

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2008

BUDGET ACTIVITY		PE NUMBER AND TITLE					
2 - Applied Research		0602787A - MEDICAL TECHNOLOGY					
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
Total Program Element (PE) Cost	228291	184214	75395	73639	74556	76105	77825
845 BONE DISEASE RESEARCH PROGRAM	968	795					
863 BTLFLD SURGICAL REPLAC							
865 CENTER FOR MILITARY BIOMATERIALS RESEARCH							
866 CLINICAL TRIAL PLEZOELECTRIC DRY POWDER INHALATION							
867 DIAGNOSTICS IN TRAUMATIC BRAIN INJURY BLOOD BASED							
869 T-MED/ADVANCED TECHNOLOGY	2912	3031	3141	3017	3045	3113	3184
870 DOD MED DEF AG INF DIS	15511	14883	15516	15802	16166	16480	16930
873 HIV EXPLORATORY RSCH	10976	11245	11389	10711	10780	11021	11268
874 CBT CASUALTY CARE TECH	18729	14595	11975	12084	12153	12355	12566
878 HLTH HAZ MIL MATERIEL	11926	13924	14312	13666	13815	14124	14438
879 MED FACT ENH SOLD EFF	10112	9955	10316	9902	9978	10200	10429
953 DISASTER RELIEF & EMERGENCY MEDICAL SVC (DREAMS)							
968 SYNCH BASED HI ENERGY RADIATION BEAM CANCER DETECT	7747	4967					
96C DIGITAL IMAGING AND CATHERIZATION EQUIPMENT							
96I REMOTE ACOUSTIC HEMOSTASIS							
977 EMERGING INFECTIOUS DISEASES	3486						
FH2 FORCE HEALTH PROTECTION - APPLIED RESEARCH	8053	8407	8746	8457	8619	8812	9010
MA2 DIABETES PROJECT	2034						
MA3 MEDICAL AREA NETWORK FOR VIRTUAL TECHNOLOGY	4164						
OA3 CENTER FOR ADV SURGICAL &	2324	993					

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2 - Applied Research	0602787A - MEDICAL TECHNOLOGY						
INTERVENTIONAL TECH (CA)							
OA5 COMPUTATION PROTEOMICS (CA)							
OA7 ELGEN GENE DELIVERY TECHNOLOGY (CA)	1066						
OA8 ENHANCED RES IN TRAUMA PREVENTION/TREATMENT/REHAB							
OA9 GENETIC ACUTE ENHANCED BOWARFARE THERAPY PROG (CA)							
PA4 WOUND HEALING PROJECT (CA)	968	1192					
PA5 NANOFABRICATED BIOARTIFICIAL KIDNEY (CA)	1453	993					
PA9 PROSTHETIC DEVICE CLIN EVAL AT WRAIR AMPUTEE CTR	5810						
RA2 TARGETED NANOTHERAPEUTICS FOR CANCER (CA)							
RA4 TRANSPORTABLE PATHOGEN REDUCT AND BLOOD SAFETY SYS	1066						
RA6 VERSA HSDI (CA)							
TA1 AUTO MEDICAL EMERGENCY INTRAVASCULAR ACCESS (CA)							
TA7 COMBAT CASUALTY CARE FOR BATTLEFIELD WOUNDS (CA)	3776						
UA2 HIGH-SPEED MEMS ELECTROMAGNETIC CELL SORTER (CA)							
UA5 NEUTRON THERAPY (CA)							
UA6 PREDICTIVE TOOLS FOR PTSD (CA)							
UA7 PREVENTIVE MEDICINE RESEARCH INSTITUTE (CA)	1743						
UA8 PROTEIN HYDROGEL (CA)	968	1987					

0602787A
MEDICAL TECHNOLOGY

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Exhibit R-2
Budget Item Justification

028 0602787A MEDICAL TECHNOLOGY

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BUDGET ACTIVITY		PE NUMBER AND TITLE					
2 - Applied Research		0602787A - MEDICAL TECHNOLOGY					
VB3	MEDICAL TECHNOLOGY INITIATIVES (CA)	109788	97247				
X06	HIBERNATION GENOMICS	2711					

A. Mission Description and Budget Item Justification: This program element (PE) supports applied research required to sustain a force of healthy, medically protected warfighters. The primary goal of military medical applied research is to develop medical knowledge and technology (drugs, vaccines, and devices) to effectively protect and improve the survivability of US Forces. This PE funds applied research in the following areas: Militarily Relevant Infectious Diseases including HIV (Human Immunodeficiency Virus); Combat Casualty Care; and Military Operational Medicine (efforts aimed at protecting the Soldier against physiological and environmental degradation). Applied research program development and execution is externally peer reviewed and, to prevent unnecessary duplication, fully coordinated with other Services and Agencies through the Joint Technology Coordinating Groups of the Armed Services Biomedical Research Evaluation and Management Committee.

All medical applied research is conducted in compliance with US Food and Drug Administration (FDA) regulations. The FDA requires thorough testing in animals (referred to as preclinical testing) to assure safety and, where possible, effectiveness (i.e., efficacy) prior to approving controlled clinical trials where these experimental (previously unproven in humans) drugs, vaccines, and medical devices are tested in humans. Subsequent clinical trials are conducted in three phases (Phase 1, 2, and 3) to prove safety and effectiveness of the drug/vaccine/device for the targeted disease/condition, including an increasing number of people in each subsequent phase. Research conducted in this PE primarily focuses on completing preclinical technology maturation activities, although some activities may require use of human subjects to determine preliminary effectiveness when there are no validated animal models.

The Militarily Relevant Infectious Diseases effort focuses on designing and developing medical protection and treatment against naturally occurring diseases of military importance as identified by worldwide medical surveillance and military threat analysis. Methods identified and matured for prevention and treatment of infectious diseases include candidate vaccines, prophylactic (i.e. preventive measures) intervention, therapeutic drugs, and control of disease-carrying vectors (e.g., mosquitoes, ticks, and mites). HIV Exploratory Research focuses on developing diagnostics, surveillance, epidemiology, and identification of candidate vaccines for prevention and treatment of HIV subtypes found outside the US, which are problematic in military deployments and joint operations with coalition forces.

The Combat Casualty Care effort conducts research to develop knowledge and technologies that can improve medical treatment outcomes for battlefield injuries. Work involves identification and evaluation of drugs, biologics (products derived from living organisms), and diagnostics for resuscitation and life support, as well as trauma care systems for use by forward medics and surgeons. This effort also includes research into treatments for face and neck injuries.

The Military Operational Medicine (MOM) effort focuses on biomedical solutions that protect Soldiers and enhance their performance in the face of multiple stressors in operational and training environments. Research matures knowledge and technologies, such as biomedically-valid design criteria for body armor and physiological monitors, to protect Soldiers from injuries from exposure to hazardous environments and materials. This research also examines physiological indicators and associated algorithms/sensors that potentially indicate performance degradation produced by operational stressors such as high altitude, extreme temperatures, hydration, fatigue, isolation, and sleep deprivation.

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Work in this PE is performed by the Walter Reed Army Institute of Research, Silver Spring, MD; US Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, MD; US Army Medical Research Institute of Infectious Diseases, Fort Detrick, MD; US Army Research Institute of Environmental Medicine, Natick, MA; US Army Institute of Surgical Research, Fort Sam Houston, TX; US Army Aeromedical Research Laboratory, Fort Rucker, AL; and the Naval Medical Research Center, Silver Spring, MD.

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<u>B. Program Change Summary</u>	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2008/2009)	229893	76544	72584
Current BES/President's Budget (FY 2009)	228291	184214	75395
Total Adjustments	-1602	107670	2811
Congressional Program Reductions		-1220	
Congressional Rescissions			
Congressional Increases		108890	
Reprogrammings	3914		
SBIR/STTR Transfer	-5516		
Adjustments to Budget Years			-189

Fifty-five FY08 congressional adds totaling \$108890 were added to this PE.

- (\$350) Mass Decontamination and Biosecurity Initiative
- (\$500) Oxygen Diffusion Dressings for the Accelerated Healing of Battlefield Wounds and Burns
- (\$800) Bone Health and Military Medical Readiness Program
- (\$800) Center for Vaccine Scale-Up Process Research (Phase I)
- (\$800) Neuroscience Research Consortium to Study Spinal Cord Injury
- (\$940) West Nile Virus Vaccine
- (\$1000) Nanofabricated Bioartificial Kidney and Bioterrorism
- (\$1000) Center for Advanced Surgical and Interventional Technology (CASIT)
- (\$1000) Carbon Nanotube Production
- (\$1000) Center for Research on Integrative Medicine for the - Military (CRIMM)
- (\$1000) Medical Image Database Holographic Archiving Library System (MIDHALS)
- (\$1000) Regional Nuclear Magnetic Resonance (NMR) Facility
- (\$1000) Remote Robotic Teleproctoring to Promote Rapid Surgical Skills Acquisition
- (\$1000) Storage Area Network
- (\$1200) Rapid Wound Healing Technology Development Project
- (\$1200) Improving Musculoskeletal Health & Function
- (\$1200) Medical Resources Conservation Technology Pilot Energy Cost Control Evaluation (PECCE)
- (\$1200) Wound Infection Treatment Program
- (\$1600) Advanced Bio-engineering for Enhancement of Soldier Survivability
- (\$1600) Armed Services Gynecological Cancer Health Program
- (\$1600) Cancer Prevention Through Remote Biological Sensing

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(\$1600) Copper Air Quality Program (\$1600) Defense Against Viral Infection (DAVI) (\$1600) Electronic Technology-Infrastructure in Support of Military Missions (\$1600) Epigenetic Disease Research (\$1600) Integrated Medicine, Communications, Compassion, Chronic Care Program (\$1600) Molecular Switch Vaccines for Biodefense and Cancer (\$1600) Neutron/Hadron Particle Therapy (\$1600) Orthopedic Implant Design and Manufacturing for Traumatic Injuries (\$1600) Prevention of Radiation Injury by use of Statins (\$1600) Respiratory Biodefense Initiative (\$1600) Technological Regional Center of Excellence for PTSD (\$2000) BioFoam Protein Hydrogel for Battlefield Trauma (\$2000) Center for Ophthalmic Innovation (\$2000) Disposable Unit Dose Drug Pumps for Anesthesia and Antibiotics (\$2000) Fibrin Adhesive Stat (FAST) Dressing (\$2000) Impact of Intensive Lifestyle Modification on Chronic Medical Conditions (\$2000) Plant-based Vaccine Research (\$2000) Rapid Vaccine Discovery Technology (\$2000) Staph Vaccine (\$2400) Cedars-Sinai Core Imaging Center (\$2400) Proton Therapy (\$2400) Synthetic Malaria Vaccine (\$2500) MRI-DTI Technology to Improve Diagnostics and Treatment of TBI (\$2800) Injury Research Center-Ryder Trauma Center (\$3000) Center for Resuscitation Research (\$3200) Center for Injury Biomechanics (\$3200) Cold Spring Harbor Laboratory Women's Cancer Genomics Center (\$3200) Cone Beam CT Scanners (\$4000) Military Interoperable Digital Hospital Testbed (\$4000) New Vaccines to Fight Respiratory Infection (\$4800) Orthopaedic Extremity Trauma Research (\$5000) Complimentary & Alternative Med Research (MIL-CAM) (\$5000) Synchrotron-Based Scanning Research (\$5600) Pain and Neuroscience Center Research Center	

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602787A - MEDICAL TECHNOLOGY					PROJECT 869	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
869 T-MED/ADVANCED TECHNOLOGY	2912	3031	3141	3017	3045	3113	3184

A. Mission Description and Budget Item Justification: This project funds applied research in the design and development of physiological status monitoring technology that enables remote monitoring of the Soldier to provide commanders and medics information on health and performance, including performance status (tracking changes in warfighter physical characteristics and physiological capacities), casualty avoidance (preventing environmentally related non-battle injuries), and wound detection (a signal identifying the occurrence of a wound). The focus is on developing the reliable interpretation of signals from a wearable, integrated system that can monitor Soldier physiological status and provide actionable information. It enables personnel to quickly and accurately determine that a Soldier is fully functional, impaired but still capable of functioning, or in need of medical attention. This information would also be useful in planning the evacuation and treatment of casualties. Work includes identification and initial development of parallel and supporting technologies including medical informatics (science of organizing and interpreting medical information), medical artificial intelligence, and data mining tools that develop predictors of detrimental physiologic changes. Work is performed in coordination with US Army Natick Soldier Research, Development, and Engineering Center. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work in this project is performed by the US Army Research Institute of Environmental Medicine, Natick, Massachusetts; the US Army Institute of Surgical Research, Fort Sam Houston, Texas; and the Walter Reed Army Institute of Research, Silver Spring, Maryland.

<u>Accomplishments/Planned Program:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Physiological/Life Sign Monitoring: In FY07, demonstrated real-time remote monitoring of thermal-work strain in encapsulated Soldiers during a simulated chemical-biological mission. In FY08, develop and evaluate Spartan network (SPARNET) and next-generation Heat Strain Decision Aid (HSDA) prototypes with Ranger Training Brigade; track Ranger student hydration and geo-location; demonstrate HSDA value in reducing likelihood of heat injury. Apply predictive modeling and simulation to support improvements in training doctrine and individual equipment. Evaluate new method of monitoring fluid consumption. Demonstrate remote real-time prediction and management of thermal strain in physically active Soldiers. In FY09, will demonstrate remote medical monitoring capability in mountain and swamp phases of Ranger training. Evaluate models predicting thermal status and water requirements for missions in rugged terrain, swamps, and cold weather.	2912	2968	3141
Small Business Innovative Research/Small Business Technology Transfer Programs		63	
Total	2912	3031	3141

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602787A - MEDICAL TECHNOLOGY					PROJECT 870	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
870 DOD MED DEF AG INF DIS	15511	14883	15516	15802	16166	16480	16930

A. Mission Description and Budget Item Justification: This project supports applied research on medical countermeasures to naturally occurring infectious diseases that pose a significant threat to the operational effectiveness of forces deployed outside the United States. Preventive countermeasures would 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 malaria, bacterial diseases responsible for diarrhea (i.e., caused by Shigella, enterotoxigenic Escherichia coli, and Campylobacter), and viral diseases (e.g., dengue fever and hantavirus). This project explores improved materiel to control disease transmission by insects, ticks, and other organisms (vectors) that transmit diseases to humans thus reducing incidence of these diseases. It also addresses a variety of other infectious disease threats to mobilizing forces, including leishmaniasis, meningitis, viral encephalitis, scrub typhus, and hemorrhagic fevers. Improved diagnostic capabilities will enable rapid battlefield identification important for a commander's medical situational awareness and physician's intervention. Major goals include the discovery and application of new technologies including the integration of genomic (DNA-based) and proteomic (protein-based) technologies into vaccine and drug discovery, developing broad-spectrum vaccines that can protect against multiple disease strains and developing improved drugs to prevent or treat malaria. For the development of drugs and biological products, preclinical studies in the laboratory and in animal models assess safety, toxicity, and effectiveness and are necessary to provide evidence to the U.S. Food and Drug Administration (FDA) to justify approval for a product to enter into future human clinical trials. Additional nonclinical studies are often needed in Applied Research even after candidate products enter into human testing during Advanced Technology Development, usually at the direction of the FDA, to assess potential safety issues. Drug and vaccine development bear high technical risk. Of those candidates identified as promising in initial screens, the vast majority are eliminated after additional safety, toxicity, and/or effectiveness testing. In drug discovery, about 1 of every 10,000 new chemical entities will end up as a licensed drug with most being disqualified in early cell and animal safety and effectiveness testing. Similarly vaccine candidate have a high failure rate, but as animal testing is not a predictor of human response, disqualification of this technology occurs after going into human trials. The high risk of such technology development forces efforts to be repetitive to provide the continuing pipeline of candidates needed to sustain the developmental efforts. Work is managed by the US Army Medical Research and Materiel Command. As the lead service for infectious diseases research within the Department of Defense, the Army is responsible for programming and funding all research on joint and service-specific requirements thereby precluding duplication of effort within the Military Departments. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work in this project is performed by the Walter Reed Army Institute of Research, Silver Spring, Maryland, and its overseas laboratories; the US Army Medical Research Institute of Infectious Diseases, Fort Detrick, Maryland; and the Naval Medical Research Center, Silver Spring, Maryland, and its overseas laboratories.

Accomplishments/Planned Program:	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Drugs to Prevent/Treat Parasitic Diseases: Assess and improve current candidate drugs for prevention and treatment of malaria and/or leishmaniasis, selecting the most effective and safe candidates for continued development. The malaria parasite becomes resistant to currently licensed drugs, making it necessary to continually search for new drugs to maintain the developmental pipeline. In FY07, assessed about 100 potential vaccine components against malaria and leishmaniasis from the greater than 1000 chemical compounds screened in basic science program. Qualified 40 compounds of potential interest and as possible replacement lead candidates. Introduced novel approaches identified in basic research to aide in accessing these compounds. Continued to optimize (improve safety and	4232	4706	5815

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT		
2 - Applied Research	0602787A - MEDICAL TECHNOLOGY	870		
effectiveness profiles) current lead candidates in the developmental pipeline. In FY08, continue studies to design, assess, and qualify candidate chemical compounds in search of more promising candidate drug classes to maintain pipeline of potential compounds of which the best will enter lead optimization. In FY09, will continue the process of identifying and improving chemical compounds that have highest potential to be effective drugs against malaria and/or leishmaniasis. Will examine drugs currently licensed for another medical indication for potential to be effective against malaria or leishmania. Will complete optimization of one lead drug to move into clinical testing (transition to PE 810).				
Vaccines for Prevention of Malaria: Conduct studies to investigate new candidate vaccines as well as assess and improve current candidate vaccines for prevention of malaria to find and select the most effective and safe items for continued development. A malaria vaccine could reduce the need for antimalarial drugs, the continuing problems with parasite drug resistance and compliance issues with taking antimalarial drugs. In FY07, assessed, designed, or disqualified candidate vaccines against malaria, introducing novel approaches identified in basic research to improve assessment and selection of candidate vaccines. Refined candidates previously assessed as promising, including improved versions of these, through using alternative vaccine delivery methods. In FY08, assess potential malaria vaccine subcomponents in animal testing. Take into concept exploration new proteins and gene-based vaccines identified from animal malaria models or malaria in humans, using molecular biological approaches to produce sufficient material to formulate into a vaccine candidate and to test in animal studies. In FY09, will continue to test and develop vaccine candidates in the pipeline until they fail or are moved to Advanced Technology Development and will continue to assess new vaccine candidates against malaria emerging from the basic science program to maintain a pipeline of new technologies to mitigate risk if lead technologies fail.	2249	3117	3082	
Bacterial Threats Vaccine Programs: Conduct studies to design and assess antibacterial vaccine candidates to prevent diarrhea and dysentery (a threat to deployed troops), meningitis (a threat to trainee and deployed troops), and scrub typhus (a debilitating disease that is developing resistance to the only treatments available). In FY07, continued to design and validate potential vaccine candidates against diarrhea, meningitis, and scrub typhus, including assessment of new vaccine strategies and of candidate vaccines against diarrhea; completed improved version of meningitis vaccine for assessment in animals; and assessed new and revised scrub typhus DNA and protein vaccines in mouse model based on lessons learned in FY06. In FY08, refine anti-diarrheal vaccine candidates and assess a potential vaccine made of bacterial proteins associated with the bacteria adhering to the gut, establish a model of dysentery (bloody diarrhea caused by Campylobacter) in nonhuman primates that can be used to assess/demonstrate new candidate vaccines before taking into expensive human clinical trials, and complete preclinical evaluation of new candidate diarrheal and meningitis vaccines. In FY09, will continue systematic examination of potential bacterial gut adhesion proteins as new vaccine candidates and assess other nonvaccine countermeasures against diarrhea. Continue to genetically modify the meningitis bacteria to expand the diversity of expressed proteins, thereby increasing the range of protection across multiple subtypes of the bacteria, and manufacture and test as a vaccine in animal models. Will test new scrub typhus proteins as potential candidates in a broadly protective vaccine against multiple scrub typhus subtypes, over 100 subtypes recognized.	3880	2731	2591	
Insect Vector Control and Infectious Disease Diagnostics Programs: Develop interventions that protect warfighters from insect bites that transmit diseases and design new medical diagnostic and surveillance tools for the field. Sand flies can transmit Leishmania, and different species of mosquitoes can transmit dengue fever and malaria. In FY07, conducted studies to find better ways to protect from insect-borne diseases and to improve medical diagnostic capabilities in the field. Refined field pathogen detection kits and continued to assess sand fly preventive medicine materials and an improved standard bed net that is an effective barrier to tiny sand flies. Continued to develop improved laboratory diagnostics for malaria, dengue virus and diarrheal diseases. In FY08, refocus effort to reduce disease threat from insects other than sand flies, including testing of insect-based pathogen detection assays, down selecting a new insect repellent for final formulation, and continuing to improve medical diagnostic capability in the field. Assess individual and combined components of	2332	1973	2152	

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diagnostic tests for selected naturally occurring infectious disease agents and begin design of next-generation diagnostic assays. In FY09, will investigate new intervention methods that reduce/prevent biting by insect vectors and will design and evaluate new medical diagnostic and surveillance tools for the field to improve the medical response to threats for which solutions have not been found.			
Viral Threats Vaccine Programs: In FY07, continued developing and testing new vaccine candidates against dengue and hantaviruses and assessed new technologies to protect against other lethal viral diseases. In FY08, evaluate new antiviral vaccines against emerging viral threats, and assess potential of a combined DNA vaccine against several highly lethal viruses including Rift Valley fever, Crimean-Congo hemorrhagic fever, and tick-borne encephalitis. In FY09, will continue to assess and evaluate new antiviral vaccine against Lassa virus in animals and continue to support the hantaviral vaccine development effort. Will examine new vaccine delivery approaches to improve vaccine responses in animal models with goal of finding a way to enhance vaccines for protecting against or treating viral disease threats.	2818	2313	1876
Small Business Innovative Research/Small Business Technology Transfer Programs		43	
Total	15511	14883	15516

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602787A - MEDICAL TECHNOLOGY					PROJECT 873	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
873 HIV EXPLORATORY RSCH	10976	11245	11389	10711	10780	11021	11268

A. Mission Description and Budget Item Justification: This project supports the medical technology area of the Future Force by conducting applied research and development of improved diagnostics, assessing genetic diversity of the virus, conducting regional overseas studies of disease to identify and develop vaccine trial sites, and developing of candidate vaccines for prevention and treatment of human immunodeficiency virus (HIV) infection. HIV is the virus that causes Acquired Immunodeficiency Syndrome. This program is jointly managed through an Interagency Agreement between the U.S. Army Medical Research and Materiel Command and the National Institute of Allergy and Infectious Diseases. Main efforts include development and preclinical studies (studies required before testing in humans) of candidate vaccines, such as small animal and nonhuman primate studies, as well as laboratory methods to assess vaccine protection, improved diagnosis of HIV infection, improved prognostic assessment, and disease management of HIV-infected individuals. This project contains no duplication of effort within the Military Departments or other government organizations. Work is related to and fully coordinated with work funded in PE 0603105, project H29. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work in this project is performed by the Walter Reed Army Institute of Research and the Naval Medical Research Center, Silver Spring, Maryland, and their overseas laboratories. Most work is conducted under a cooperative agreement with the Henry M. Jackson Foundation, Rockville, Maryland.

<u>Accomplishments/Planned Program:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
HIV Research Program: Conduct projects assessing new HIV vaccine candidates, vaccine test site development worldwide, HIV disease outbreaks, and genetic attributes of HIV threat. In FY07, continued assessment of new HIV vaccine candidates, vaccine test site development in Africa and Asia, and epidemiological and genetic assessment of the HIV threat and potential impact to operations. Continued vaccine testing using a "prime-boost" vaccine strategy (using a combination of two different vaccines to induce strong and long-term protective immune response), evaluated animal and human physiological responses that correlate with disease protection for assessing effectiveness of vaccines in humans and novel vaccine strategies. In FY08, continue ongoing long-term candidate vaccine refinement based on studies of globally prevalent HIV viral subtypes, continue to improve methodologies for medical monitoring of Department of Defense (DoD) personnel's viral exposure and infection, and continue to improve and integrate new methods to assess the effectiveness of candidate vaccines in support of clinical research (tests in humans). In FY09, will continue long-term efforts to find solutions to the HIV threat to DoD personnel with ongoing studies directed at assessing HIV vaccine candidates, vaccine test sites in Africa and Asia, and continuing changes in global risk and genetic makeup of HIV threat to U.S. forces to help direct future research and intervention programs.	10976	10947	11389
Small Business Innovative Research/Small Business Technology Transfer Programs		298	
Total	10976	11245	11389

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BUDGET ACTIVITY 2 - Applied Research		PE NUMBER AND TITLE 0602787A - MEDICAL TECHNOLOGY					PROJECT 874	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
874 CBT CASUALTY CARE TECH	18729	14595	11975	12084	12153	12355	12566	

A. Mission Description and Budget Item Justification: This project supports applied research to develop and assess the feasibility of concepts, techniques, and materiel that improve survivability and ensure better medical treatment outcomes for warfighters wounded in combat and military operations other than war. The focus is on improving the effectiveness of medical treatment in the pre-hospital setting and during evacuation. Major areas of emphasis include hemorrhage control (novel bandages and techniques), resuscitation (fluid replacement and oxygen delivery), prognostics and diagnostics (predictive indicators, decision aids, and devices for triage), life support (computerized monitors and autonomous patient care devices), and repair (novel treatments to minimize tissue damage and accelerate restoration of function). This project also funds research to enable better medical training for Soldiers, medics, and other battlefield medical personnel to reduce evacuations due to dental disease and reduce the medical logistics footprint (weight, cube, and number of personnel) on the battlefield. For the development of drugs, biological products, medical devices, preclinical studies in the laboratory and in animal models assess safety, toxicity, and effectiveness and are necessary to provide evidence to the U.S. Food and Drug Administration to justify approval for a product to enter into future human clinical trials. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work on this project is performed by the U.S. Army Institute of Surgical Research, Fort Sam Houston, Texas; the U.S. Army Research Institute of Environmental Medicine (USARIEM), Natick, Massachusetts; and the Walter Reed Army Institute of Research, Silver Spring, Maryland.

<u>Accomplishments/Planned Program:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Hemorrhage Control, Blood, and Resuscitative Fluids: Includes materials and systems for minimizing the effects of traumatic blood loss, preserving blood and blood products, and resuscitation following trauma: In FY07, completed stability studies of freeze-dried plasma; selected best method to inactivate disease-causing agents in blood to prevent disease from blood transfusions; developed preclinical models of abnormal blood clotting in combined injury, bleeding, and massive resuscitation model; defined resuscitation strategies to correct abnormal clotting; engineered a nonperishable fluid to mimic fresh whole blood; completed comparative experiments to determine the best new fluid for resuscitation; and selected the most promising blood additive to reduce tissue and organ injury, inflammation, and shock in severely injured patients. In FY08, begin preparation for initial safety study of freeze-dried plasma, identify new strategies to treat the abnormal blood-clotting response that occurs in severely injured patients, establish the effects of resuscitation treatments for combined blast-trauma-hemorrhage injuries on the brain and lungs; and determine if red blood cells lose efficacy near the end of their shelf life. Also, test products and methods of using a foam blood clotting agent to stop internal bleeding. In FY09, will identify specific diagnostic and therapeutic interventions for abnormal blood clotting from the candidates identified in FY08, optimize resuscitation strategies for blast-trauma-hemorrhage on brain and lung in small animal models and investigate methods to freeze-dry red blood cells.	6050	7519	5138
Combat Trauma Therapies: Includes identification and development of candidate drugs and medical procedures to minimize the effects of combat injuries: In FY07, began planning a long-term collaborative effort with the Armed Forces Institute of Regenerative Medicine (AFIRM) to study restoration of limb function by both reducing infections and by regenerating skin, muscle, and bone tissue in battle-injured extremities; evaluated a method of cooling the brain as a neuroprotection therapy; and studied a drug to enhance brain function as a potential post injury rehabilitation treatment for brain trauma. In addition, the Biomarker Assessment for Neurotrauma Diagnosis and	8800	3895	4552

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT		
2 - Applied Research	0602787A - MEDICAL TECHNOLOGY	874		
Improved Triage System (BANDITS) implemented a clinical research platform for biomarker analysis. In FY08, award contracts to AFIRM and begin to assess emerging therapeutics (stem cell therapy and growth factors for tissue and bone regeneration) in animal models and assess new methods to repair areas with major injuries caused by projectiles; develop selective brain cooling and neuroregeneration for early intervention and treatment of traumatic brain injury; establish neuroprotection/neuroregeneration methods to reduce death and illness resulting from brain trauma including stem cell therapies, tissue grafts, and a drug to improve new learning and memory; complete studies of FDA-licensed drugs that are candidate anti-seizure therapies for silent brain seizure; and continue BANDITS biomarker clinical trials and design a prototype device for brain injury diagnostics. In FY09, will focus AFIRM tissue regeneration activities on the most promising clinical treatments for blood vessel grafts, muscle regeneration, regeneration of bones in the head and face, and preclinical assessment of long-bone regeneration; will continue to refine selective brain cooling and neuroregeneration for early intervention and treatment of brain injury; will conduct drug combination studies for the treatment of acute brain trauma.				
Far-Forward Medical Systems: Includes diagnostic and therapeutic medical devices and associated algorithms, software, and data-processing systems for resuscitation, stabilization, life support, surgical support, and dental care treatments that can be applied in a pre-hospital, operational field setting. In FY07, completed preclinical evaluation of a software algorithm for automated ventilation and oxygen administration based on lung mechanics and blood gas measurements. Continued toxicity and formulation studies on an antimicrobial, antiplaque compound. In FY08, complete preclinical evaluation of algorithms for simultaneous operation of closed-loop control of ventilation, oxygen administration, and fluid administration, and identify a hardware platform for this system and complete toxicity and formulation studies on an antimicrobial, antiplaque compound. In FY09, will complete preclinical evaluation of oxygen, ventilation, and fluid resuscitation algorithms in an integrated hardware platform (either the Army's integrated litter or the Navy's lightweight trauma module) for casualty transport and transition antiplaque compound to a commercial partner.	2200	1168	1220	
Combat Casualty Bioinformatics and Simulation: Focuses on a data management system to capture and analyze time series data (such as heart and respiration rates) over time and the development of casualty simulations and durable, realistic simulators for initial and reinforcement training of medical care providers. In FY07, refined components of a deployable medical simulation training system for reinforcement training of far-forward care providers and designed new technologies to add to simulators that depict realistic battlefield injuries to train combat medics in treatment of severe trauma. This effort builds upon previous medical simulator technology efforts through the introduction of simulated skin, flesh, and blood to increase realism of models and reduce the need for live tissue (animal) training for trauma treatment. In FY08, complete prototype patient trauma simulations with advances in material sciences that depict realistic skin, flesh, blood, bone, organs, and loss of fluids; and improve sensors that detect and provide feedback on interventions by medics. In FY09, will support testing and evaluate trauma simulation components developed in a joint Research, Development & Engineering Command/U.S. Army Medical Research and Materiel Command effort to assess training effectiveness at the Army Medical Department Center and School and other military training venues.	1679	1759	1065	
Small Business Innovative Research/Small Business Technology Transfer Programs		254		
Total	18729	14595	11975	

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

BUDGET ACTIVITY 2 - Applied Research		PE NUMBER AND TITLE 0602787A - MEDICAL TECHNOLOGY					PROJECT 878	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
878 HLTH HAZ MIL MATERIEL	11926	13924	14312	13666	13815	14124	14438	

A. Mission Description and Budget Item Justification: This project supports the Medical and Survivability technology areas of the Future Force with a focus on providing Soldier protection from health hazards associated with materiel and operational environments. Emphasis is on identifying health hazards inherent to the engineering design and operational use of equipment, systems, and materiel used in Army combat operations and training. Major areas of emphasis include battlefield lasers, ballistic, and mechanical injury (e.g., models of protection by soft body armor), health hazards of operations in environmental extremes, and toxic environments. Specific hazards addressed include blast overpressure generated by weapons systems, toxic chemical hazards associated with deployment into environments contaminated with industrial and agricultural chemicals (which complement ongoing Defense Threat Reduction Agency initiatives for chemical/biological threat agent detection), directed energy sources (laser), and environmental stressors (heat, cold, and high altitude). Specific research tasks include characterizing the extent of exposure to potential hazards; delineating exposure thresholds for illness, injury, and performance degradation; establishing biomedical databases to support protection criteria; and developing and validating models for hazard assessment, injury prediction, and health and performance protection. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work in this project is performed by the Walter Reed Army Institute of Research, Silver Spring, Maryland; the US Army Research Institute of Environmental Medicine, Natick, Massachusetts; the US Army Center for Environmental Health Research, Fort Detrick, Maryland; and the US Army Aeromedical Research Laboratory, Fort Rucker, Alabama.

<u>Accomplishments/Planned Program:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Laser Protection Research: In FY07, examined candidate drug therapy interventions for laser-induced eye injuries and monitored recovery rates of nerve fibers responsible for eye-to-brain data transmissions. In FY08, complete functional assessment of visual acuity recovery in a behavioral model based on emerging laser injury research to determine the best eye injury treatment approach and refine a strategy for combined drug therapies in treatment of laser and trauma-induced eye injuries (blast, fragments). In FY09, will utilize animal testing to assess laser eye injury hazards from advanced military systems. Will evaluate a combination of drugs for treatment of laser-induced eye injury.	1694	2020	2479
Injury Protection (face/eye): In FY07, used laboratory tests and injury trend data to assess computational and physical models of the face and eye, and proposed injury-based protection criteria. The data obtained from these models will produce a biomedically valid advanced physical headform device that can be utilized to assess facial and ocular injury. In FY08, validate and transition physical model and face/eye injury dose-response models to Army materiel developers. In FY09, will design an impact test methodology for assessing face shield performance.	3064	3490	2950
Pulmonary Hazards and Risk Assessment Models: In FY07, developed assessment software that predicts lung damage progression caused by blunt impacts and severe injuries. Conducted large-animal tests to determine the effects of inhaled toxic fire gases on physical performance. In FY08, develop an integrated model that will predict lung injury and performance outcomes from exposures to combined insults of blast over-pressure and blunt trauma. Collect experimental data required to expand the scope of the Toxic Gas Assessment Software - Performance Evaluator (TGAS-PE) model to predict the impact of inhaled fire gas exposures on physical performance. In FY09, will use new and existing animal injury and performance data to validate the integrated blast overpressure/blunt trauma lung injury	3884	4324	4460

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February 2008

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT		
2 - Applied Research	0602787A - MEDICAL TECHNOLOGY	878		
and performance model. Will use large-animal performance data to validate the TGAS-PE model for performance impacts from exposure to inhaled toxic fire gases and release TGAS-PE1 (performance) to survivability assessors for live-fire vehicle testing.				
Biomonitor System and Dehydration Research: In FY 07, completed laboratory testing of an environmental sentinel biomonitor platform that integrates toxicity sensor information to provide rapid analysis of drinking water quality; designed and validated models to predict water needs for a broad spectrum of modern missions in environmental extremes. In FY08, conduct laboratory testing of the environmental sentinel biomonitor system to demonstrate capability of the integrated platform and sensors to rapidly assess drinking water quality and provide relevant health risk information to decision makers regarding toxic hazards in water. Also, conduct laboratory studies using human subjects data to assess the effects of nutritional countermeasures (such as caffeine) on fluid balance and performance when working in hot environments In FY09, will assess technologies for rapidly identifying chemical contamination by toxic industrial chemicals and that are appropriate for use with field water production equipment. Will conduct field test to evaluate on-the-move enhanced fluid and nutrient delivery systems to enhance fluid and electrolyte delivery to Soldiers. Will demonstrate efficacy of inducing acquired thermal tolerance (cellular protection) coincident with heat acclimatization in Soldiers.	3284	3806	3211	
Systems Biology and Network Science: In FY09, will conduct applied research to investigate whether protein-protein network models, developed for a particular pathogen, are portable to a different pathogen sharing a common set of proteins. Will develop mathematical models to predict host-pathogen protein-protein interaction networks, and metabolic network models to predict phenotypical (genetically and environmentally determined physical appearance of an organism) responses induced by external stimuli.			1212	
Small Business Innovative Research/Small Business Technology Transfer Programs			284	
Total	11926	13924	14312	

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602787A - MEDICAL TECHNOLOGY					PROJECT 879	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
879 MED FACT ENH SOLD EFF	10112	9955	10316	9902	9978	10200	10429

A. Mission Description and Budget Item Justification: This project supports applied research with a focus on sustaining and enhancing Soldier health and performance during military operations in the full spectrum of military environments. Emphasis is on identification of baseline physiological performance and assessment of degradations produced by operational stressors. The resulting databases and collection of rules and algorithms for performance degradation in multi-stressor environments form the basis for the development of behavioral, training, pharmacological, and nutritional interventions, including psychological debriefing to prevent degradation in Soldier health 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. Will also assess the adverse effect of shifting biological rhythms during deployments across multiple time zones (extreme jet lag), night operations, and thermal and altitude stress. The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan. Work in this project is performed by the Walter Reed Army Institute of Research, Silver Spring, Maryland; the US Army Research Institute of Environmental Medicine, Natick, Massachusetts; and the US Army Aeromedical Research Laboratory, Fort Rucker, Alabama.

<u>Accomplishments/Planned Program:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
High Altitude Research: In FY07, refined predictive models of altitude acclimatization and completed studies to determine how to optimally accelerate high-altitude acclimatization through intermittent exposure to reduced levels of oxygen. In FY08, integrate doctrinal and technological components into the prototype Altitude Readiness Management System (ARMS), a personalized digital assistant device designed to use altitude and physiological modeling data to monitor individual susceptibility to adverse health and performance at high altitudes. ARMS provide an enhanced planning and prediction capability. In FY09, will examine use of FDA approved drug (erythropoietin) to prevent neuropsychological deficits and acute mountain sickness. Will provide critical information to the Army Medical Department Combat Developer for the development of new Army doctrine related to high altitude deployments.	2686	2815	2657
Fatigue/Sleep Research: In FY07, conducted studies to improve Soldier effectiveness predictions and assessed the efficacy of drug countermeasures for individual Soldiers. In FY08, conduct laboratory studies to assess predictions of performance effectiveness and efficacy of drug interventions for individual Soldiers. In FY09, will further integrate components of the next-generation Fatigue Intervention and Recovery Model/Sleep Activity, Fatigue, and Task Effectiveness (FIRM/SAFTE) which will include enhanced capability for prediction of the effects of stimulants, into the Sleep History and Readiness Predictor (SHARP). SHARP is a program that facilitates interpretation and usefulness of the FIRM/SAFTE model by providing summary information on the relative predicted efficacy of each individual Soldier within a unit.	1823	1702	1682
Mental Health Research: In FY07, determined the impact of deployment length and frequency of deployments in identifying unit/individual characteristics that enhanced resilience. In FY08, assess individual intervention strategies such as DoD post-deployment health assessment and post-deployment health reassessments; assess leader development tools such as pre-deployment battlemind training, and Soldier and leader training modules including post-deployment battlemind training and spouse battlemind training. In FY09, will develop unit-level intervention tools for military-wide implementation to improve warfighter resiliency, health, and performance.	3153	2809	3589
Vision and Auditory Research: In FY07, used human and animal data to initiate evaluation of a hearing damage model, the Auditory	2450	2520	2388

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT	
2 - Applied Research	0602787A - MEDICAL TECHNOLOGY	879	
<p>Hazard Assessment Algorithm for the Human Ear, to assess its utility in performing auditory health risk assessments and guiding development of hearing protective devices; conducted laboratory evaluations of a noise immune electronic stethoscope. The ability to use a stethoscope in noisy environments (i.e., medical evacuation vehicles) will provide significant improvements to Soldier survivability following trauma from hostile action or accidental injury; completed analysis of optometric data investigating the visual effect of wearing a monocular helmet mounted display; designed test methodology for production compliance/quality assurance testing of the protective eyewear program. In FY08, conduct evaluations of animal database for the effects of impulse noise/blast waves on hearing; conduct clinical and animal evaluations of a noise immune electronic stethoscope directed toward future Food and Drug Administration approval; develop the concept of solar protection compatible with rapid transition into darkened environments. In FY09, will conduct comparative analysis of six damage risk criteria identified by NATO countries and provide recommendations of optimum health risk assessment criteria; transition a noise immune electronic stethoscope into advanced development with the United States Army Medical Research and Material Command Developmental Activity; conduct assessments of integrated solar protection prototype eye protection systems.</p>			
Small Business Innovative Research/Small Business Technology Transfer Programs		109	
Total	10112	9955	10316

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

BUDGET ACTIVITY 2 - Applied Research		PE NUMBER AND TITLE 0602787A - MEDICAL TECHNOLOGY					PROJECT FH2	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
FH2 FORCE HEALTH PROTECTION - APPLIED RESEARCH	8053	8407	8746	8457	8619	8812	9010	

A. Mission Description and Budget Item Justification: This project supports applied research directed toward the sustainment of a healthy force of warfighters from accession through retirement. This research focuses on enhanced protection of Soldiers against health threats in military operations and training. Stressors that adversely affect individual Soldier health readiness are identified and studied to develop interventions that will protect Soldiers and improve their health and performance in stressful environments. This is follow-on research that extends and applies findings from a decade of research on Gulf War Illnesses and other chronic multisymptom illnesses that have suspected nerve and behavioral alterations due to environmental contaminants and deployment stressors. Additionally, environmental monitoring efforts are directed at demonstration and validation of an Environmental Sentinel Biomonitor (ESB) that can identify the presence of toxic industrial chemicals in water and monitor potable water sources. Force Health Protection applied research is conducted in close coordination with the Department of Veterans Affairs. The program has the following three major thrust areas: (1) global health monitoring; (2) health behavior interventions and health risk communication (e.g., weight management and benefits of exercise); and (3) health risk assessment methods and medical materiel safety (e.g., interactions of operational stressors such as heat strain, psychological trauma, and pesticides) with neurotoxic chemical exposures including petroleum products and insecticides). The goals of the Health Behavior/Weight Control effort are to evaluate the effectiveness of specific health behavior interventions, modification to establish their benefit to readiness, especially non-drug, neuroprotection that comes from an informed and positive lifestyle. This project contains no duplication with any effort within the Military Departments and includes direct participation by other Services working on Army projects. The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work in this project is performed by the US Army Center for Environmental Health Research, Fort Detrick, Maryland; and the US Army Research Institute of Environmental Medicine (USARIEM), Natick, Massachusetts.

<u>Accomplishments/Planned Program:</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Nerve-based Disease Research: In FY07, further characterized cognitive and behavioral changes associated with deployment and assessed the time it takes for recovery. Refined the Automated Neuropsychological Assessment Metric test battery to a minimum number of robust, reproducible, and well-validated set of tests, which provided measures of change in psychological and neural functioning due to military operational impacts. Conducted range finding for selected military relevant chemicals in model organisms. In FY08, complete a study of relationships between military occupation and nerve degeneration diseases. Complete comprehensive data collection on the health effects of exposure to jet fuel in a military setting. Complete examination of individual permethrin (insect repellent) exposure and dose levels in different environmental settings designed to simulate operationally relevant scenarios; conduct assessments of military relevant chemicals and materials to identify biological markers, biomarkers, of exposure and effect using genomic and proteomic analyses. Identify potential multianalyte testing platforms for ready determination of identified biomarkers. In FY09, will complete analyses of the association between jet fuel exposure over a work week and nervous system health outcomes. Will complete studies of head trauma (i.e., head impact due to poor parachute landings and boxing as models) and neuropsychological adverse effects (mood and cognitive function). Will integrate ESB components and will conduct bench testing of the composite system.	5937	6082	4664
Health Behavior/Weight Control: In FY07, developed a diet and exercise program for redeployed Soldiers to reduce body fat without loss	2116	2090	4082

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

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BUDGET ACTIVITY
2 - Applied Research

PE NUMBER AND TITLE
0602787A - MEDICAL TECHNOLOGY

PROJECT
FH2

of lean body tissue (including bone and muscle). In FY08, assess novel military weight management programs that include food intake monitoring, meal replacement, and portion size retraining. Complete analysis of two community-based intervention programs for military weight management in active duty and reserve forces. In FY09, will evaluate associations between weight and chronic medical conditions (e.g. diabetes, cardiovascular disease, metabolic syndrome), test feasibility and efficacy of new approaches to enhance nutrition in military dining facilities, evaluate a community-based environmental intervention programs for weight management by reserve personnel, evaluate associations between service member weight/weight changes with number and location of deployments and presence of Post Traumatic Stress Disorder, characterize successful and unsuccessful weight management techniques by establishment of a military weight registry database.

Small Business Innovative Research/Small Business Technology Transfer Programs

235

Total

8053

8407

8746