

# UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603706N

PROGRAM ELEMENT TITLE: Medical Development (Advanced)

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 1999 ACTUAL	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0095 Fleet Health Technology	2,772	3,983	4,839	4,809	4,799	4,634	4,514	CONT.	CONT.
R0096 Fleet Health Standards	5,393	5,429	5,271	5,418	5,409	5,379	5,279	CONT.	CONT.
R2022 Bone Marrow Donor Registry	800	0	0	0	0	0	0	0	149,651
R2332 Mobile Medical Device	1,991	0	0	0	0	0	0	0	1,991
R2333 Rural Health	2,905	2,984	0	0	0	0	0	0	5,889
R2334 Bone Marrow	33,014	33,813	0	0	0	0	0	0	145,974
R2336 Freeze Dried Blood	823	0	0	0	0	0	0	0	823
R2375 Dental Research	2,942	2,984	0	0	0	0	0	0	5,926
R2377 Naval Biodynamics Lab	1,744	994	0	0	0	0	0	0	2,738
R2491 Naval Blood Research Lab	1,490	2,486	0	0	0	0	0	0	3,976
R2492 Medical Readiness Telemedicine	2,912	8,951	0	0	0	0	0	0	11,863
R2493 Directly Transfusable Blood	823	0	0	0	0	0	0	0	823
R2494 Center for Disaster Management	969	2,984	0	0	0	0	0	0	3,953
R2495 Telemedicine	971	0	0	0	0	0	0	0	971
R2712 Prostate Cancer Immunotherapy	0	1,491	0	0	0	0	0	0	1,491
R2713 Improved Bone Marrow Trans	0	1,989	0	0	0	0	0	0	1,989
R2714 Teleradiology	0	2,984	0	0	0	0	0	0	2,984
<b>Total</b>	<b>59,549</b>	<b>71,072</b>	<b>10,110</b>	<b>10,227</b>	<b>10,208</b>	<b>10,013</b>	<b>9,793</b>	<b>CONT.</b>	<b>CONT.</b>

(U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program element (PE) supports the Future Naval Capability in Warfighter Protection by providing advanced medical care to Navy and Marine Corps personnel in operational theaters and by

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providing means for force health protection from hazardous occupational and operational exposures. The PE also contributes to Joint Support Areas including Readiness, Support & Infrastructure, and Manpower, Personnel & Shore Training. Goals include increasing return-to-duty rates of troops injured in combat, enhancing personnel performance in demanding Fleet jobs (and the selection of candidates for these jobs), reducing operationally related morbidity and mortality, and ensuring the physical readiness and safety of deployed personnel. Specific task areas include medical care and life-saving therapies for shipboard and battlefield casualties, blood and stem cell products and substitutes, treatments for wounds and multiple organ system failure, methods for managing injuries related to extreme thermal environments, and new capabilities in field diagnostics and medical support. This PE also provides validated techniques for the selection of personnel based on medical criteria and standards and procedures that will protect Fleet personnel during exposure to Navy and Marine Corps operational environments. The impact of this PE includes improved medical logistics, safety, Service-wide standards and technologies. This PE also has supported the Navy's effort to register and match donors and complete bone marrow transplants.

(U) This Navy S&T program includes projects that focus on or enhance the affordability of warfighting systems.

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is budgeted within the Advanced Technology Development Budget Activity because it encompasses design, development, simulation, or experimental testing or prototype hardware to validate technological feasibility and concept of operations and reduce technological risk prior to initiation of a new acquisition program or transition to an ongoing acquisition program.

(U) PROGRAM CHANGE SUMMARY FOR TOTAL PROGRAM ELEMENT:

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
FY 2000 President's Budget	68,505	15,064	15,929
Appropriated Value	-	77,064	-

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Adjustments from FY 2000 PRESBDG

Comparability Adjustments to PE 0603707N	-5,200	-5,600	-
Program Adjustment to PE 0603707N	-	-	-5,000
Congressional Plus-ups	-	+62,000	-
Congressional Rescissions	-	-392	-
SBIR/STTR Transfer	-1,187	-	-
Execution Adjustments	-2,223	-	-
Minor Program Adjustments	-32	-	-723
Various Rate Adjustments	-314	-	-96
FY 2001 President's Budget Submission	59,549	71,072	10,110

(U) SCHEDULE: Not applicable

(U) TECHNICAL: Not applicable

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PROJECT NUMBER & TITLE	FY 1999 ACTUAL	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0095 Fleet Health Technology	2,772	3,983	4,839	4,809	4,799	4,634	4,514	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project supports the Future Naval Capability in Warfighter Protection by providing advanced medical care and treatment to Navy and Marine Corps personnel in operational theaters. The project encompasses critical endeavors designed to enhance fleet health care, augment field treatment capabilities, and improve medical logistics necessary for support of Naval and Marine Corps forces and combat casualties. Ongoing projects focus on key biomedical and casualty-relevant areas including: (1) casualty stabilization and far-forward echelon critical care; (2) blood products; (3) combat wounds and multiple organ system failure; and (4) field diagnostics and medical support capabilities.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1999 ACCOMPLISHMENTS:

- (U) TREATMENT OF CASUALTIES TO PREVENT HEMORRHAGIC SHOCK AND COMPLICATIONS ASSOCIATED WITH COMBAT TRAUMA: Continued studies that validate the feasibility and efficacy of life sustainment and casualty stabilization interventions. Tested modalities that impact metabolic down-regulation and delayed resuscitation. Demonstrated that normal neurologic function could be restored following 15 minutes of experimentally induced cardiac arrest in animal models. Conducted studies into the complications of hemorrhagic shock and late sequelae that may be prevented with early immune modulator or other interventions. Extended studies to large animal models. Completed

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PROGRAM ELEMENT: 0603706N

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PROGRAM ELEMENT TITLE: Medical Development (Advanced) PROJECT TITLE: Fleet Health Technology

initial development of improved local hemostatic agents/devices -- demonstrated the effectiveness of a hemostatic dressing (based on a complex sugar derived from a marine alga) in stopping arterial hemorrhage.

- (U) BLOOD AND BLOOD SUBSTITUTES: Conducted pre-clinical trials and modifications for Food and Drug Administration approval for technologies that extend the refrigerated liquid storage time for red blood cell transfusion units. Demonstrated that red blood cells can be stored for 9.5 weeks under anaerobic conditions. Continued development of freeze-dried red blood cell units having a minimum of a two-year room temperature shelf life and ease of use with immediate transfusion post-rehydration. Maintained efforts to develop improved frozen and freeze-dried platelet products with enhanced storage capabilities. Continued initial human studies on freeze-dried platelets. Initiated studies to develop freeze-dried plasma and vitrified platelets. Continued automated processing of frozen red blood cells to extend the post-thaw storage beyond 24 hours. Completed the development of a porcine model for testing the toxicity of liposome encapsulated hemoglobin.
- (U) MODULATION OF IMMUNE SYSTEM IN COMBAT CASUALTIES: Continued development of advanced modulation techniques for cytokines and immune cell functions that impact the cellular and physiological responses of combat casualties. Conducted large animal studies to demonstrate the efficacy of cytokines in preventing complications from combat relevant trauma and hemorrhage. Completed a study to enhance transplant acceptance by modulation of the immune response -- demonstrated the successful use in non-human primates of a novel drug ("hu5C8") that allows the immune system to accept transplant tissue that normally would be rejected.
- (U) MEDICAL MANAGEMENT TOOLS AND EQUIPMENT USED IN FIELD OPERATIONS: Developed interface for selected medical databases for advanced medical support planning and casualty management. Continued validation of the relationships of these databases and ensure their effectiveness in military environments. Supported development of models for projecting casualty rates for various battle scenarios and war fighting intensities, upgrading systems to current war fighting and enemy systems information. Completed model of casualty flows between echelons

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PROGRAM ELEMENT TITLE: Medical Development (Advanced) PROJECT TITLE: Fleet Health Technology

of care and developed planning factors needed to forecast medical requirements at these echelons and project necessary evacuation assets incorporating terrain features into optimization models based on changing warfighting scenarios and medical support capabilities. Initiated the development of an eye oximeter for field use and demonstrated that the device provides a reliable, non-invasive indicator of blood loss. Completed effort to incorporate into Mobile Medical Monitor a database system to capture, store, display and report data from sensors, for multiple casualties.

- (U) PHYSIOLOGICAL ENHANCEMENT OF PERFORMANCE IN MILITARY/EXTREME ENVIRONMENTAL CONDITIONS: Completed study to modify physical training programs to reduce training related injuries in female recruits - provided recommendations to Marine Corps Recruit Depot, Parris Island, South Carolina (approved for implementation by recruit training leadership). Completed study to assess the value of intervention techniques, which preclude high-risk individuals from musculoskeletal trauma.

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PROGRAM ELEMENT: 0603706N

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PROGRAM ELEMENT TITLE: Medical Development (Advanced) PROJECT TITLE: Fleet Health Technology

(U) FY 2000 PLAN:

- (U) TREATMENT OF CENTRAL NERVOUS SYSTEM TRAUMA: Initiate studies in animal models of traumatic injury to the central nervous system.
- (U) TREATMENT OF CASUALTIES TO PREVENT HEMORRHAGIC SHOCK AND COMPLICATIONS ASSOCIATED WITH COMBAT TRAUMA: Continue studies that validate the feasibility and efficacy of life sustainment and casualty stabilization interventions. Test modalities that impact metabolic down-regulation and delayed resuscitation. Maintain studies on the complications of hemorrhagic shock and late sequelae that may be prevented with early immune modulator or other interventions. Refine studies in large animal models. Complete development of improved local hemostatic agents/devices. Continue studies of traumatic injury to the central nervous system. Initiate the development of a system to produce sterile water for injection from potable water. [This task area moves to PE 0603707N Project R0542 in FY01.]
- (U) BLOOD AND BLOOD SUBSTITUTES: Complete pre-clinical trials and modifications for Food and Drug Administration approval for technologies that extend the refrigerated liquid storage time for red blood cell transfusion units. Continue development of freeze-dried red blood cell units having a minimum of a two-year room temperature shelf life and ease of use with immediate transfusion post-rehydration. Further the development of improved frozen and freeze dried platelet products with enhanced storage capabilities. Extend pre-clinical trials for freeze-dried platelets. Continue studies on the development of freeze-dried plasma and vitrification of platelets. Complete automated processing of frozen red blood cells to extend post-thaw storage beyond 24 hours. [This task area moves to PE 0603707N Project R0542 in FY01.]
- (U) MODULATION OF IMMUNE SYSTEM IN COMBAT CASUALTIES: Further support development of advanced modulation techniques for cytokines and immune cell functions that impact the cellular and physiological responses of combat

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casualties. Continue large animal studies to demonstrate the efficacy of cytokines in preventing complications from combat relevant trauma and hemorrhage. Initiate a study to rescue lethally irradiated bone marrow cells (using an endothelial cell culture system) and to reconstitute lethally irradiated animals.

- (U) MEDICAL MANAGEMENT TOOLS AND EQUIPMENT USED IN FIELD OPERATIONS: Continue to establish interface for selected medical databases for advanced medical support planning and casualty management. Extend validation of the relationships of these databases and ensure their effectiveness in military environments. Complete the development of models for projecting casualty rates for various battle scenarios and war fighting intensities, upgrading systems to current war fighting and enemy systems information.

(U) FY 2001 PLAN:

- (U) TREATMENT OF CENTRAL NERVOUS SYSTEM TRAUMA: Continue animal studies of traumatic injury to the central nervous system.
- (U) MODULATION OF IMMUNE SYSTEM IN COMBAT CASUALTIES: Further develop advanced modulation techniques for cytokines and immune cell functions that impact the cellular and physiological responses of combat casualties. Continue large animal studies to demonstrate the efficacy of cytokines in preventing complications from combat relevant trauma and hemorrhage.
- (U) MEDICAL MANAGEMENT TOOLS AND EQUIPMENT USED IN FIELD OPERATIONS: Refine interface for selected medical databases for advanced medical support planning and casualty management. Finalize validation of the relationships of these databases and ensure their effectiveness in military environments.

B. (U) PROGRAM CHANGE SUMMARY: See Total Program Summary for Total Program Element.

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PROGRAM ELEMENT: 0603706N

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PROGRAM ELEMENT TITLE: Medical Development (Advanced)

PROJECT TITLE: Fleet Health Technology

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) RELATED RDT&E:

- (U) PE 0601152N In-House Laboratory Independent Research
- (U) PE 0601153N Defense Research Sciences
- (U) PE 0602233N Human Systems Technology
- (U) PE 0603707N Manpower, Personnel and Training Advanced Technology Development
- (U) PE 0604771N Medical Development
- (U) PE 0602787A Medical Technology
- (U) PE 0603002A Medical Advanced Technology

(U) This program is coordinated through the Armed Services Biomedical Research Evaluation and Management Committee.

D. (U) SCHEDULE PROFILE: Not applicable.

(U) COST: (Dollars in thousands)

PROJECT NUMBER & TITLE	FY 1999 ACTUAL	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0096 Fleet Health Standards	5,393	5,429	5,271	5,418	5,409	5,379	5,279	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project supports the future Naval capability in Warfighter Protection by providing means for force health protection from hazardous occupational and operational exposures. The project

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PROGRAM ELEMENT: 0603706N

PROGRAM ELEMENT TITLE: Medical Development (Advanced)

develops valid medical standards for selection, training, and retention, reduces attrition and injury, and enhances personnel performance in Navy operational environments.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1999 ACCOMPLISHMENTS:

- (U) UNDERSEA MEDICINE, DIVER DECOMPRESSION, AND OXYGEN TOXICITY: Continued development of programs to enhance the safety of Navy divers/submariners. Identified that limbic structures are areas of the brain associated with high-pressure oxygen seizures; this information will facilitate the development of prevention drugs. Completed development of biochemical decompression technology to accelerate decompression with hydrogen. Technology developed within biochemical decompression produced two patents. State-of-the-art review on bioeffects of underwater blasts on human divers completed. Research on skull resonant frequencies resulting from low frequency sonar exposures provided guidance on damage risk thresholds for central nervous system effects.
- (U) DELIVER GUIDELINES: Provided recommendations for use of biomedical countermeasures to counteract performance decrements associated with sustained operations. Exploited current technology for evaluation of stimulant effects, susceptibility to sleep loss, and fatigue-related impairment. Fielded guidance for use of specific pharmacological agents during sustained operations. Collected and analyzed data on injuries resulting from small boat operations at SBU12 and SBU22 -- results show substantial reduction in operational readiness. Guidance developed on the use of nutritional and ergogenic supplements for Navy and Marine Corps special operations personnel.
- (U) MEDICAL STANDARDS FOR SELECTION: Began validation of an integrated, updated database of medical conditions associated with, or precluding, service.

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PROJECT NUMBER: R0096

PROGRAM ELEMENT TITLE: Medical Development (Advanced) PROJECT TITLE: Fleet Health Standards

- (U) ENHANCED HUMAN PERFORMANCE: Fielded a model of the physical and perceptual stress of shipboard firefighting. Provided guidance for use of existing Physiological Heat Exposure Limits (PHEL) for women, including use of ice vests for microclimate cooling. Extended investigation of operational impact of photorefractive keratectomy (PRK). Continued development of occupational physical standards for sustained operations. Further developed means to reduce neck and back injuries in Naval aviators.
- (U) AVIATION/SPATIAL DISORIENTATION ATTRITION AND INJURY REDUCTION: Continued program in identification and prevention of aircraft mishaps due to spatial disorientation, human performance and human factors problems.
- (U) REDUCE ATTRITION AND INJURY RELATED TO HAZARDOUS MATERIALS: Initiated development of criteria for evaluating direct-reading instruments for detecting and quantifying airborne toxic chemicals aboard ship to ensure that, as state-of-the-art sensors and devices are developed, there will be a generally-recognized methodology, acceptable to Federal regulatory agencies, for evaluating their precision and accuracy.
- (U) REDUCE ATTRITION AND INJURY RELATED TO TOXICITY: Identified mechanisms of action for select neurotoxicants; results used to develop the Neuromolecular Toxicity Assessment System (NTAS), a molecular-level set of tests that can assess possible performance deficits caused by exposure to hazardous materials.
- (U) REDUCE ATTRITION AND INJURY RELATED TO TOXICITY/SHIPBOARD FIRES: Developed capability to measure particle-vapor interactions of smoke and measure their effects upon pulmonary function. Initiated development of biomarkers (enzyme and cytokines) that can be used to identify the onset of acute respiratory distress syndrome (ARDS).
- (U) HEALTH PROMOTION; REDUCTION OF MILITARY ATTRITION AND INJURY: Delivered guidelines for health promotion and physical readiness of active duty personnel. Initiated study to evaluate dietary interventions to reduce loss of

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PROGRAM ELEMENT TITLE: Medical Development (Advanced) PROJECT TITLE: Fleet Health Standards

bone mineral density in physically active females. Conducted a feasibility study to assess the value of nicotine replacement therapy for Navy recruits who were smokers prior to enlistment.

- (U) RADIO FREQUENCY (RF) RADIATION EXPOSURE EFFECTS (REDUCE ATTRITION AND INJURY): Completed computational dosimetry model of radiofrequency (RF)-induced current. Used mock-up shipboard topside to evaluate RF-induced body and limb currents; utilized results to develop criteria for exposure standards and guidelines.

(U) FY 2000 PLAN:

- (U) UNDERSEA MEDICINE, DIVER DECOMPRESSION, AND OXYGEN TOXICITY: Continue development of programs to deliver products that enhance the safety and effectiveness of Navy divers/submariners and extend the operational envelope by permitting extended use of hyperbaric oxygen, faster decompression procedures, longer bottom time, and submersed rescue operations. Initial identification of pharmacological agents to reduce incidence of decompression sickness. Start procedural interventions concerned with blood flow for protection against oxygen toxicity. Initiate study of sonar low frequency sound effects on biological function.
- (U) DELIVER GUIDELINES: Continue to provide recommendations for use of biomedical countermeasures to counteract performance decrements associated with sustained operations. Further exploit current technology for evaluation of stimulant effects, susceptibility to sleep loss, and fatigue-related impairment. Complete guidance for use of specific pharmacological agents during sustained operations.
- (U) MEDICAL STANDARDS FOR SELECTION: Extend fielding of an integrated updated database of medical conditions associated with, or precluding, service. Continue validation.

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PROGRAM ELEMENT: 0603706N

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PROGRAM ELEMENT TITLE: Medical Development (Advanced) PROJECT TITLE: Fleet Health Standards

- (U) ENHANCED HUMAN PERFORMANCE: Continue to field a model of the physical and perceptual stress of shipboard firefighting. Complete guidance for use of existing PHEL for women, including use of ice vests for microclimate cooling. Refine investigation of operational impact of PRK. Maintain development of occupational physical standards for sustained operations. Continue study concerning reduction of neck and back injuries in Naval aviators.
- (U) AVIATION/SPATIAL DISORIENTATION ATTRITION AND INJURY REDUCTION: Maintain program in identification and prevention of aircraft mishaps due to spatial disorientation, human performance and human factors problems. Initiate an effort to apply, to large surface areas, the sound-attenuating technology developed for the aviation environment. Begin studies on an advanced treatment for hearing loss/inner ear disorder. Begin the development of a digital anthropomorphic video-imaging device as a computer-based method for anthropometric screening of aviation candidates.
- (U) REDUCE ATTRITION AND INJURY RELATED TO HAZARDOUS MATERIALS: Continue development of criteria for evaluating direct-reading instruments for detecting and quantifying airborne toxic chemicals (aboard ship and in the field and work environments) to ensure that, as state-of-the-art sensors and devices are developed, there will be a generally-recognized methodology, acceptable to Federal regulatory agencies, for evaluating their precision and accuracy.
- (U) REDUCE ATTRITION AND INJURY RELATED TO TOXICITY: Conduct application testing of military-relevant chemicals utilizing the NTAS, a molecular level set of tests that can assess possible performance deficits caused by exposure to hazardous materials. Upon completion of final validation studies, transition Neuromolecular Toxicity Assessment Battery (NTAB) to toxicology laboratories for testing of navy materials as part of the Health Hazard Evaluation program.

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- (U) REDUCE ATTRITION AND INJURY RELATED TO TOXICITY/SHIPBOARD FIRES: Develop real-time measures of acute response and hypersensitivity, and other measures of permanent damage, from certain smoke and fire gases and incorporate them into experimental models. Develop predictive models of aerosol lung deposition and clearance, carboxyhemoglobin formation (biomarker), and changes in lung ventilation.
- (U) HEALTH PROMOTION; REDUCTION OF MILITARY ATTRITION AND INJURY: Complete data analysis to develop predictive medical models for injury in Marine Corps recruits for the reduction of risk of stress fractures and musculoskeletal injuries. Initiate a study of heart rate variability associated with simulated combat stress. Complete efforts on real-time medical supply modeling/requirements on Navy ships. Complete the effort to assess medical requirements to support Operational Maneuver from the Sea.
- (U) PHYSIOLOGICAL ENHANCEMENT OF PERFORMANCE IN MILITARY/EXTREME ENVIRONMENTAL CONDITIONS: Initiate studies to develop predictors and preventive interventions for traumatic and exercise related injuries among shipboard personnel during deployment. Initiate studies to establish performance standards and training guidelines for Military Operations in Urban Terrain (MOUT), which optimize performance and minimize musculoskeletal injury. Further the evaluation of dietary interventions to reduce loss of bone mineral density in physically active females.
- (U) RADIO FREQUENCY RADIATION EXPOSURE EFFECTS (REDUCE ATTRITION AND INJURY): Compare and validate mockup exposures and models to RF-induced currents against actual shipboard exposures. Evaluate chronic health effects of RF-induced body and limb currents from topside shipboard exposures.

(U) FY 2001 PLAN:

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PROGRAM ELEMENT TITLE: Medical Development (Advanced) PROJECT TITLE: Fleet Health Standards

- (U) UNDERSEA MEDICINE, DIVER DECOMPRESSION, AND OXYGEN TOXICITY: Maintain programs to deliver products that enhance the safety of Navy divers/submariners and extend the operational envelope by permitting extended use of hyperbaric oxygen, faster decompression procedures, longer bottom time, and submersed rescue operations.
- (U) DELIVER GUIDELINES: Provide recommendations for use of biomedical countermeasures to counteract performance decrements associated with military operations. Complete studies on evaluation of stimulant effect and provide guidance. Continue to exploit current technology for evaluation of methodologies to improve impaired operational performance due to stress and fatigue. Initiate development of measurement tests for assessment of performance of Navy/Marine Corps personnel in operational environments.
- (U) MEDICAL STANDARDS FOR SELECTION: Maintain extended efforts to field an integrated updated database of medical conditions associated with, or precluding, service. Continue validation efforts.
- (U) ENHANCED HUMAN PERFORMANCE: Continue to field a model of the physical and perceptual stress of shipboard firefighting. Further refine investigation of operational impact of PRK. Continue development of occupational physical standards for sustained operations. Finalize study concerning reduction of neck and back injuries in Naval aviators.
- (U) AVIATION/SPATIAL DISORIENTATION ATTRITION AND INJURY REDUCTION: Continue program in identification and prevention of aircraft mishaps due to spatial disorientation, human performance and human factors problems. Maintain effort to apply, to large surface areas, the sound-attenuating technology developed for the aviation environment. Perform additional studies on an advanced treatment for hearing loss/inner ear disorder. Continue the development of a digital anthropomorphic video-imaging device as a computer-based method for anthropometric screening of aviation candidates.

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PROGRAM ELEMENT TITLE: Medical Development (Advanced) PROJECT TITLE: Fleet Health Standards

- (U) REDUCE ATTRITION AND INJURY RELATED TO HAZARDOUS MATERIALS/PHYSICAL AGENTS: Complete development of criteria for evaluating direct-reading instruments for detecting and quantifying airborne toxic chemicals; field-test new methodology for evaluating their precision and accuracy using one or more new-technology sensors. If successful, submit to appropriate Federal regulatory agency recommending adoption. Initiate studies comparing use of evoked otoacoustic emissions with pure-tone audiometry for screening for temporary and permanent hearing losses in Fleet/Fleet Marine Force personnel.
- (U) REDUCE ATTRITION AND INJURY RELATED TO TOXICITY: Complete application testing of military-relevant chemicals utilizing the Neuromolecular Toxicity Assessment System (NTAS), a molecular-level set of tests that can assess possible performance deficits caused by exposure to hazardous materials. Initiate development of a clinical set of tests based on the NTAS that can be validated against the previously developed Neuromolecular Toxicity Assessment Battery (NTAB) and used eventually for medical surveillance examinations of exposed personnel. Initiate assessment of second-order electroencephalogram measures for evaluating effects of neurotoxicants and incorporation into NTAB to enhance predictive capability.
- (U) REDUCE ATTRITION AND INJURY RELATED TO TOXICITY/SHIPBOARD FIRES: Complete real-time measures of acute response and hypersensitivity, and other measures of permanent damage, from certain smoke and fire gases; complete development of experimental response models, and of predictive pharmacokinetic models of aerosol lung deposition and clearance, carboxyhemoglobin formation (biomarker), and changes in lung ventilation. Initiate pharmacodynamic modeling of fire/smoke aerosol interactions with identified lung biomarker(s) to enhance predictive value of Acute Respiratory Distress Syndrome (ARDS) model.
- (U) PHYSIOLOGICAL ENHANCEMENT OF PERFORMANCE IN MILITARY/EXTREME ENVIRONMENTAL CONDITIONS: Initiate studies to develop predictors and preventive interventions for traumatic and exercise related injuries among shipboard personnel during deployment. Initiate studies to establish performance standards and training guidelines for

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PROGRAM ELEMENT: 0603706N

PROJECT NUMBER: R0096

PROGRAM ELEMENT TITLE: Medical Development (Advanced) PROJECT TITLE: Fleet Health Standards

Military Operations in Urban Terrain (MOUT), which optimize performance and minimize musculoskeletal injury. Continue study to evaluate dietary interventions to reduce loss of bone mineral density in physically active females.

- (U) RADIO FREQUENCY RADIATION EXPOSURE EFFECTS (REDUCE ATTRITION AND INJURY): Complete validation of RF-induced currents models against actual shipboard exposures. Complete evaluation of chronic health effects of RF-induced body and limb currents from topside shipboard exposures. Initiate dosimetry modeling for realistic operational RF exposures.

B. (U) PROGRAM CHANGE SUMMARY: See Total Program Summary for Total Program Element.

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

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(U) RELATED RDT&E:

- (U) PE 0601152N In-House Laboratory Independent Research
- (U) PE 0601153N Defense Research Sciences
- (U) PE 0602233N Human Systems Technology
- (U) PE 0603707N Manpower, Personnel and Training Advanced Technology Development
- (U) PE 0604771N Medical Development
- (U) PE 0602787A Medical Technology
- (U) PE 0603002A Medical Advanced Technology
- (U) PE 0602202F Human Effectiveness Applied Research
- (U) PE 0603231F Crew Systems and Personnel Protection Technology

(U) This program is coordinated through the Armed Services Biomedical Research Evaluation and Management Committee.

D. U) SCHEDULE PROFILE: Not applicable.

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