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

February 2003

BUDGET ACTIVITY	PE NUMBER AND TITLE
2 - Applied Research	**0602716A - HUMAN FACTORS ENGINEERING TECHNOLOGY**

	COST (In Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
	Total Program Element (PE) Cost	20144	20516	16749	16357	17676	18193	18331	18753
H34	RURAL HEALTH TECH	2398	0	0	0	0	0	0	0
H70	HUMAN FACT ENG SYS DEV	17746	17180	16749	16357	17676	18193	18331	18753
J20	OMNI DIRECTIONAL TREADMILL UPGRADE	0	3336	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: The primary objectives of this program are to maximize the effectiveness of soldiers in concert with their materiel so that they may survive and prevail on the battlefield in the context of the Army Transformation to the Objective Force. Specialized laboratory studies and field evaluations are conducted to collect performance data on the capabilities and limitations of soldiers, with particular attention on soldier and equipment interaction. The Congressionally directed program on Rural Health Technology focused on the researching, field testing, and empirical validation of methods for improving the coordinated functioning of civilian and military emergency medical teams. A FY03 Congressionally directed program for the Omni Directional Treadmill upgrades focuses on designing and developing a state-of-the-art omni directional treadmill to support research studies in virtual environments to support Objective Force Warrior. Work in this PE is related to and fully coordinated with efforts in PE 0602601 (Combat Vehicle and Automotive Advanced Technology), PE 0602786 (Warfighter Technology), PE 0603001 (Warfighter Advanced Technology), and PE 0603005 (Combat Vehicle and Automotive Technology). The cited work is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance. The program element contains no duplication with any effort within the Military Departments. Work is performed by the Army Research Laboratory (ARL). This program supports the Objective Force transition path of the Transformation Campaign Plan.
No Defense Emergency Response Funds have been provided to this program.

B. Program Change Summary	FY 2002	FY 2003	FY 2004	FY 2005
Previous President's Budget (FY 2003)	19791	17415	17132	17607
Current Budget (FY 2004/2005 PB)	20144	20516	16749	16357
Total Adjustments	353	3101	-383	-1250
Congressional program reductions				
Congressional rescissions		-2239		
Congressional increases		5600		
Reprogrammings	512	-118		
SBIR/STTR Transfer	-159	-142		
Adjustments to Budget Years			-383	-1250

FY03 Congressional Adds:
Omni Direction Treadmill Upgrade, Project J20 ($3500); MANPRINT Modeling, Project H70 ($2100)

Projects with no R-2A:

($3452)Omni Direction Treadmill Upgrade, Project J20: The objective of this one-year Congressional Add is to provide technology to upgrade the Omni Directional Treadmill. The Omni-Directional Treadmill is a device that infantry soldiers use to move (crawl, walk, run) through a virtual environment. No additional funding is required to complete this project.

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

February 2003

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602716A - HUMAN FACTORS ENGINEERING TECHNOLOGY**	**H70**

COST (In Thousands)		FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
H70	HUMAN FACT ENG SYS DEV	17746	17180	16749	16357	17676	18193	18331	18753

A. Mission Description and Budget Item Justification: The goal of this program is to maximize the effectiveness of soldiers in concert with their equipment, in order to survive and prevail on the battlefield in the context of the Army Transformation to the Objective Force. The barriers to achieving the goal include incomplete soldier performance data and models of the new missions, organizations, and new and complex technologies transforming the Army. Specialized laboratory studies and field evaluations are conducted to collect performance data on the capabilities and limitations of soldiers, with particular attention on soldier and equipment interaction. The resulting data are the basis for weapon systems and equipment design standards, guidelines, handbooks and soldier training and manpower requirements to improve equipment operation and maintenance. Application of advancements yields reduced workload, fewer errors, enhanced soldier protection, user acceptance, and allows the soldier to extract the maximum performance from the equipment. The cited work is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance. The program element contains no duplication with any effort within the Military Departments. Work is performed by the Army Research Laboratory (ARL). This program supports the Objective Force transition path of the Transformation Campaign Plan.
No Defense Emergency Response Funds have been provided to this project.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
- Identify metrics to optimize information flow, workload and skill requirements of command and control processes and how commanders and staffs make decisions at all echelons. In FY02, two C2 training tools were transitioned to the Command and General Staff College (CGSC), the School of Command Preparation (SCP), the Depth and Simultaneous Attack Battle Lab (D&SA BL), the National Guard, and Forces Command (FORSCOM). The Command, Control, and Communications Tactically Relevant Assessment of Combat Execution (C3 TRACE) modeling tool results were used to guide and validate soldier-in-the-loop Battle Lab experiments and to provide criteria to evaluate FCS concept proposals. In FY03, model Future Combat System (FCS) and Objective Force Warrior (OFW) information flow, decision-making and collaboration to evaluate operational concepts. In FY04, mature a suite of command and control (C2) tools for Objective Force commanders, leaders, and soldiers to employ during close combat in complex and urban terrain. In FY05, provide baseline C2 tools to TRADOC schools. These tools will allow for collaborative and distributed decision making with the objective of improving performance under time, combat, fatigue, and workload stressor conditions.	4584	3700	4078	4062
- Develop human performance modeling tools to optimize soldier machine interactions for Objective Force Warrior and FCS. In FY02, modeled function allocation for FCS (Line of Sight - Beyond Line of Sight vehicle) crew using the IMPRINT human performance-modeling tool, and examined the effects of interocular sensor separation on terrain-hazard detection and braking distance, improving driver's ability to negotiate roads, trails, or paths at night or under reduced visibility. In FY03, create a digital library of individual soldier equipment to use in modeling FCS and OFW and evaluate soldier perceptual performance when operating in an urban environment. In FY04, link vehicle dynamics, biodyanimcs, and anthropometric modeling capabilities and apply the hearing hazard model to firing weapons in hazardous environments such as MOUT enclosures and tunnels to specific hearing protection requirements. In FY05, provide user-accessible soldier-centered tools, models and expertise to combat and materiel developers so that the full range of soldier cognitive and task performance can be considered in a cost-effective manner in all phases of acquisition.	2555	2266	2556	2500

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
- Increase soldier performance while conducting operations on-the-move. Validate and recommend methods to mitigate soldier performance degradation due to motion sickness induced by noise, vibration, vehicle movement and confinement during operations-on-the-move. Determine soldier requirements for multi-modal information presentation, the interaction of physical & cognitive loading and its impact on situational awareness and performance. Expand model to include motion tolerance effects of on-the-move mission planning and rehearsal for the mounted and dismounted OFW. In FY02, conducted follow-on studies investigating operations-on-the-move impact on soldier performance using the ride motion simulator and Stryker armored vehicle and provided results to the Lead System Integrator (LSI) and PM for FCS, established Human Dimension IPT to support Phase I of FCS in order to include soldier performance considerations in analyses, modeling, simulation, and testing, and conducted initial studies to address increased cognitive load and information availability and management on dismounted teams and soldier mission performance and provided results to Natick Soldier Center. In FY03, support PM FCS during development of the Phase II program and investigate the ability of soldiers to control a semi autonomous moving platform from an encapsulated, dynamic environment. In FY04, evaluate new head-mounted displays, cognitive decision aids and driving aids concepts for Block II FCS, and conduct situational understanding studies to validate modeling results. In FY05, field validate and provide recommendations on warrior interface design specifications for C4ISR systems to PM OFW and FCS.	5048	6534	3410	3095

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
- In FY02, conducted broad-based program of research directed toward optimizing soldier performance and soldier-machine interactions to maximize battlefield effectiveness and reduce operations and sustainment costs. In FY03, provide lead on Human Factors Engineering (HFE) and MANPRINT support to Training and Doctrine Command (TRADOC) Centers and Schools, Battlelabs, Army Materiel Command (AMC), AMC Research Development and Engineering Centers (RDEC)s, Army Test and Evaluation Command (ATEC) and other service laboratories. In FY04, establish parameters of human-robot interaction research on effects of incorporating robot telepresence on soldier situation awareness; develop concept of "context sensitivity," including how best to provide the operator with a compressed history of the robot's (or robot swarm) environment for the period leading up to its spotting a cue, an unknown, or its getting stuck. In FY05, broaden the concepts to incorporate humans-in-automation UGV issues such as "automation environment cognitive task-shifting requirements" of autonomous and semi-autonomous robots providing combat information under often unexpected schedules; soldier-robot team interaction issues including mixed-initiative executive control; and span of control enhancements (number of operators vs number of robots).	4559	2580	2705	2700
-In FY04, determine optimal allocation of tasks to soldier and automation for control of unmanned systems. In FY05, validate allocation of tasks to soldiers and automation for control of unmanned systems.	0	0	4000	4000
-MANPRINT Modeling: This one year congressional add will focus on developing human performance modeling tools and associated databases for the Objective Force Warrior and FCS. No additional funding is required to complete this project.	0	2100	0	0
- Soldier Centered Design Tools: This one-year congressional add allowed Soldier-specific design constraints to be evaluated in the design process of materiel acquisition. In FY02, improved the tools connectivity with other models, reduced analysis turnaround time, improved representation of training effect on soldier performance, reduced cost to model performance under extreme environments, and increased flexibility to model novel maintenance and support concepts. No additional funding is required to complete this project.	1000	0	0	0
Totals	17746	17180	16749	16357