FY 2009 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2008
Exhibit R-2

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N
PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

COST: (Dollars in Thousands)

Project Number & Title	FY 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
WARFIGHTER SUSTAINMENT APPLIED RESEARCH	114,975	107,564	93,862	92,068	94,177	86,301	87,242

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The efforts described in this Program Element (PE) are based on investment directions as defined in the Naval S&T Strategic Plan approved by the S&T Corporate Board (Jan 2007). This strategy is based on needs and capabilities from Navy and Marine Corps guidance and input from the Naval Research Enterprise (NRE) stakeholders (including the Naval enterprises, the combatant commands, the Chief of Naval Operations (CNO), and Headquarters Marine Corps). It provides the vision and key objectives for the essential science and technology efforts that will enable the continued supremacy of U.S. Naval forces in the 21st century. The Strategy focuses and aligns Naval S&T with Naval missions and future capability needs that address the complex challenges presented by both rising peer competitors and irregular/asymmetric warfare.

This PE supports the Future Naval Capabilities (FNCs) of Littoral Combat/Power Projection, Capable Manpower, Force Health Protection Future Capability, and Total Ownership Cost (TOC) Reduction; and innovation-based efforts that will provide technology options for future Navy and Marine Corps capabilities. Efforts focus on manpower and personnel; naval systems training; littoral combat and power projection capabilities; advanced naval materials; medical technologies; environmental quality; biocentric technologies; high speed sealift; cost reduction technologies; and seabasing technologies. Within the Naval Transformation Roadmap, this investment supports eight transformational capabilities within the "Sea Strike", "Sea Shield", and "Sea Basing" operational concepts; the critical human system, "Sea Warrior"; and Naval business efficiencies within "Sea Enterprise." FY 2008 reflects the reinitiation of Human Systems Integration efforts to develop automation, human interface, and decision support technologies (funded in FY 2005 and prior).

Due to the number of efforts in this PE, the programs described herein are representative of the work included in this PE.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N
PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

B. PROGRAM CHANGE SUMMARY:

	FY 2007	FY 2008	FY 2009
FY 2008/FY 2009 President's Budget Submission	119,759	88,297	93,263
Congressional Action	0	20,880	0
Congressional Undistributed Reductions/Rescissions	0	-730	0
Execution Adjustments	-2,174	0	0
Program Adjustments	0	0	765
Rate Adjustments	0	0	-166
SBIR Assessment	-2,610	-883	0
FY 2009 President's Budget Submission	114,975	107,564	93,862

PROGRAM CHANGE SUMMARY EXPLANATION:
Technical: Not applicable.

Schedule: Not applicable.

C. OTHER PROGRAM FUNDING SUMMARY:
Not applicable.

D. ACQUISITION STRATEGY:
Not applicable.

E. PERFORMANCE METRICS:
As discussed in Section A, there are a significant number of varied efforts within this PE. For the most part these efforts support the FNC program of the Office of Naval Research. As such, each is monitored at two levels. At the lowest level each is measured against both technical and financial milestones on a monthly basis. Annually each FNC and its projects are reviewed in depth for technical and transition performance by the Chief of Naval Research against goals which have been approved by the Navy's senior flag level Technical Oversight Group.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N
PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

The FNC managers conduct routine site visits to performing organizations to assess programmatic and technical progress and most projects conduct an annual or bi-annual review by an independent board of visitors who assess the level and quality of the Science and Technology (S&T) basis for the project.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

COST: (Dollars in Thousands)

Project Number & Title	FY 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
WARFIGHTER SUSTAINMENT APPLIED RESEARCH	114,975	107,564	93,862	92,068	94,177	86,301	87,242

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project supports the FNC's of Littoral Combat/Power Projection, Capable Manpower, Force Health Protection Future Capability, and Total Ownership Cost (TOC) Reduction; and innovation-based efforts that will provide technology options for future Navy and Marine Corps capabilities. Efforts focus on manpower and personnel; naval systems training; littoral combat and power projection capabilities; advanced naval materials; medical technologies; environmental quality; biocentric technologies; high speed sealift; cost reduction technologies; and Sea Basing technologies. Within the Naval Transformation Roadmap, this investment supports eight transformational capabilities within the "Sea Strike", "Sea Shield", and "Sea Basing" operational concepts; the critical human system, "Sea Warrior"; and Naval business efficiencies within "Sea Enterprise."

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 2007	FY 2008	FY 2009
HUMAN SYSTEMS INTEGRATION	0	2,280	2,494

This activity supports the warfighter by designing affordable user-centered systems that are efficient, easy to use, and provide required mission capabilities at lowest lifecycle costs. Such systems will be optimally designed for the right number and types of personnel, requiring minimum training while providing high skills retention.

FY 2008 reflects a reinitiation of work in this field of research, so important to the reduction in complex naval systems design, acquisition, operation, and maintenance costs and improvements in the effectiveness of operations. This effort was funded from FY 2002 through FY 2005 under this PE within the Manpower and Personnel activity; budget priorities led to the gap in funding in FY 2006 and FY 2007. Congressional, DoD, and Navy policies and instructions require Navy and Marine Corps Program Managers to have a comprehensive plan

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

for Human Systems Integration (HSI) in the acquisition process to optimize total system performance, minimize total ownership costs, and ensure the system is built to accommodate the characteristics of the user population that will operate, maintain, and support the systems. A strong HSI effort must be part of the Capable Manpower Program during the period FY 2008 - FY 2012.

FY 2008 Plans:

- Initiate research to develop automation and human interface technologies to support collaborative decision-making in which multiple unmanned system operators manage groups of vehicles with optimal manning.
- Initiate research to develop tactical decision making concepts to integrate spatially disparate displays and reduce the reliance of crew support to achieve superior ship commanding officer and crew decision making.
- Initiate HSI tool research, development, and application to engineering efforts to develop robust standardized set of human systems integrated specific modeling and simulation tools to assess the interaction between operators performance by system design by manning levels.

FY 2009 Plans:

- Continue all efforts of FY 2008.

	FY 2007	FY 2008	FY 2009
MANPOWER/PERSONNEL	2,422	2,435	2,540

These technologies enhance the Navy's ability to select, assign, and manage its people by responding to a variety of requirements, including: managing the force efficiently and maintaining readiness with fewer people and smaller budgets; providing warfighting capabilities optimized for low-intensity conflict and littoral warfare; and operating and maintaining increasingly sophisticated weapons systems while managing individual workload and supporting optimal manning.

This activity further supports the warfighter by providing enhanced capabilities by designing affordable user-centered systems that are efficient, easy to use, and provide required mission capabilities at lowest lifecycle costs. Such systems will be optimally designed for the right number and types of personnel, requiring minimum training while providing high skills retention.

FY 2007 Accomplishments:

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

- Continued low-velocity impact and shaker table dynamic internal response mapping with new anatomical features and sensor suite GelMan thoracic surrogate. (NRL)
- Completed modeling of forecasting/trend analysis models within functions of the personnel enterprise.
- Completed applicant cultures and values program to assess the practicality and predictive validity of socialization measures for selection into the military.
- Completed modeling integration methodologies for sailor/marine members' cognitive agents and distribution and assignment system portal.

FY 2008 Plans:

- Continue all efforts of FY 2007 less those noted as completed above.
- Initiate development of a virtual, experimental-based software environment to test and evaluate the effect of various incentive structures on resource allocation decision making.
- Initiate development of artificial intelligence and optimization techniques to create simulation based decision support tools for resource allocations across units and battle groups.
- Initiate development of Unit-level tools to enable commanders to analyze the cost implications of their actions and weigh tradeoffs between readiness, cost, and risk.
- Initiate development of intelligent agents to empower total force members to make training and assignment choices that enhance their careers and meet personal goals.
- Initiate research to provide results for guiding the development on an interface allowing experts in HSI to work with subject matter experts to define and refine critical intra-domain concepts while capturing information for future use.
- Initiate a continuous engineering process evaluation and adaptation to show that the developing process is executable and effective.

FY 2009 Plans:

- Continue all efforts of FY 2008.

	FY 2007	FY 2008	FY 2009
TRAINING TECHNOLOGIES	11,130	10,999	10,812

Training technologies enhance the Navy's ability to train effectively and affordably in classroom settings, in

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

simulated environments, while deployed, and to operate effectively in the complex, high-stress, information-rich and ambiguous environments of modern warfare such as asymmetric warfare. Technology development responds to a variety of requirements, including providing more affordable approaches to training and skill maintenance. Improved training efficiency and cost-effectiveness is achieved by applying operations research, modeling and simulation, and instructional, cognitive, and computer sciences to the development, delivery, evaluation, and execution of training.

FY 2007 Accomplishments:

- Continued program on intelligent agents for objective-based training.
- Continued Computer Generated Forces (CGF) task aimed at improved techniques for human cognitive and behavioral modeling.
- Continued work on effective feedback in artificially intelligent tutoring for dynamic task environments such as anti-air warfare, instrument flying and other characteristic military tasks.
- Continued a systematic program of applied research addressing unanswered questions regarding effective instructional strategies in artificially intelligent tutoring.
- Continued work on software tools to facilitate building natural language tutorial dialogs for artificially intelligent tutoring.
- Continued task to apply recently developed learning techniques that can be used in a model interacting with its application environment to extend or refine its knowledge base and behavioral competence.
- Continued task to develop multi-agent based architectures for modeling human behavior, improve techniques for human cognitive and behavioral modeling, and create highly realistic simulated teammates.
- Continued field studies and user tests evaluating new features and job aiding tools.
- Completed development of optimized strategies for performance aiding and training.
- Completed development of immersive interaction technologies for team training application.
- Completed research in CGF for improving training effectiveness in Virtual Environments.
- Completed task to develop multi-agent based architectures for modeling human behavior, improve techniques for human cognitive and behavioral modeling, and create highly realistic simulated teammates.
- Completed modeling of the integration of different military domains into a distributed Virtual Technologies and Environments Full Spectrum Combat simulation.

FY 2008 Plans:

- Continue all efforts of FY 2007 less those noted as completed above.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

- Initiate development of optimized strategies for performance aiding and training.
- Initiate development of virtual technologies for warfare training application.
- Initiate development of technologies to support human performance in networked warfighting environments.
- Initiate development of training technologies for culture, values, and language training and opponent simulation for training systems.

FY 2009 Plans:

- Continue all efforts of FY 2008.
- Initiate research to create computational models of human behavior in selected non-Western environments that reflect the dominant cultural, social, ethnic, and economic determinants of behaviors, attitudes, and beliefs of individuals, groups, and organizations operating in these environments, and exploit these models to forecast responses to our actions and those of others attempting to exert influence in these environments.

	FY 2007	FY 2008	FY 2009
LITTORAL COMBAT / POWER PROJECTION	9,327	10,673	6,000

This activity provides for technologies that enhance the ability of the Navy-Marine Corps team to assure access and sustained operations in the Littorals. The FNC Program considers all the critical functions of warfighting: command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR); fires; strike; maneuver; sustainment; and fleet/force protection. This activity includes technical assessments and trade studies for FNC Enabling Capabilities that transition high priority technologies to the Navy and Marine Corps in support of the Sea Strike, Sea Shield, Sea Basing, and ForceNet Naval Power 21 pillars as well as Enterprise and Platform Enabling Science and Technology requirements.

The decrease from FY 2008 to FY 2009 reflects the completion of the Battlefield Power Generation Technology FNC effort in FY 2008.

FY 2007 Accomplishments:

- Continued development of battlefield power generation technologies.
- Completed program to develop oxygen, water vapor and temperature measurement capability for safety during littoral combat (NRL).
- Completed efforts for laser safety testing of Streak Tube Imaging Light Detection and Ranging (LIDAR)

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

technology being developed as part of the obstacle avoidance system for the Expeditionary Fighting Vehicle (EFV).
- Completed development of advanced weapons materials technology for use in artillery and mortar systems. (Concurrently funded by PE 0602131M).
- Completed development of improved lightweight fire control systems interface technologies.
- Completed development of landmine countermeasure insensitive munitions technology. (Concurrent effort funded by PE 0602131M).

FY 2008 Plans:

- Complete development of battlefield power generation technologies.
- Initiate efforts to conduct FNC warfighter sustainment applied research, including technology management of FNC investments supporting the naval enterprise and naval capability pillars.
- Initiate efforts to perform technology analyses to support the development and validation of FNC technology performance metrics for enabling capabilities structured to close naval capability gaps.
- Initiate efforts to assess technology options for the development of applied FNC technologies packaged into deliverable S&T products.

FY 2009 Plans:

- Continue all efforts of FY 2008 less those noted as completed above.

	FY 2007	FY 2008	FY 2009
ADVANCED NAVAL MATERIALS	6,772	8,275	13,519

Advanced Naval Materials efforts include: developing advanced, high-performance materials; processes to reduce weight and cost; and enhanced sonar transducers.

Increase from FY 2007 to FY 2008 is due to completion of acceptance testing methodologies for advanced transducer materials and welding processes for high-nickel naval steels. The increase between FY 2008 and FY 2009 reflects the initiation of new applied research in Naval Structural Health Monitoring and Corrosion Control Prevention Technologies.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

FY 2007 Accomplishments:

- Continued low cost phthalonitrile based organic resin material and hybrid composite development with improved fire resistance; and process development of fiber reinforced foam material.
- Continued development of multifunctional transducer material, high-force high-strain actuators; and evaluation of advanced transducer single crystal high strain materials.
- Continued multi-laser-processing technique development for the fabrication of ultra hard materials for wear resistance applications.
- Continued development of advanced, cost-efficient joining of titanium for >25% weight reduction of large seaborne structures.
- Continued development of advanced composites and polymers with fire resistance for ship structures.
- Continued development of nanotube reinforced composite materials for the improvement of their out-of-plane mechanical properties.
- Continued development of acceptance testing methodologies for advanced transducer single-crystal high-strain materials and definition of standardized materials properties and composition ranges.
- Continued development of compositional tuning of single-crystal, high-strain transducer materials, for specialized naval system applications.
- Continued development of cavitation resistant ship rudder coatings based on the FY 2004 shipboard coating study.
- Continued catalyst development and grew vertically aligned carbon nanotubes in existing gated silicon post structures in a Direct Current (DC) plasma Chemical Vapor Deposition (CVD) reactor, obtaining stable field emission and 1 ampere/cm2 current densities. (NRL)
- Continued marine titanium alloy design and development, exploiting anticipated cost reductions for high performance, reduced maintenance naval applications.
- Continued development of continuous single wall carbon nanotube composite materials for next generation air and naval platforms.
- Continued evaluation of corrosion performance on the family of conjugated poly (phenylenevinylene) polymers.
- Continued development of techniques and procedures to enhance hot corrosion and oxidation resistance.
- Continued development of surface preparation methods and characterization of corrosion performance for future naval ship materials.
- Continued evaluation of low temperature carburized materials for marine application.
- Continued development of coating performance and knowledge database for Naval use.
- Continued development of mechanistic model for stress corrosion cracking in Nickel Aluminum Bronze (NAB).
- Continued development of Microbiologically Influenced Corrosion (MIC) resistant passive alloys for sea

basing.
- Continued friction stir welding development for control of residual stresses and elimination of distortion in naval steels.
- Completed fabrication studies of pultruded sandwich for low cost, high performance ship structural applications.
- Completed cellular metal blast resistant materials with full section ship hull blast evaluation.
- Completed development of weld processing of stainless steel.
- Completed program to optimize a-c loss and mechanical reliability of second generation high temperature superconductors for future naval power applications. (NRL)
– Initiated development of innovative sonar transducers based on high-strain, high-coupling piezoelectric single crystals.
- Initiated development of solid-state growth methods for making high-strain, high-coupling piezoelectric single crystals.
– Initiated development of integrated structural composites with blast resistance, manufacturing technologies, and low-cost organic resins with improved fire resistance.
- Initiated development of novel processing technologies for increasing the fatigue strength and corrosion resistance of weldments for ship structures with reduced weight and maintenance requirements.
- Initiated development of friction stir joining of marine titanium alloys.

FY 2008 Plans:

- Continue all efforts of FY 2007 less those noted as completed above.
- Complete evaluation of corrosion performance on the family of conjugated poly (phenylenevinylene) polymers.
- Complete development of techniques and procedures to enhance hot corrosion and oxidation resistance.
- Complete development of MIC resistant passive alloys for sea basing.
- Complete development of acceptance testing methodologies for advanced transducer single-crystal high-strain materials.
- Complete development of welding processes and consumables for high-nickel containing naval steels.
- Complete development of phthalonitrile based organic resin material and hybrid composite development with improved fire resistance; and process development of fiber reinforced foam material.
- Complete catalyst development and grow vertically aligned carbon nanotubes in existing gated silicon post structures in a DC plasma CVD reactor, obtaining stable field emission and 1 ampere/cm2 current densities. (NRL)
- Initiate development of materials processing methods for single crystal piezoelectrics to make strong,

robust sonar transducers.
- Initiate modeling and process development of single-melt cold hearth casting of naval titanium alloys including Ti 5-1-1-1 for enhanced mechanical properties and formability.
- Initiate development of models and characterization methods for dynamic loading (water slamming and blast loading) in polymer composite materials.
- Initiate ballistic test program to assess dependence of penetration velocity on coating thickness and substrate properties. (NRL)
- Initiate effort to develop single domain antibodies for the recognition of explosives and small toxins. (NRL)

FY 2009 Plans:

- Continue all efforts of FY 2008 less those noted as completed above.
- Complete development of compositional tuning of single-crystal, high-strain transducer materials, for specialized naval system applications.
- Complete evaluation of corrosion performance on conjugated poly (phenylenevinylene) polymers.
- Complete development of techniques and procedures to enhance hot corrosion and oxidation resistance.
- Complete development of MIC resistant passive alloys for sea basing.
- Initiate development of novel growth methods to specialized single crystal transducer materials tuned to requirements of specialized naval systems.
– Initiated development of new 3D mechanical characterization technique for polymer composites based on dissipative energy density principles.
– Initiate development of continuous based monitoring techniques of new synthetic fuels and lubricants based on electromagnetic signature analysis.
– Initiate development and application of distributed fiber optic Bragg gratings for structural health monitoring of ships and aircrafts.
- Initiate grain boundary engineering to improve corrosion resistance of marine grade Al alloys.
- Initiate assessment of the degree of sensitization potential of marine grade Al alloys.
- Initiate investigation of criteria for stable pitting of stainless steel.
- Initiate acoustic damping coatings for ship tank application.
- Initiate development of surface assessment technologies to measure surface profile and chlorine.
- Initiate evaluation of advanced material coating for erosion control on helicopter main rotor blade leading edges.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

	FY 2007	FY 2008	FY 2009
MEDICAL TECHNOLOGIES	8,398	12,256	12,020

This program supports the development of field medical equipment, diagnostic capabilities and treatments; technologies to improve warfighter safety and to enhance personnel performance under adverse conditions; and systems to prevent occupational injury and disease in hazardous, deployment environments. Navy investment in these areas is essential because Navy/USMC mission needs are not adequately addressed by the civilian sector or other Federal agencies. For example, civilian emergency medicine does not address casualty stabilization during long transit times to definitive care. The National Institutes of Health (NIH) focuses on the basic science of disease processes and not applied research related to development. Programs are coordinated with other Services through the Armed Services Biomedical Research Evaluation and Management (ASBREM) Committee to prevent duplication of effort. This project funds the Force Health Protection FNC that will provide technology options for future Navy and Marine Corps capabilities and supports the "Sea Warrior" component of the Naval Transformation Roadmap, medical logistics aspects of "Sea Basing" and expeditionary force medical support associated with "Sea Strike".

The increase from FY 2007 to FY 2008 reflects realignment of funds from PE 0603729N to support the Force Health Protection Future Capability FNC program.

FY 2007 Accomplishments:

- Continued studies on decompression sickness (DCS) and arterial gas embolism (AGE), to include novel approaches to the prevention, detection and treatment of DCS/AGE, particularly by non-recompressive methods.
- Continued efforts to develop prophylactic agents preventing hyperbaric oxygen toxicity. Prolonged exposure to hyperbaric oxygen can be toxic to lungs, nervous system and eyes.
- Continued efforts to assess the impact of thermal (i.e., heat and cold) stress on operational performance. Underwater thermal extremes can affect diver performance and alter risk of incurring decompression sickness.
- Continued studies related to optimization of diver performance. Operational performance in the undersea environment can be hampered by a variety of environmental stressors.
- Continued study to evaluate endomorphin-based product to treat traumatic brain injury (TBI).
- Continued studies related to optimization of submariner health and performance. Submarine crewmembers are exposed to a variety of unique stressors including prolonged deployments, effects of altered diurnal rhythms, non-standard breathing gases, lack of sunlight, etc that can impact health and performance.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

- Continued studies related to biomedical effects of underwater sound. Military divers must operate safely and effectively in potentially complex underwater sound fields.
- Continued research to treat and prevent attrition due to combat related psychological stress and acute Post Traumatic Stress Disorder (PTSD), a significant problem for retention of personnel.
- Continued efforts for "stress inoculation" to mitigate the impact of exposure to stressful combat environments prior to deployment.
- Completed work on shipboard injury, exposure guidelines, and engineering specifications for preventing shock-related injury. Reducing neck, spine and musculoskeletal injury will increase force readiness.
- Completed work on hearing protection systems and on improved treatment for restoring Noise-Induced Hearing Loss (NIHL). Compensation for hearing loss currently costs DoN over $70M per year.
- Completed study to identify selective & specific biomarkers for mild and moderate TBI.

FY 2008 Plans:

- Continue all efforts of FY 2007 less those noted as completed above.
- Complete study to evaluate endomorphin-based product to treat TBI.
- Complete research to treat and prevent attrition due to combat related psychological stress and acute PTSD, a significant problem for retention of personnel.
- Initiate program to develop enhanced First Responder capability.
- Initiate program to develop enhanced Forward Resuscitative Surgical capability.
- Initiate program to develop enhanced En Route Care capabilities.
- Initiate efforts to mitigate the effects of environmental and other threats to health.
- Initiate efforts to reduce operational injuries.
- Initiate efforts to reverse NIHL.

FY 2009 Plans:

- Continue all efforts of FY 2008 less those noted as completed above.

	FY 2007	FY 2008	FY 2009
ENVIRONMENTAL QUALITY	3,122	3,495	3,303

Environmental Quality technologies enable sustained world-wide Navy operations in compliance with all local, state, regional, national and international laws, regulations and agreements, and support the Navy

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

Transformational Roadmap in the areas of Sea Basing, Sea Strike and Sea Warrior. Compliant operations enable training evolutions and exercises that are critical for maintaining readiness.

FY 2007 Accomplishments:

- Continued development of new, advanced, environmentally benign AF/Anti-Corrosive (AC) coating systems for Navy platforms, far-term noise and air pollution emissions abatement technology for unrestricted operations, and alternative torch technologies for shipboard plasma waste treatment, and multiple aqueous metal ion sensor to incorporate copper sensor developed in the Strategic Environmental Research and Development Program (SERDP) program for planned combined transition to the Environmental Security Technology Certification Program (ESTCP).
- Continued initial development of robotic Hull Biomimetic Underwater Grooming (BUG) and associated grooming approaches.
- Completed evaluation of aqueous film forming foam (AFFF) without perfluoroctanylsulfonates (PFOS) and studies to determine copper input into harbors from Navy ship hull coatings.
- Initiated development of advanced environmentally sound technologies for shipboard waste treatment and pollution abatement systems.
- Initiated pilot scale system development of miniature gasification process for treatment of shipboard solid waste.
- Initiated and complete initial decision report on impact of synthetic lubricants on shipboard oily waste treatment systems.

FY 2008 Plans:

- Continue all efforts of FY 2007 less those noted as completed above.
- Complete alternate torch technologies for shipboard plasma waste treatment.
- Complete report on cost benefit analysis of improved hull coatings and technologies for prevention of marine fouling.
- Initiate development and modifications to shipboard oily waste treatment systems to accommodate processing of synthetic lubricants.

FY 2009 Plans:

- Continue all efforts of FY 2008 less those noted as completed above.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

- Complete pilot scale system development of miniature gasification process for treatment of shipboard solid waste.
- Complete development of the Mobile Cleaning Recovery and Recycling System (MCRRS) vehicle for cleaning of aircraft non-skid decks as a part of advanced environmentally sound tetechnologies for shipboard waste treatment and pollution abatement systems.
- Complete initial development of robotic Hull BUG and associated grooming approaches.
- Initiate field evaluation of prototype robotic Hull BUG to identify gaps needed to refine and advance the technology.

	FY 2007	FY 2008	FY 2009
BIOCENTRIC TECHNOLOGIES	995	5,168	6,443

Biocentric technologies provide novel solutions for naval needs based upon the applications of biosensors, biomaterials, and bioprocesses. Topic areas include, but are not limited to development of biologically-based signal processing for medical, surveillance and security applications; bioinspired robotics; microbial or plant engineering to produce high-value naval materials such as energetic compounds or to develop sentinel organisms, and marine mammal diagnostics to support the Navy's Fleet Marine Mammal Systems.

The increase from FY 2007 to FY 2008 is due to realignment and consolidation of existing efforts funded under PE 0602123N Activity "Fleet Force Protection and Defense Against Undersea Threats" and PE 0602435N Activity "Coastal Geosciences/Optics/Biology" into this activity. The increase from FY 2008 to FY 2009 is due to the initiation of new efforts for advanced biometric sensing for autonomous systems, chemical sensing, and micro-bio-fuel cells for autonomous vehicles.

FY 2007 Accomplishments:

- Continued engineered microbial synthesis and processing of energetic materials.
- Continued development of innovative naval biosensors, biomaterials, and bioprocess technology (i.e., engineered plants for explosives detection, study of human stress biomarkers and bioinspired panoramic imaging systems).
- Continued efforts on naval biosensor to detect brain structures and blood vessels through skull bones.
- Continued efforts on innovative marine mammal diagnostics to detect viruses, bacteria, fungi and immunomarkers.
- Completed efforts in marine mammal vaccine.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

- Initiated, develop and demonstrate methods for determining multiple microbial genetic sequences which will have profound implications for detection of environmental pathogens and marine sensory systems using microorganisms. (NRL)
- Initiated program to aid warfighter protection that will provide versatile systems for tagging and tracking using chemical tangents tailored to simultaneously satisfy operational requirements and match optical or physio-chemical detection methods. (NRL)
- Initiated a program to develop a microfabricated analytical system for trace detection of illicit materials including explosives, and other hazardous chemicals. (NRL)

FY 2008 Plans:

- Continue all efforts of FY 2007 less those noted as completed above.

The following tasks will move from PE 0602123N to Biocentric Technologies in FY 2008 due to realignment of funds and focus.
- Continue biomimetic signal processing efforts, such as temporal and temporal pattern recognition for security breaching noise detection and biomimetic sonar systems for operation in air and aquatic environments based on bat echolocation neurophysiology and information processing algorithms.
- Continue efforts in bioinspired quiet, and maneuverable self-propelled line array using high-lift propulsors based on animal wing and fin biomechanics.
- Continue efforts in naval biosensors, biomaterials and bioprocessing, (i.e., underwater explosives/chemical detectors and benthic microbial energy harvesting)

The following tasks will move from PE 0602435N to Biocentric Technologies in FY 2008 due to realignment of funds and focus.
- Continue efforts on innovative marine mammal diagnostics (detection of viruses, fungi and bacteria, and immunomarkers).
- Continue engineering development and optimization of sea-floor sediment energy harvesting system for sustainable and autonomous powering of underwater sensor networks.

FY 2009 Plans:

- Continue all efforts of FY 2008.
- Continue marine mammal immunomarker efforts, including the characterization of the dolphin fore-stomach

microbial community, identification of probiotic immunostimulating species and immunobioassays for stress and infection detection.
- Complete biomimetic temporal pattern recognition for security breaching noise detection and biomimetic sonar systems for operation in air and aquatic environments based on bat echolocation neurophysiology and information processing algorithms.
- Complete development of an initial set of molecular diagnostic tests for bacterial, fungal and viral pathogens of marine mammals.
- Initiate efforts on advanced biomimetic sensing and neural control for human-robot interaction to enable effective collaboration of warfighters and autonomous systems.
- Initiate efforts on advanced biomimetic sensing and neural-based intelligent control and neural control for human-robot interaction to enable effective collaboration of warfighters and autonomous systems.
- Initiate development of underwater chemical sensors powered by sediment fuel cell
-Initiate research for detection or mitigation of microbes or compounds of naval relevance in various settings.
- Initiate micro-bio-fuel cell efforts for implanted or micro-autonomous vehicles.
- Initiate integration of biomimetic sonar with bioinspired autonomous undersea vehicles (with high-lift propulsors) to achieve closed loop control.

	FY 2007	FY 2008	FY 2009
HIGH SPEED SEALIFT	10,663	0	0

Fast sealift continues to be a military priority. However, friction drag reduction is increasingly essential for long-range, large-payload Navy ships to travel at high speeds (50+ knots). The High Speed Sealift (HSS) effort focuses on the design of a hydrodynamic experimentation capability to resolve questions pertaining to full-scale implementation of friction drag reduction procedures.

This effort ends in FY 2007.

FY 2007 Accomplishments:

- Completed development of experimentation test plans, management procedures, and system requirements.
- Completed high-speed sealift system studies.
- Completed designs for large-scale testing of technologies, concepts, and systems.
- Initiated and completed large-scale assembly and testing of technologies, concepts, and systems.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

- Initiated and completed experiments for HSS technologies, concepts and systems.

	FY 2007	FY 2008	FY 2009
COST REDUCTION TECHNOLOGIES	8,638	9,494	9,736

Cost Reduction Technology efforts include: developing ultrareliable materials and sensors to reduce cost by enabling condition-based and zero maintenance capabilities; and airframe and ship corrosion efforts for advanced cost effective prevention and life cycle management technologies. This activity includes the Navy's share of the Versatile, Affordable, Advanced Turbine Engine (VAATE) program for materials. Investments under this activity were previously reported under Advanced Naval Materials and were broken out to provide improved clarification of the overall investment scope.

FY 2007 Accomplishments:

- Continued development of ceramic matrix composite turbine blades for gas turbine engines.
- Continued development of portable, real-time, non-destructive examination (NDE)/Non-destructive Inspection (NDI) technology for heat damage detection in composite materials.
- Continued development of cavitation resistant ship rudder coatings transitioned from FY 2005 Advanced Naval Materials.
- Continued development of fiber-optic Bragg grating demodulation system for structural health monitoring of ships and submarines. (moved from Advanced Naval Materials activity)
- Continued development of a revolutionary new thermal spray technology for repair and refurbishment of worn and/or corroded components on ships, aircraft and combat vehicles.
- Completed development of durable new materials and thermal barrier coatings for naval gas turbine hot sections; environmental barrier coatings for ceramics/composites for gas turbine engines; new thermal barrier technology; materials and processes for high temperature turbine disks; and higher temperature aluminum alloys for propulsion.
- Completed development of calcium magnesium aluminum-silicate (CMAS) resistant thermal barrier coatings.
- Completed development of nickel-aluminized thermal barrier coating which will be phase compatible with turbine blade alloys.
- Completed development of standardized road test methodology and coating test metrics for USMC vehicles.
- Completed development of single coat corrosion control coatings for collect/hold/transfer (CHT) ship tank.
- Completed development of ultrasonic imaging NDI for aircraft.
- Completed NDE/NDI technologies for damage detection in composite materials.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

- Completed advance coatings and component for Marine Corps vehicles.

FY 2008 Plans:

- Continue all efforts of FY 2007 less those noted as completed above.
- Initiate development of durable alloys and materials for shipboard and aircraft gas turbine engines and spallation-resistant thermal barrier coatings for shipboard/aircraft marine gas turbine hot sections.
- Initiate development of advanced materials and processes for high temperature marine turbine disks and combustors.
- Initiate development of oxidation and vanadium/sulfate-resistant high temperature coatings for shipboard/aircraft gas turbine engines.
- Initiate development of CMAS-resistant coatings for ceramic matrix composites.
- Initiate development of high temperature foil bearing coatings for aircraft engine weight reduction.
- Initiate development of high temperature organic matrix composites.
- Initiate development of low-platinum and platinum-free aluminide coatings that are phase compatible with turbine blade alloys and exhibit low oxidation rates.
- Initiate efforts to assess manufacturing issues and reliability of ceramic matrix composites for turbine engines.
- Initiate integrated development of durable thermal barrier coating system with various bond coats for naval aircraft gas turbine hot section.
- Initiate development of materials processing for future gas turbine molybdenum-based alloys.
- Initiate efforts to conduct warfighter sustainment applied research, including technology management of investments supporting the naval enterprise and naval capability pillars.
- Initiate efforts to perform technology analyses to support the development and validation of FNC technology performance metrics for enabling capabilities structured to close naval capability gaps.
- Initiate efforts to assess technology options for the development of applied FNC technologies packaged into deliverable science and technology products.
- Initiate applied research and development of improved coatings for (1) non-skid surfaces, (2) ship rudders, (3) high performance ship topsides, and (4) high performance airfield pavements.
- Initiate efforts for the development of technologies supporting automated shipboard assembly of air-delivered weapons. (This effort realigned to Sea Basing Technologies activity in this PE in FY 2009)
- Initiate analytical model and reduced scale component development of shipboard compact power conversion technologies for multi-function motor drives, bi-directional power conversion modules, and power management controllers, focusing on closing technology gaps associated with Alternative Integrated Power System

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

Architectures. (This effort transfers to PE 0602123N in FY 2009)

FY 2009 Plans:

- Continue all efforts of FY 2008.
- Initiate applied research in determining lifting of hot section materials exposed to alternative synthetic fuels and petroleum-synthetic fuel blends.
- Initiate applied research development of Calcium Magnesium Aluminum-Silicate (CMAS)-resistant coatings for molybdenum-base alloys.
- Initiate life prediction research for modeling of hot section gas turbine materials, including blades, in mixed naval environments.
- Initiate development of an Adaptive Expert System to automatically and rapidly analyze aircrew performance (1M+ flight hours annually) to detect human factors related mishap leading indicators using a new technique with anomaly detection and corroboration.

	FY 2007	FY 2008	FY 2009
SEA BASING TECHNOLOGIES	11,523	21,742	26,995

This activity includes development and advancement of technologies to support Seabasing. Areas include: advanced hull forms, propulsion, and materials to support high speed, shallow draft, and beachable connectors; innovative connector interface and transfer technologies; advanced wave and position sensors and autonomous controls to support vessel to vessel interfaces; and autonomous conveyance systems to support automated and integrated warehousing.

The increase in funding between FY 2007 to FY 2008 is due to the initiation of the Sense and Respond Logistics (S&RL) program. The increase from FY 2008 to FY 2009 represents changes in the complexity and cost for expanded efforts under the T-Craft Innovative Naval Prototype (INP) program model design and fabrication. This change is also due to a planned increase in funding for the Sea Basing program, continuation of the S&RL program, and movement of Automated-semi-automated Weapons Breakout and Build-up System funding from Cost Reduction Technologies into this R-2 Activity where the effort is correctly identified in the FY 2008 Plans.

FY 2007 Accomplishments:

- Continued multiple Innovative Naval Prototype (INP) contracts for preliminary designs in the area of a Sea

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

Base to "Over-the-Shore" Connector Prototype (T-CRAFT)and a Rapidly Deployable Seabasing Stable Transfer Platform.
- Completed the preliminary design phase of the T-CRAFT demonstrator.
- Initiated the down-selection of T-CRAFT designs for further development and model construction and testing.
- Initiated T-CRAFT model construction and testing.
- Initiated the construction of a scaled model of a Rapidly Deployable Stable Transfer Platform demonstrator.
- Initiated a second evaluation of potential Seabasing INP efforts.

FY 2008 Plans:

- Continue all efforts of FY 2007 less those noted as completed above.
- Initiate planning of T-CRAFT prototype and component development.
- Initiate S&RL research in: battlefield fuel management; decision support systems for S&RL; emergent intelligence/intelligent agents for S&RL; and advanced sensors/processes for S&RL.

FY 2009 Plans:

- Continue all efforts of FY 2008.
- Continue efforts for the development of technologies supporting automated shipboard assembly of air-delivered weapons. (Realigned from Cost Reduction Technologies activity in this PE after FY 2008.)
- Complete T-CRAFT model testing and evaluation.
- Initiate the down-selection of Transformable (T-CRAFT) designs for prototype and component development and fabrication.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

CONGRESSIONAL PLUS-UPS:

	FY 2007	FY 2008
ADVANCED FOULING AND CORROSION CONTROL COATINGS	6,974	1,989

FY 2007 Accomplishments – Using combinatorial synthesis techniques, this effort conducted applied research into new and/or advanced polymers. It also catalogued candidate coatings to be evaluated for ship hull antifouling, fouling release, or anti-corrosion applications. Classes of coatings may include: silicones; silicones with tethered biocides; and silicone modified polyurethanes.

FY 2008 Plan - Continue development of promising classes of ship hull fouling release and antifouling coatings bases on silicones, silicones with tethered biocides, silicone and fluoropolymer modified polyurethanes. This effort will continue collaborations with other ONR academia for the synthesis of new coatings and for field testing of promising coatings.

	FY 2007	FY 2008
ADVANCED REINFORCED MATERIALS AND NEW MATERIALS RESEARCH FOR AIRCRAFT TIRES	971	993

FY 2007 Accomplishments - This effort addressed applied research and development of advanced materials for the Joint Strike Fighter (JSF) tires. Specifically, this research program is investigating: will functionalized and alternate microstructure Polybutadiene (PBD) polymers for improved tread wear, high reinforcement filler and modified elastomers for reduced weight, merged tire reinforcement with increased strength and lower weight, advanced material concepts and processes for reduced liner weight, and alternate bead designs for reduced weight.

FY 2008 Plan - The objective of the program continues to be to reduce weight, improve strength, wear, air retention, and fatigue resistance for aircraft tires. The program continues to: investigate new polybutadiene rubbers for increased number of landings; investigate new fillers and modified elastomers for lighter weight and improved wear resistance; investigate new tire reinforcement and alternate bead construction for added strength.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

	FY 2007	FY 2008
AMELIORATION OF MILITARY HEARING LOSS	971	795

FY 2007 Accomplishments - This research addressed optimizing the support cell specific expression of the marker transgene, GFP. Several promoters have been identified that are active in support cells. Comparisons began in the rat and guinea pig models to determine which promoter provides optimum transgene expression within this population of cells. These are the first steps necessary in accomplishing the overall goal of this effort which is to develop a treatment to reverse noise-induced hearing loss by regenerating functional sensory cells in the cochlea.

FY 2008 Plan - Using Adeno-associated viral (AAV) vectors as the gene delivery vehicle, this effort will examine the ability of the S100A1, pGFA, and EAAT1 promoters to establish efficient support cell specific transgene expression within the guinea pig cochlea in vivo and rat cochlear explants in vitro. AAV will be used to deliver and express the Math-1 gene in support cells of the guinea pig cochlea and rat cochlear explants. The potential of support cell targeted expression of exogenous Math-1 to induce the transdifferentiation of support cells into functional hair cells will be examined.

	FY 2007	FY 2008
ATMOSPHERIC WATER HARVESTING	971	993

FY 2007 Accomplishments - This effort developed and delivered prototype water harvesting device(s) to condense water from the air. The device is self-powered, using photovoltaics to gather power from the sun and store it in batteries. The battery power was used to operate various mechanical and/or solid state cooling devices to condense vapor from the air.

FY 2008 Plan - The FY 2008 effort will focus on finishing the development of the prototype device into a potential commercial product for home use as a back-up system to condense potable water from air in the event of a loss in water supply. A larger, trailer mounted prototype will be build for potential military/ community use.

	FY 2007	FY 2008

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

	FY 2007	FY 2008
BIOSENSORS FOR DEFENSE APPLICATIONS	996	1,989

FY 2007 Accomplishments - This research addressed the utility of proteomic signature approaches to human cell-based environmental responses and for identification of new pollutant exposure biomarkers (using statistical analysis of 2D protein gels). Assessed rapid, affordable analysis of single nucleotide polymorphisms to predict clinical outcomes of drug exposures (using artificial neural networks for analysis). Developed antibody-based biosensors for micro-autonomous underwater vehicle platforms and for harmful algal bloom toxins. Utilized Louisiana Optical Network Initiative for health monitoring of coastal and urban infrastructure systems and extreme event response. Conducted Center for Bioenviromental Research Summer Academy for undergraduate minority students. Planned and held an "Urban Geochemistry and Health" Conference.

FY 2008 Plan - Toxic agents, including environmental compounds, can adversely affect the preparedness of naval personnel. Portable monitors of such exposures coupled with effects measures are critically needed. This project will employ in silicon modeling of relevant environmental signaling endpoints established from exposure sensitive cell systems. These modeling systems will be coordinated with gene expression signature networks to provide biologic validation. The integration of these cell systems and in silico outputs with established biosensor will move studies in FY 2008 towards lab-on a chip platforms that can ultimately be field and individually deployed.

	FY 2007	FY 2008
CONTINUATION OF HYDRATE DESALINATION TECHNOLOGY	1,445	0

This effort addressed the development of novel methods to desalinate seawater using gas hydrate crystals. This process uses the formation kinetics of gas hydrate crystals at the sea floor and the exclusion of salts from these hydrated crystals. The natural buoyancy of the formed crystals should allow them to rise in a vertical pipe extending from the sea surface. As the crystals rise and are exposed to reduced hydrostatic pressure they will melt creating a steady state column in which fresh water rises to the top.

	FY 2007	FY 2008
DIGITAL DIRECTED MANUFACTURING PROJECT	0	1,273

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

This effort seeks to conduct research on the use of digital manufacturing technologies (DDM). This type of technology can produce complex parts in a fraction of the time required by conventional manufacturing processes. This effort will investigate and develop process capabilities for DDM of thermoplastics and metal alloy parts and will characterize the complete range of physical and mechanical properties of these parts.

	FY 2007	FY 2008
DURABILITY OF COMPOSITE MATERIALS AND STRUCTURES	1,096	1,589

FY 2007 Accomplishments - This effort addressed applied research on the durability characteristics of composite materials used in naval structures in severe marine environment. This research focus' on the effect of moisture and sea water on marine composites, including degradation processes. This research provides a better understanding of performance and degradation mechanisms of composite materials in marine environments, leading to advanced or new materials systems.

FY 2008 Plan - This effort supports Durability Of Composite Materials and Structures for Naval use applied research.

	FY 2007	FY 2008
ENVIRONMENTAL MICRO-BIOLOGICAL ENERGY HARVESTING	996	0

This research addressed concepts to better understand microbe-electrode interactions in order to improve the power output of microbial fuel cells and the effectiveness of electrode-based strategies for environmental restoration.

	FY 2007	FY 2008
FRICTION STIR WELDING	1,096	0

This effort addressed applied research on the feasibility of expanding Friction Stir Welding (FSW) technology beyond aluminum alloys to High Strength Low Alloy (HSLA) steels that are of interest to the Navy and to expand the fundamental understanding of the FSW process to other metals. The specific focus of this effort will be to demonstrate a continuous 60-foot FSW in HSLA steel, develop new tools to weld 3/8-inch thick plate,

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

demonstrate travel speeds up to 12-inches per minute, develop zero tilt-angle tools to enhance shipyard applications, and improve 2-D and 3-D numerical modeling capabilities.

	FY 2007	FY 2008
LOW OBSERVABLE AIRCRAFT	1,464	0

This research developed durable, lightweight, polymeric-based conductive gap sealants for use on Navy fighter aircraft, utilizing novel carbon nanotube blends. Conductive gap sealants based on polymers loaded with carbon nanotubes offers the potential for significant improvements over current technology, specifically in aircraft weight savings.

	FY 2007	FY 2008
MAGNETIC RESONANCE IMAGING & MAGNETIC RESONANCE	996	0

This effort supported magnetic resonance imaging and magnetic resonance angiography for accurate diagnosis of TBI research.

	FY 2007	FY 2008
MAST-MOUNTED IN PORT VIDEO FORCE PROTECTION SURVEILLANCE SYSTEM	996	1,589

FY 2007 Accomplishments - This research supported mast-mounted in-port video force protection surveillance system research. This effort developed techniques for display, analysis and communication of target clips within the wide field of view imagery. A medium resolution 360 degree EO sensor was mounted on the mast of a boat and the imagery and watercraft tracks were successfully integrated into a land-based sensor network monitoring harbor traffic.

FY 2008 Plan – A very high resolution 360 degree EO imager and 360 degree IR imager will be developed and evaluated for its ability to provide wide area and long range video surveillance from watercraft and unmanned surface vessels for force, ship and harbor protection.

	FY 2007	FY 2008
MATERIALS AND COATINGS ENHANCEMENTS THROUGH HIGH PERFORMANCE	8,619	0

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

This research investigated new polymer coatings and materials for naval ship and aircraft applications. This initiative included the design, development, and utilization of polymers for applications with passive response capabilities, including materials to detect changes in the environment and active response materials designed to exhibit or deter failure, infiltration, permeation, and tampering. This effort also focused on adaptive materials, stimuli-responsive polymeric films and coatings, self-healing materials, biologically and chemically active polymeric materials, polymeric membranes and films for control transport properties, and nanocomposite materials.

	FY 2007	FY 2008
MINIATURIZATION, SYSTEMIZATION OF SEMICONDUCTING METAL OXIDE	0	795

This effort supports miniaurization, systemization of semiconducting metal oxide.

	FY 2007	FY 2008
MISSION DEPLOYABLE SURVEILLANCE BIOMETRICS	0	1,589

This effort supports mission deployable surveillance biometrics.

	FY 2007	FY 2008
NANOTECHNOLOGY ENGINEER & MANUFACTURING OPERATION (NEMO)	0	795

This effort will initiate development of nanostructured smart coatings that can reduce corrosion, wear and fouling utilizing innovative resin chemistry and surface modification methods to extend the service life and reliability of Navy assets while reducing cost and environmental impacts.

	FY 2007	FY 2008
NANOTECHNOLOGY RESEARCH	0	3,974

This effort supports nanotechnology research.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

	FY 2007	FY 2008
NATIONAL CENTER FOR ADVANCED SECURE SYSTEMS RESEARCH (NCASSR)	4,881	0

This effort supported research in information assurance. New approaches in the area of security tools, cyber informatics, network sensors and supervisory control are being developed. This will benefit national information infrastructure and national security by providing means to deploy monitor assess and react to cyber events.

	FY 2007	FY 2008
NEUROBIOLOGICALLY INSPIRED COMPUTATIONAL ARCHITECTURES AND METHODOLOGIES	3,188	0

This research expanded the capabilities of the individual neural core systems special purpose processor (SPP) to achieve 4 times the bandwidth of the data. This initiative included research that increased programmability of the computing device SPP with an increased repertoire of synaptic rules. This research also extended the design of the SPP to multiple homogeneous platforms and to facilitate sensor.

	FY 2007	FY 2008
PARTNERSHIP SIMULATION LAB FOR MILITARY HEALTH	1,345	0

This research focused on the use of the rapid learning authoring tool, to author problem based medical cases including bioterrorism, combat wound, catastrophic events and significant hazards to provide an immense pool of diverse case scenarios accessible in the virtual environment.

	FY 2007	FY 2008
SENSORY SUBSTITUTION FOR WOUNDED SERVICE MEMBERS	3,984	0

This effort supported research that developed novel, non-invasive methods of sensory augmentation and replacement to permit wounded naval personnel who suffered sight or vestibular dysfunction resultant from exposure to blast or other combat trauma to regain some level of basic sensation that will allow them to interact with others and with the environment around them.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

	FY 2007	FY 2008
VIRTUAL CLINICAL LEARNING LAB AND CENTER OF EXCELLENCE (PULSE)	996	2,384

FY 2007 Accomplishments - This effort addressed the Virtual Clinical Learning Lab program and demonstrated personal computer-based technologies to enable acquisition and rehearsal of critical skills and knowledge for military and civilian healthcare professionals.

FY 2008 Plan - This effort supports the Virtual Clinical Learning Lab and Center of Excellence.

C. OTHER PROGRAM FUNDING SUMMARY - NAVY RELATED RDT&E:
PE 0308601N Modeling and Simulation Support
PE 0601103N University Research Initiatives
PE 0601152N In-House Laboratory Independent Research
PE 0601153N Defense Research Sciences
PE 0602123N Force Protection Applied Research
PE 0602435N Ocean Warfighting Environment Applied Research
PE 0602747N Undersea Warfare Applied Research
PE 0603236N Warfighter Sustainment Advanced Technology
PE 0603512N Carrier Systems Development
PE 0603640M USMC Advanced Technology Demonstration (ATD)
PE 0603721N Environmental Protection
PE 0603724N Navy Energy Program
PE 0603729N Warfighter Protection Advanced Technology
PE 0604561N SSN-21 Developments
PE 0604703N Personnel, Training, Simulation, and Human Factors
PE 0604771N Medical Development
PE 0605152N Studies and Analysis Support - Navy
PE 0708011N Industrial Preparedness

OTHER PROGRAM FUNDING SUMMARY - NON-NAVY RELATED RDT&E:
PE 0601102A Defense Research Sciences
PE 0602105A Materials Technology

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602236N PROGRAM ELEMENT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH
PROJECT TITLE: WARFIGHTER SUSTAINMENT APPLIED RESEARCH

PE 0602211A Aviation Technology
PE 0602303A Missile Technology
PE 0602601A Combat Vehicle and Automotive Technology
PE 0602705A Electronics and Electronic Devices
PE 0602709A Night Vision Technology
PE 0602716A Human Factors Engineering Technology
PE 0602785A Manpower/Personnel/Training Technology
PE 0602786A Warfighter Technology
PE 0602787A Medical Technology
PE 0603002A Medical Advanced Technology
PE 0603003A Aviation Advanced Technology
PE 0603716D8Z Strategic Environmental Research Program
PE 0603851D8Z Environmental Security Technical Certification Program
PE 0601102F Defense Research Sciences
PE 0602102F Materials
PE 0602202F Human Effectiveness Applied Research
PE 0602203F Aerospace Propulsion
PE 0602204F Aerospace Sensors
PE 0602702F Command Control and Communications
PE 0603216F Aerospace Propulsion and Power Technology

D. ACQUISITION STRATEGY:
Not applicable.