seasonal impacts on Objective Force logistics and mobility.

Total 5157

FY 2001 Planned Program

•	5159	- Characterize the geophysical properties at Yuma Proving Grounds Smart Weapons Test Range with geophysical testing techniques and run corresponding computer simulations to verify accuracy of simulated seismic signal levels for non-moving impulsive loads.
		- Integrate multispectral (infrared and millimeter wave) sensor performance products into 3-dimensional (3D) terrain visualization.
		- Advance innovative thawed soil stabilization techniques for base camps and expedient roadways in austere/remote theaters.
		- Incorporate the freeze-thaw model into the 3D finite element pavement model in order to predict pavement performance during freeze-thaw periods.
		- Apply high fidelity vehicle dynamics modeling capability for development of seismic source signatures.
•	41	- Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.
Total	5200	

FY 2002 Planned Program

•	3932	- Use DoD high performance computing resources to perform a seismic simulation sensitivity study of ground vibrations propagating from armored vehicles moving over a variety of terrains and geologic settings, and use results of the study to verify accuracy of seismic simulations in comparison to field test results of moving tracked vehicles.
		- Implement 3D dynamic multi-spectral synthetic scene visualization capability in mission planning, training, and weapon selection tools through the Digital Topographic Support System.
		- Modify Theater Infrastructure Planning and Assessment Model with effects of frost heave, thaw weakening, and snow and ice accumulation planning algorithms to optimize the prioritization and scheduling of maintenance and repair resources.
		- Complete mechanistic model for pavement design and evaluation to prevent/alleviate frost heave and thaw weakening, thermal cracking, and cracking induced by structural loading during thaw periods.
		- Develop high fidelity model for prototype wheeled vehicle performance evaluation on a dynamic surface (alterable friction coefficients representing snow and ice conditions).
Total	3932	

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

June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602784A - Military Engineering Technology**	**T45**

COST (In Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
T45 ENERGY TEC APL MIL FAC	2425	2771	2847	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: The objective of this project is to provide technology necessary to provide cost effective, energy efficient, sustainable military installations during the dramatically changing energy picture (i.e., deregulation) and the Army transformation to the Objective Force. Advanced energy technologies and processes are also applied to the Army's industrial base to maintain its cost-effective readiness. Examples of the advanced technologies include integrated distributed and renewable energy supply, hybrid cooling; and microturbines for Army application at all installations, to include theater of operations. Under the Department of Defense (DoD) Project Reliance initiative, the Army is responsible for managing the conventional facilities research and development needs of all the military services through the U.S. Army Engineer Research and Development Center (ERDC). This project supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 2425 - Completed investigation of electrical, gas and cooling screening, design and application tools for development of hybrid cooling systems.
  - Developed methodology for integrated long-term utility and energy planning initiatives for Army installations.
  - Completed automated procedures for heat system inventory, inspection, condition assessment, and condition prediction for systematic maintenance and repair of heat distribution systems.

Total 2425

FY 2001 Planned Program

- 2752 - Complete process for maintaining technology for improving energy system performance for building energy systems.
  - Automate selection/design practice for hybrid cooling systems.
  - Complete process energy and pollution reduction (PEPR) program with expert system capability.
- 19 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.

Total 2771

FY 2002 Planned Program

•	2847	- Develop air pressure leak management techniques for modernizing Army compressed air systems.
		- Determine the number and types of verification processes necessary to validate the full range of Army energy projects.
Total	2847	