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

February 2003

BUDGET ACTIVITY
2 - Applied Research

PE NUMBER AND TITLE
0602787A - MEDICAL 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	122121	124314	58877	61072	70351	68156	66969	65273
841	COMPUTER-ASST MINIMALLY INVASIVE SURGERY	10753	2003	0	0	0	0	0	0
845	BONE DISEASE RESEARCH PROGRAM	2685	1001	0	0	0	0	0	0
863	BTLFLD SURGICAL REPLAC	4509	4813	0	0	0	0	0	0
865	CENTER FOR MILITARY BIOMATERIALS RESEARCH	0	953	0	0	0	0	0	0
866	CLINICAL TRIAL PLEZOELECTRIC DRY POWDER INHALATION	0	1620	0	0	0	0	0	0
867	DIAGNOSTICS IN TRAUMATIC BRAIN INJURY BLOOD BASED	0	1431	0	0	0	0	0	0
869	T-MED/ADVANCED TECHNOLOGY	4151	3155	3466	3495	3526	3629	3718	3802
870	DOD MED DEF AG INF DIS	24022	27696	14292	15078	15780	15414	15633	16171
873	HIV EXPLORATORY RSCH	10227	0	11238	11356	11808	12074	12081	12075
874	CBT CASUALTY CARE TECH	8529	10317	8953	8379	16353	14016	12113	9239
878	HLTH HAZ MIL MATERIEL	10627	11302	11900	12363	12370	12509	12751	13052
879	MED FACT ENH SOLD EFF	8216	8781	9028	10401	10514	10514	10673	10934
967	DYE TARGETED LASER FUSION	3263	0	0	0	0	0	0	0
968	SYNCH BASED HI ENERGY RADIATION BEAM CANCER DETECT	0	16917	0	0	0	0	0	0
96A	EMERGENCY HYPOTHERMIA	2495	2107	0	0	0	0	0	0
96C	DIGITAL IMAGING AND CATHERIZATION EQUIPMENT	0	764	0	0	0	0	0	0
96D	ENDOBIOLOGICS VACCINATION PROGRAM	0	953	0	0	0	0	0	0
96E	HEMORRHAGE CONTROL DRESSING	0	2335	0	0	0	0	0	0
96F	PORTABLE BIOCHIP ANALYSIS SYSTEM	0	1715	0	0	0	0	0	0
96G	PRE-CLINICAL AND CLINICAL EVALUATION	0	1620	0	0	0	0	0	0

96H	RUGGED TEXTILE ELECTRONIC GARMENTS	0	953	0	0	0	0	0	0
96I	REMOTE ACOUSTIC HEMOSTASIS	0	6673	0	0	0	0	0	0
96J	GULF WAR ILLNESS	0	2859	0	0	0	0	0	0
977	EMERGING INFECTIOUS DISEASES	6458	0	0	0	0	0	0	0
MA1	ARTHROPOD-BORNE INFECTIOUS DISEASE CONTROL	2398	2003	0	0	0	0	0	0
MA2	DIABETES PROJECT	4891	0	0	0	0	0	0	0
MA3	MEDICAL AREA NETWORK FOR VIRTUAL TECHNOLOGY	7674	3241	0	0	0	0	0	0
MA4	SPEECH CAPABLE PERSONAL DIGITAL ASSISTANT	958	1906	0	0	0	0	0	0
MA5	CENTER FOR INTERNATIONAL REHABILITATION	1343	3336	0	0	0	0	0	0
MA6	DERMAL PHASE METER	576	1001	0	0	0	0	0	0
MA7	VCT LUNG SCAN	3070	0	0	0	0	0	0	0
MA8	MONOCLONAL ANTIBODY BASED TECHNOLOGY	2878	0	0	0	0	0	0	0
MA9	OPERATING ROOM OF THE FUTURE	2398	2859	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: This program element supports focused research for healthy, medically protected soldiers, and funds research consistent with the "Medical," "Survivability," and "Future Warrior" technology areas of the Objective Force. The primary goal of medical research and development is to sustain medical technology superiority to improve the protection and survivability of U.S. forces on conventional battlefields as well as in potential areas of low intensity conflict and military operations short of war. This program element funds applied research in Department of Defense (DoD) medical protection against naturally occurring diseases of military importance and combat dentistry, as well as applied research for Department of Army care of combat casualties, health hazard assessment of military materiel, and medical factors enhancing soldier effectiveness. This program element is the core DoD technology base to develop methods and materials for infectious disease prevention and treatment including vaccines, prophylactic and therapeutic drugs, insect repellents, and methods of diagnosis and identification of naturally occurring infectious diseases; prevention and treatment of combat maxillofacial (face and neck) injuries, and essential dental treatment on the battlefield; combat casualty care of trauma and burns due to weapons, organ system survival, shock resulting from blood loss and infection, blood preservation, and potential blood substitutes for battlefield care; assessment of the health hazards of military materiel, and the sustainment or enhancement of soldier performance. 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. The U.S. Army Medical Research and Materiel Command manage this program. This program supports the Objective Force transition path of the Transformation Campaign Plan.

There are no Defense Emergency Response Funds provided to this program.

B. Program Change Summary	FY 2002	FY 2003	FY 2004	FY 2005
Previous President's Budget (FY 2003)	128798	67476	71682	75359
Current Budget (FY 2004/2005 PB)	122121	124314	58877	61072
Total Adjustments	-6677	56838	-12805	-14287
Congressional program reductions				
Congressional rescissions		-5886		
Congressional increases		66160		
Reprogrammings	-4010	-709		
SBIR/STTR Transfer	-2667	-2727		
Adjustments to Budget Years			-12805	-14287

Change Summary Explanation:
Significant Changes:
FY 2003 - Program responsibility for management and oversight of HIV R&D efforts was transferred to the National Institutes of Health (NIH). FY 2004 – Program was transferred back to the Army.
FY 2004/2005: Funds realigned to higher priority requirements in the medical advanced technology (PE 0603002) to support FCS and Objective Force.

FY03 Congressional adds:

Proj		
841	Minimally Invasive Surgery Modeling & Simulation	$2,100
845	Bone Health	$1,050
863	Tissue Engineering Initiative	$2,550

863	Tissue Repair and Replacement for Battlefield Injuries	$2,500
865	Center for Military Biomaterials Research	$1,000
866	Clinical Trial Utilizing a Piezoelectric Dry Powder Inhalation Device	$1,700
867	Diagnostics in Traumatic Brain Injury-Blood Based	$1,500
968	Proton Beam Radiation Therapy Program	$5,000
968	Synchrotron Based Scanning Research	$12,750
96A	Emerg Hypothermia for Adv Cbt Cas and Delayed Resuscitation	$2,210
96C	Digital Imaging and Catheterization Equipment	$800
96D	Endobiologics Vaccination Program	$1,000
96E	Hemorrhage Control Dressings	$2,450
96F	Portable Biochip Analysis System for Rapid Detection of Biowarfare Agents	$1,800
96G	Preclinical and Clinical Evaluation of High Resolution Mobile Gamma Camera & Position Imaging Devices	$1,700
96H	Rugged Textile Electronic Garments for Combat Casualty Care	$1,000
96I	Remote Acoustic Hemostasis	$7,000
96J	Gulf War Illness	$1,000
97W	SEATreat	$2,000
MA1	Controlling Mosquito and Tick Trans Dis	$2,100
MA3	Medical Area Networks for Virtual Tech	$3,400
MA4	Speech Capable Personal Digital Assist	$2,000
MA5	International Rehabilitation Network	$3,500
MA6	Dermal Phase Meter	$1,050
MA9	Operating Room of the Future	$3,000

FY03 Congressional Add projects with no R-2As not listed/defined due to space limitations.

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

February 2003

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602787A - MEDICAL TECHNOLOGY**	**869**

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
869	T-MED/ADVANCED TECHNOLOGY	4151	3155	3466	3495	3526	3629	3718	3802

A. Mission Description and Budget Item Justification: This project supports focused research for the soldier contributing to casualty avoidance, casualty detection, and evacuation and treatment of casualties through application of physiological status monitoring technologies (biophysical and biochemical sensors and fusion) as outlined in the Medical and Future Warrior Objective Force Technology Areas. Research efforts focus on developing a wearable, integrated system to determine soldier physiological status. This includes developing the ability to quickly and accurately determine when a soldier is minimally impaired but still capable of functioning. Work will also focus on identification and initial development of parallel and supporting technologies and systems, including medical informatics, medical artificial intelligence, and data mining tools. The following US Army Medical Research and Materiel Command laboratories conduct research under this project: the US Army Aeromedical Research Laboratory, the US Army Research Institute of Environmental Medicine, the US Army Institute of Surgical Research, and the Walter Reed Army Institute of Research. Additional contributors include Los Angeles County and the University of Southern California Medical Centers. This program supports the Objective Force transition path of the Transformation Campaign Plan.

There are no Defense Emergency Response Funds provided to this project.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
FY02, designed a prototype system for remote detection of a ballistic wounding event. Established a database of human physiological responses associated with severe trauma to provide a tool for judging effectiveness of new treatments. Obtained acoustic signatures associated with a collapsed lung in animal models as a basis for diagnosing a collapsed lung in humans. Developed knowledge management system to reduce complex biological data to essential information about the physiological readiness of soldiers. FY03, evaluate prototype acoustic collapsed lung detector. Design prototype handheld Personal Digital Assistant-based physiological monitor for the medic, and provide final sensor specifications and physiological data management algorithms for monitoring heart rate and breathing, wound detection, heat stress, movement, and sleep. FY04, pursue component technology improvement objectives for metabolic monitoring, including hydration and energy expenditure, and developing body signal processing algorithms and physiological models. FY05, demonstrate ability to noninvasively monitor alertness in real time in operational settings and establish accuracy of pulse velocity as an alternative measure of blood pressure and incorporate into remote triage algorithm for Objective Force Warrior medic.	4151	3155	3466	3495
Totals	4151	3155	3466	3495

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

February 2003

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602787A - MEDICAL TECHNOLOGY**	**870**

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
870	DOD MED DEF AG INF DIS	24022	27696	14292	15078	15780	15414	15633	16171

A. Mission Description and Budget Item Justification: This project researches and investigates medical countermeasures to naturally occurring infectious diseases potentially affecting the "Medical" technology area of the Objective Force. Infectious diseases pose a significant threat to operational effectiveness and forces deployed outside the United States. Countermeasures will protect the force from infection and sustain operations by preventing hospitalizations and evacuations from the theater of operations. Of major importance to the military are the parasitic disease malaria, the bacterial diseases responsible for diarrhea (i.e., caused by Shigella, enterotoxigenic Escherichia coli, and Campylobacter), and viral diseases (i.e., dengue fever and hantavirus). The program also develops improved materiel for control of arthropod disease vectors and addresses a variety of other threats to mobilizing forces, including meningitis, viral encephalitis, and hemorrhagic fevers. Improved diagnostic capabilities are also pursued to enable rapid battlefield identification and management of diseases for which there is no current method of protection. Goals include developing (gene-based) DNA vaccines; incorporating new technologies to enhance effectiveness and duration of vaccines; integrating cutting edge genomic and proteomic (protein-based) technologies into vaccine and drug discovery; developing vaccines that can protect against multiple disease strains and drugs to treat malaria; and increasing vaccine safety and efficacy. Intramural research under this project is conducted at the US Army Medical Research and Materiel Command's US Army Medical Research Institute of Infectious Diseases, the Walter Reed Army Institute of Research and its overseas laboratories, and the Naval Medical Research Center and its overseas laboratories. This program supports the Objective Force transition path of the Transformation Campaign Plan.

There are no Defense Emergency Response Funds provided to this project.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
FY02, continued efforts to develop a vaccine to protect the warfighter against the falciparum and vivax malaria parasites, the two most lethal forms of malaria; evaluated new technologies such as experimental vaccine additives that can increase effectiveness of malaria vaccines and initiated preclinical testing of these in animals. FY03, evaluate candidate DNA vaccines as a part of a multicomponent vaccine; complete preclinical testing of a liver stage malaria vaccine. FY04, produce malaria parasites for use in clinical challenge studies and test development; generate virus-based vaccines; conduct safety and protection studies; FY05, test DNA and protein vaccine candidates in preclinical trials for inclusion into multicomponent malaria vaccine.	5940	7905	4588	5508
FY02, evaluated a combined antidiarrheal vaccine candidate that can protect against Shigella-based diarrheas and a hybrid Shigella-Enterotoxigenic Escherichia coli (ETEC) vaccine in animals. FY03, construct an improved Shigella flexneri candidate vaccine; conduct preclinical studies of Campylobacter vaccine; complete combined Shigella-ETEC vaccine study, and produce clinical-grade lots of candidate vaccine for testing. FY04, refine animal model and conduct preclinical testing of candidate vaccines to support investigational new drug application to the Food and Drug Administration (FDA). FY05, formulate a mixed component vaccine to provide broad protection against bacterial diarrheal diseases to the warfighter.	4414	5945	2742	2600
FY02, conducted toxicological studies of candidate insect repellent; evaluated a candidate repellent for improved protection and reduced toxicity; and conducted preliminary tests of system for controlling insects carrying dengue virus. FY03, select new repellent; continue field study of the dengue vector control system. FY04, perform final evaluation of repellent with human volunteers; FY05, complete testing of a dengue vector control system.	2050	2253	1524	1297
FY02, broadened protection of scrub typhus vaccine candidates based on gene sequencing efforts. Determined that a vaccine with only five selected strains of scrub typhus will provide protection against the hundreds of known strains. FY03, develop a second animal model required for safety testing and initiate vaccine testing. FY04, complete animal safety and protection studies. FY05, compile preclinical data to justify FDA Phase 1 trials of single strain vaccine to demonstrate safety and response to vaccine in humans.	2000	2138	1094	999

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
FY02, improved the effectiveness of candidate dengue fever DNA vaccines and the ability to measure immunity generated by the vaccine; engineered two candidate Group B strain bacterial meningitis vaccines; completed preclinical testing of a candidate hantavirus DNA vaccine to protect against Hemorrhagic Fever with Renal Syndrome (HFRS) in compliance with FDA; and constructed a vaccine against Rift Valley fever. FY03, prepare and evaluate dengue vaccines for FDA clinical trials; complete genetic engineering of three group B meningitis strains; prepare for Phase 1 clinical trials for HFRS vaccine. FY04, select the most promising new dengue vaccines from clinical trials and improve as needed; perform preclinical trial of a meningitis vaccine. FY05, complete construction of the second vaccine component to provide complete protection against HFRS, submit investigational new drug application to test new component for an improved meningitis vaccine; conduct preclinical testing of improved dengue vaccines.	6618	6126	2311	2339
FY02, selected the Artesunate drug for further development to treat severe malaria. Performed animal toxicology tests on additional new antimalarial drugs to treat and protect against malaria. FY03, conduct preclinical studies of new drugs to prevent malaria; complete preclinical toxicology testing of new drug to treat severe malaria and submit investigational new drug application for clinical testing, develop animal models that better predict human safety and continue to test new classes of drugs for antimalarial activity. FY04, select best drug candidates for preclinical and clinical studies. FY05, perform toxicological studies of new drug candidates.	3000	3329	2033	2335
Totals	24022	27696	14292	15078

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

February 2003

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602787A - MEDICAL TECHNOLOGY**	**873**

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
873	HIV EXPLORATORY RSCH	10227	0	11238	11356	11808	12074	12081	12075

A. Mission Description and Budget Item Justification: This project supports the "Medical" technology area of the Objective Force by conducting applied research and development of improved diagnostics, surveillance and epidemiology, candidate vaccines, and promising drugs for prevention and treatment of human immunodeficiency virus (HIV). Main efforts include construction and pre-clinical development of candidate vaccines, including small animal and non-human primate studies, initial clinical development in humans, improved diagnosis of HIV infection, and improved prognostic assessment and disease management of HIV infected individuals. Research under this project is conducted at the U.S. Army Medical Research and Materiel Command's Walter Reed Army Institute of Research and its overseas laboratories, and the Naval Medical Research Center and its overseas laboratories. Most work is conducted under a cooperative agreement with the Henry M. Jackson Foundation, Rockville MD. This program supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

There are no Defense Emergency Response Funds provided to this program or project.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
FY02; continued surveillance of HIV-1 subtype emergence and spread in South and Central America, Eastern Europe, and parts of Asia which are regions of current or potential deployment. Characterized the occurrence of HIV and the immune response to it in multiple populations in projected vaccine study areas. Optimized sensitive, specific, reproducible, high-throughput assays for assessment of individuals immunized with HIV vaccines and for pre-clinical evaluation of HIV vaccines in non-human primates and rodents. Supported the development of international laboratories for HIV studies at associated medical centers and hospitals. Continued studies of HIV-1 infections in U.S. military health care beneficiaries in a multi-center study. FY03 HIV program transferred to NIH. FY04/05, HIV program returned to the Army. Construct additional candidate vaccines that induces a broader anti-HIV immune responses against HIV subtypes found outside the United States and important in military deployments. Continue genetic analysis of HIV subtypes isolated in Africa for integration into vaccine candidates for this region. Develop HIV vaccine study populations for future field trials in Kenya, Uganda, Tanzania and Cameroon. Support global surveillance of HIV-1 to (a) target international HIV-1 vaccine development and (b) inform the U.S. military of the HIV threat in areas of potential troop deploy ment through the existing network of overseas collaborators, with special attention to surveillance in Eastern Europe and countries of the former Soviet Union. Maintain U.S. Military Clinical Intervention Network that is operated through Military Medical Treatment Facilities to study the frequency and impact of HIV/AIDS in/on military populations, especially when consequent to troop deployments. Identify cost effective drugs and care strategies to control HIV infection and transmission in military populations.	10227	0	11238	11356
Totals	10227	0	11238	11356

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

February 2003

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602787A - MEDICAL TECHNOLOGY**	**874**

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
874	CBT CASUALTY CARE TECH	8529	10317	8953	8379	16353	14016	12113	9239

A. Mission Description and Budget Item Justification: This project investigates potential treatments for weapons-induced trauma and shock because of blood loss on the battlefield. This project funds the core technology base to develop concepts, techniques, and materiel for the treatment and return-to-duty of warfighters wounded in combat and to support low-intensity combat as well as military operations other than war. The primary goal is to provide technologies that save lives far forward and maintain critical care at all levels of the battlefield. Applied research in combat casualty care focuses on the evaluation of feasibility of concepts for drugs, biologics, and diagnostics for resuscitation and life support as well as designing trauma care systems for advanced monitoring and testing, emphasizing products for forward medic and surgeon use. Major efforts include blood products; resuscitation fluids; drugs and devices to control severe bleeding; methods to minimize, repair, and prevent injury; and diagnostic and predictive indicators for remote triage and computerized, autonomous patient care. Additional goals are to reduce evacuations due to dental disease and reduce the medical footprint on the battlefield. Internal research under this project is conducted at the US Army Medical Research and Materiel Command's US Army Institute of Surgical Research, and the Walter Reed Army Institute of Research. Major contractors include the University of Washington, Seattle, Washington; the State University of New York at Buffalo, and Monterey Biomedical, Inc., Scotts Valley, California. This program supports the Objective Force transition path of the Transformation Campaign Plan.

There are no Defense Emergency Response Funds provided to this project.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
FY02, refined the plasma freeze-drying process to reduce field logistical load; designed and tested a prototype device to detect blood-borne infectious diseases to improve transfusion safety; evaluated commercially available resuscitation fluids for best effect in animal models; evaluated methods to reduce inflammatory response and improve survival after resuscitation of animals with severe blood loss. FY03, conduct animal testing of freeze-dried plasma; refine freeze-drying process for red blood cells to replace refrigerated red blood cells on the battlefield; begin studies in animal models of the impact of low-volume fluid resuscitation on survival and outcome after severe blood loss. FY04, conduct manufacturing and testing of pilot lots of freeze-dried plasma and novel storage containers; submit investigational new drug application for freeze-dried plasma, conduct animal testing of freeze-dried plasma. FY05, submit investigational new drug (IND) application for freeze-dried plasma, prepare for clinical testing of freeze-dried plasma, complete studies of low-volume fluid resuscitation, identify new candidate chemical additives for resuscitation fluids to improve outcome of resuscitated casualties.	2678	3812	3132	2932
FY02, developed animal models to study safety and effectiveness of drugs to control severe bleeding; conducted animal studies of candidate drugs to restore blood clotting in casualties with abnormal clotting. FY03, conduct research on a device to control severe bleeding without a tourniquet; continue development of a handheld device to stop bleeding with sound waves in animals; conduct follow-on animal studies of candidate drugs to restore blood clotting. FY04, initiate animal studies of candidate drugs to evaluate potential to restore blood clotting in casualties that have abnormal clotting to increase survival of battlefield casualties. FY05, complete animal studies of candidate drugs to evaluate their potential to restore blood clotting in casualties that have abnormal clotting, submit investigational new drug application for candidate drug to restore blood clotting function.	2278	2100	1610	1447

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
FY02, demonstrated effectiveness in animal models of antimicrobial cement and antimicrobial fixator pins to prevent bone infection after fracture repair; conducted animal studies to mitigate effects of smoke inhalation in combat casualties; evaluated already licensed drugs for safety and effectiveness in treating penetrating brain injury; tested a new device to measure intracranial pressure after head injury. FY03, study new methods to manage and mitigate injuries caused by land mines and shrapnel weapons; investigate newly licensed drugs for stroke to mitigate effects of traumatic brain injury. FY04, conduct initial studies of an antimicrobial wound-cleaning device, conduct initial studies of lightweight materials and splints for fracture stabilization, evaluate candidate neuroprotective drugs in cell culture and in an animal model of brain injury. FY05, down-select and conduct clinical testing of an advanced prototype wound protective barrier device, submit an investigational device exemption application (IDE) for a prototype wound protective barrier device, continue studies in animal models of the effectiveness of candidate drugs to mitigate brain injury after head trauma.	2007	2000	1911	2100
FY02, designed and tested micro-impulse radar (MIR) as a means to monitor life-signs in casualties; conducted toxicity studies of candidate chemical food additives for preventing dental disease in deployed warfighters. FY03, seek methods to mitigate the effects of body and vehicle motion on accuracy of MIR; conduct preclinical studies of a candidate chemical additive for meals ready to eat (MREs) for prevention of dental disease. FY04, continue to conduct preclinical studies of a candidate chemical additive for MREs; adapt handheld MIR to a wearable version. FY05, continue to conduct preclinical studies of a candidate chemical additive for MREs for prevention of dental disease; transition handheld MIR for heart rate monitoring to System Development and Demonstration.	1566	2405	2300	1900
Totals	8529	10317	8953	8379

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

February 2003

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602787A - MEDICAL TECHNOLOGY**	**878**

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
878	HLTH HAZ MIL MATERIEL	10627	11302	11900	12363	12370	12509	12751	13052

A. Mission Description and Budget Item Justification: This supports "Medical" and "Survivability" Objective Force Technology Areas with focused research for the soldier on protection from health hazards associated with materiel and operational environments. Emphasis is on identification of health hazards inherent to the engineering design and operational use of equipment, systems, and material used in Army combat operations and training. Specific hazards include repeated impact/jolt in combat vehicles and aircraft; blast overpressure and impulse noise generated by weapons systems; toxic chemical hazards associated with deployment into environments contaminated with industrial and agricultural chemicals; nonionizing radiation directed energy sources (laser); and environmental stressors (e.g., heat, cold, and terrestrial altitude). Specific research tasks include characterizing the extent of exposure to potential hazards; delineating exposure thresholds for illness or injury; identifying exposure thresholds for performance degradation; establishing biomedical databases to support protection criteria; and developing and validating models for hazard assessment, injury prediction, and health and performance protection. Intramural research is conducted at the US Army Aeromedical Research Laboratory, the US Army Research Institute of Environmental Medicine, and the Walter Reed Army Institute of Research. Major contracts are with Universal Energy Systems and JAYCOR. Additionally, numerous Cooperative Research and Development Agreements are held with universities and independent laboratories. This program supports the Objective Force transition path of the Transformation Campaign Plan.

There are no Defense Emergency Response Funds provided to this project.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
FY02, identified, through micro gene array techniques, promising candidate pharmaceuticals to minimize laser eye injuries. FY03, evaluate drugs to minimize secondary nerve injury from battlefield lasers and refine exposure limits to minimize laser eye injury hazards. FY04, test genomic/proteomic (study of protein expression and function) derived laser eye injury treatments in non-human primates. FY05, develop laser eye injury triage, treatment and protection applications.	2326	3520	3821	4212

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
FY02, established and tested standard methodologies for evaluating restraint technologies to enhance soldier safety in tactical vehicles and aircraft. Developed model of aircrew airbag interaction in helicopter crashes. Completed an approved Draft International Standard on evaluating human response to repeated mechanical shock. FY03, define injury thresholds for dynamic responses in restraint systems for Army ground and air vehicles. FY04, provide validated repeated jolt guidelines and proposed standards for safe operations of tactical ground vehicles for use in the Health Hazard Assessment program. Provide performance standards for effective military restraint systems. FY05, translate validated restraint and jolt standards into a biomedically valid virtual prototyping model.	1215	1249	1344	940
FY02, designed a device to characterize forces behind body armor and initiated blunt trauma injury studies. FY03, fully characterize forces behind soft and hard body armor and initiate a mathematical model to analyze and validate data from animal injury studies. FY04, complete animal injury studies, analyze and validate data, and develop test module for body armor developers. FY05, design human injury prediction software to facilitate development of advanced body armor that protects soldiers from potentially lethal blunt trauma injuries.	3737	3718	3920	3817
FY02, identified indicators of reproductive effects using genomic (study of genes and their functions) and proteomics (study of protein expression and function) technologies to provide faster and more comprehensive assessment of toxicological hazards. FY03, design neurotoxicity and reproductive toxicity tests for evaluating militarily relevant chemicals and mixtures. FY04, study approaches for a portable aquatic biomonitor for monitoring chemical contamination in water. FY05, apply proteomics-based findings to establish initial concepts for simple and reliable field neurotoxicity analysis.	3349	2815	2815	3394
Totals	10627	11302	11900	12363

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

February 2003

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602787A - MEDICAL TECHNOLOGY**	**879**

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
879	MED FACT ENH SOLD EFF	8216	8781	9028	10401	10514	10514	10673	10934

A. Mission Description and Budget Item Justification: This supports "Medical" and "Survivability" technology areas of the Objective Force with research for the soldier focused on preventing health and performance degradation in the military environment. Emphasis is on identification of baseline physiological performance and assessment of degradations produced by operational stressors. This database and collection of rules and algorithms for performance degradation in multistressor environments forms the basis for the development of behavioral, training, pharmacological, and nutritional interventions to prevent decrements and sustain soldier performance. Key stressors include psychological stress from isolation, new operational roles, and frequent deployments; inadequate restorative sleep; prolonged physical effort and inadequate hydration in extreme environments; desynchronization of biological rhythms during deployments across multiple time zones and night operations; and thermal and altitude stress. Research under this project is conducted at the US Army Aeromedical Research Laboratory, the US Army Research Institute of Environmental Medicine, and the Walter Reed Army Institute of Research and its overseas laboratories. Major contract is with JAYCOR. Additionally, numerous Cooperative Research and Development Agreements are held with universities and independent laboratories. This program supports the Objective Force transition path of the Transformation Campaign Plan.

There are no Defense Emergency Response Funds provided to this project.

Accomplishments/Planned Program	FY 2002	FY 2003	FY 2004	FY 2005
FY02, transitioned compatible model for measuring effects of extreme cold climate related stress and performance to Scenario, the Army's simulation model. Studied melatonin effects on mental ability, temperature regulation, and performance. FY03, establish neural network model, test dehydration component of model, and validate terrain coefficients in the model. FY04, complete the model of cold, heat, and altitude stress to predict individual and unit level performance outcomes based on environmental and operational variables. FY05, integrate temperature regulation and sleep models into the Scenario model.	2000	2030	2216	2530
FY02, demonstrated effectiveness of resynchronizing drugs to decrease jetlag following rapid deployment operations. Determined effectiveness of caffeine gum in regular and periodic users. FY03, provide guidance on using caffeine, modafinil, and amphetamines to fight fatigue. FY04, establish a sleep model that predicts the effects of stimulants and naps on performance. FY05, demonstrate a comprehensive fatigue and performance model for group predictions of soldier performance in continuous operations.	2248	2818	1610	2123

Accomplishments/Planned Program (continued)	FY 2002	FY 2003	FY 2004	FY 2005
FY02, identified stressors associated with military deployments to improve soldier resiliency and performance, and determined that deployment tempo significantly impacts the health of the military family. FY03, develop a tool to assess cognitive function in the field and develop an Army-wide suicide surveillance system. FY04, identify factors that predict high rates of mental disorders and define the association of mental health with readiness. FY05, propose effective methods for psychological health screening in deployed troops.	2100	2187	3071	3595
FY02, developed a preliminary version of the shades-of-gray model to assess visual performance with head-mounted devices. FY03, establish visual performance criteria for the integration of flat panel displays into helmet-mounted devices. FY04, determine the effect of eyesight correction on visual performance with electro-optical devices and complete visual detection model to include complex targets and backgrounds. FY05, provide guidance on safety and effectiveness of laser eye surgery for vision correction to eliminate the need for glasses.	1868	1746	2131	2153
Totals	8216	8781	9028	10401