FY 2002 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: June 2001

BUDGET ACTIVITY: 2 PROGRAM ELEMENT: 0602236N
PROGRAM ELEMENT TITLE: Warfighter Sustainment Applied Research

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 2000 ACTUAL	FY 2001 ESTIMATE	FY 2002 ESTIMATE
Warfighter Sustainment Applied Research	**	**	71,294

**The Science and Technology Program Elements (PEs) were restructured in FY 2002. The work described in FY 2000 and 2001 was funded in PEs 0602121N, 0602122N, 0602233N, and 0602234N.

(U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This PE funds applied research supporting Future Naval Capabilities (FNC) (Capable Manpower, Expeditionary Logistics, Total Ownership Cost (TOC) Reduction, and Warfighter Protection) and innovation-based efforts that will provide technology options for future Navy and Marine Corps capabilities. Efforts focus on manpower, personnel, and human factors (HF); Naval systems training; expeditionary logistics; energy conversion; Naval materials, maintenance reduction and TOC reduction; medical technologies environmental quality, and biocentric technologies

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

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is budgeted within the APPLIED RESEARCH Budget Activity because it investigates technological advances with possible applications toward solution of specific Naval problems, short of a major development effort.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) MANPOWER, PERSONNEL, AND HUMAN FACTORS: These technologies enhance the Navy's ability to select, assign, and manage its people. Technology development in these areas responds 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.

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MANPOWER, PERSONNEL & HUMAN FACTORS	FY00	FY01	FY02-$7,679
Initiate	•Integrated personnel simulation techniques •Student Value Model for Training and Readiness Continuum (StuVal) •Extensible Markup Language/ Data Mining Strategies for Navy Personnel Force Planning (XML/DM) • Electronic (E)-commerce Technologies for Personnel Distribution and Assignment (E-PASS)	• Realistic Job Previews/ Recruiter Screening Battery/ Recruiter Incentive System • Combat Systems Management • Managing Critical Events • Human Systems Integration Audio Management	• Models for Person-Organization Fit (PersOrg) • Psychometrics of Measures of Interests, Preferences, and Social Judgement (PsychoMeas) • Models of Aptitude and Interest (ModApt) • Ride/Join usability and Contents (UseCont) • Sailor/Marine Assignment Matchmaker (SMAM) • Service Member/Command Intelligent Agents (SMCIA) • Prototype Advanced Land Attack Console and Tasks (LAWCT) • Cognitive Work Tools to Develop/Model System Design (Cog-Tools) • Human Performance Micro Models (HumPerfMicro) • Human Characteristics in System Design • System Monitoring of Human Performance • Team Workload Distribution Methods
Continue	•Prediction of Submarine Service Disqualification (SubSchl)	•Integrated Personnel Simulation Techniques	•Realistic Job Previews/Recruiter Screening Battery/Recruiter

	•Selecting, Training Assigning and Retaining Sailors (FirsTerm) •Three Dimensional (3D) Perspective View	•StuVal •XML/DM • E-PASS	Incentive System •Integrated Personnel Simulation Techniques •StuVal •XML/DM • E-PASS • Combat systems management • Managing critical events • Human Systems Integration Audio Management
Complete	•Visual Information Filtering for Force Management (VisInfo) • New Personnel Assessment Technologies (NPAT)	•SubSchl •FirsTerm • 3D Perspective View	

(U) Training technologies enhance the Navy's ability to train effectively and affordably in classroom settings, in simulated environments, and while deployed, and to operate effectively in the complex, high-stress, information-rich and ambiguous environments of modern warfare. Technology development responds to a variety of requirements, including providing more affordable approaches to training and skill maintenance.

Training	**FY00**	**FY01**	**FY02-$10,480**
Initiate	• Computer Generated Forces (CGF) development of simulated team members to insert into team training intelligent tutoring systems. • Fleet Integration Training and Evaluation Research (FITER) develop/select test bed and begin empirical examination of various training strategies to close the "cognitive differences gap" between	• Apply virtual environment (VE) technology to the training of spatial behavior relevant to expeditionary forces. • Develop multi-sensory, spatially distributed computer interfaces and assess impact on human learning and memory. • Develop methods for measuring realism in VEs and determine the relationship between realism and training	• Instructional strategies for overcoming misconceptions • Effective feedback in dynamic task Artificial Intelligence (AI) tutoring • Instructional impact of personified pedagogical agents • Cognitive task analysis methods for subject matter experts • Measuring, Developing and Linking Shared Cognition to Team and

	differences gap" between novice and expert members in large distributed teams. Develop measures of effectiveness (MOEs) and measure of performance (MOPs) for this environment	realism and training effectiveness of VEs • Address human computer interaction issues relevant to developing a virtual cockpit	Distributed Team Performance • Advanced Maintenance Technology Support • Training and Performance Aiding Interactive Electronic Technical Manuals/Condition Based Maintenance (IETMs/CBM) Systems • Intelligent Maintainer Aid • Algorithms for Generating Optimal Mentor-Prototype Pairings • Fostering Continuous Learning On-The-Job Through Self Regulating Processes • On-Line Strategies for Collaborative Group Learning • Training Value of Multi-media Technologies • Simulation of Amphibious vehicles motion • Alternate displays for combat vehicle simulators • Distributed interaction of vehicle crew members • Simulation of human locomotion • Weapons handling for dismounted combatants • CGF: capability of CGF's to act as instructional agents for scenario generation and provide coaching and feedback. • CGF: Validate improved human cognitive and behavioral modeling

			techniques within CGF in a distributed environment as simulated teammates & adversaries • CGF: develop enhanced modeling techniques for representing individual differences such as the effects of training in CGFs • Dual Use technologies in the areas listed above
Continue	• Artifically intelligent tutoring in dynamic decision-making • Augmenting displays to enhance learning • Advancing applied cognitive task analysis • Physics tutor (mechanics) • Advanced Instructional Authoring Tools • Effective use of multi-media • Advanced AI teaching technology for thermodynamics • Integrating IETMs performance aiding and training • Self training teams	• Artificially intelligent tutoring in dynamic decision-making • Augmenting displays to enhance learning • Advancing applied cognitive task analysis • Physics Tutor (electricity and magnetism) • Advanced Instructional Authoring Tools • CGF: CGF development of simulated team members to insert into team training intelligent tutoring systems.	• Physics Tutor (electricity and magnetism) • Advanced Instructional Authoring Tools • Apply VE technology to the training of spatial behavior relevant to expeditionary forces. • Develop multi-sensory, spatially distributed computer interfaces and assess impact on human learning and memory • Develop methods for measuring realism in VEs and determine the relationship between realism and training effectiveness of VEs • Address human computer interaction issues relevant to developing a virtual cockpit
Complete	• Instruction for situation awareness • Shipboard skill remediation • CGF: establish a distributed battlespace simulation	• Effective use of multi-media • Advanced AI teaching technology for thermodynamics • Integrating IETMS, training, performance aids	• Artificially intelligent tutoring in dynamic decision-making • Augmenting displays to enhance learning

	facility dedicated to supporting research in model development, integration and evaluation for CGF • CGF: assessment of the current state-of-the-art for the realistic modeling of human behavior for use within Naval modeling and simulation projects • Exploratory research on issues and technological problems in VE training	• Self training teams • FITER: development of test-bed to study large distributed teams	• Advancing applied cognitive task analysis • CGF: CGF development of simulated team members to insert into team training intelligent tutoring systems (experiments on training effectiveness).

(U) Expeditionary Logistics addresses enabling capabilities covering distribution, command and control (C2), and readiness. Operational maneuvers from the sea (OMFTS), seabasing, and other future Naval concepts hinge on timely and responsive sustainment from the sea. Work areas encompass surface replenishment of the seabase from Naval and commercial shipping, ship-to-ship material handling to include at-sea rearming, internal seabase material handling, and ship to shore material distribution. Additionally, OMFTS will rely on managing available assets more wisely. Technology areas include improved tactical supply and maintenance systems, a comprehensive architecture for C2, battlefield sensor feeds into logistics situational awareness and consumption reduction.

Expedit-ionary Logistics	**FY00**	**FY01**	**FY02-$7,426**
Initiate		• Develop metrics, demonstration plans, and transition for the Five Year Defense Plan (FYDP) investment cycle • Create decision support technologies for Log C2 Course of Action (COA) generation	• Refined algorithms to incorporate captured use rates, improve source data quality, improve sustainment rate calculation, and establish stockage levels that are situationally dependent • Material handling technologies for Sea State 5 strike up/down applied to carriers and

			combatants, as well as logistics future platforms • Underway replenishment technologies including wave motion characterization and station keeping technology development • Explore annealing and similar algorithm optimization techniques for balancing large array logistics throughput equations • Create C2 technology functional architecture
Continue			• Ground Log C2 decision support COA
Complete		▪ Develop metrics, demonstration plans, and transition for the FYDP investment cycle	

(U) Energy Conversion efforts address technology development to provide significant improvements in energetic material systems and subsystems in terms of performance, safety, reliability, and affordability, and to transition advanced technology to the Fleet for warfighter sustainment. Goals include: advanced energetic materials for both warheads and propellants with both superior performance and acceptable insensitivity characteristics to reduce vulnerability to both personnel and platforms; and reliable simulation tools and diagnostics to (1) develop and design superior performance reduced vulnerability systems tailored to specific warfighter missions, (2) improve safety, and (3) reduce cost by enabling simulation aided design and condition-based monitoring capabilities. This work develops technologies for cost effective design, performance assessment, and vulnerability assessment of enhanced performance, insensitive munitions.

Energy Conversion	**FY00**	**FY01**	**FY02-$2,659**
Initiate	• Develop capability to predict effects of energetic components on propellant burn rate parameters	• Evaluate advanced fuels for enhanced explosive and propellant applications	• Develop diagnostics to monitor response of energetic materials to external stimuli

	• Develop capability to simulate system response to explosive effects		• Develop capability to tailor propellant performance to combustion characteristics
Continue	• Develop laboratory scale diagnostic to determine underwater explosive performance • Develop underwater explosion parameters to accurately assess structural response to attack	• Develop laboratory scale diagnostic to determine underwater explosive performance • Develop capability to simulate system response to explosive effects • Develop capability to predict effects of ammonium perchlorate (AP) size on propellant burn rate parameters	• Evaluate advanced fuels for enhanced explosive and propellant applications • Develop capability to predict effects of ballistic modifiers on propellant performance parameters
Complete	• Reactive material underwater structure burn-through mechanism	• Validated underwater explosion parameters to accurately assess structural response to attack	• Development of laboratory scale diagnostic to accurately determine underwater explosive performance with large scale test results • Development of 1st generation model to predict effects of AP size effects on propellant burn rate parameters

(U) Materials, Maintenance Reduction, and TOC reduction efforts address significant improvements in terms of affordability, reliability and performance to transition advanced technology to the Fleet for warfighter sustainment. Goals include: advanced, lightweight materials and processes to reduce weight and cost; ultrareliable materials and sensors to reduce cost by enabling condition-based and zero maintenance capabilities; environmentally acceptable long-life coatings for aircraft and ships to improve the quality of life for sailors; advanced low cost welding and joining methods, and new low cost sensors. Turbine improvement efforts cover the Navy's share of the turbine engine component development efforts under the Department of Defense (DoD)/National Aeronautics and Space Administration (NASA) Industry Integrated High Performance Turbine Engine Technology (IHPTET) program, ensuring that Navy unique design and operational

requirements are met. Also included are aircraft and ship electrical power generation and thermal management technologies. Airframe and ship corrosion efforts address an integrated approach for the control of the effects of external and internal corrosion. The work develops advanced cost effective prevention and life cycle management technologies. This is particularly significant to life extension for the aging fleet.

Materials/ Maintenance /TOC	FY00	FY01	FY02-$22,704
Initiate	• Develop friction stir welding methods for ship steels • Feasibility of oxidation-resistant Molybendum (Mo) alloys (2500^{o}F) • High Diameter Speed (DN) Bearing • Reduced Cost Integral Blade Rotors (IBRs) • Integrated Engine Health Management • Innovative composite casting technologies for ship shafts and seals • Ausform finishing of rotocraft gears	• Characterize system performance of hybrid composite/concrete with fault monitoring system • Thermal barrier technology for oxidation resistant Mo alloys • Cadmium replacement technologies • New corrosion prevention applique technologies • Tiled Blade Technology • Active Turbine Tip Control • Life Extending Control • Environmental barrier coatings for ceramics/composites	• Develop advanced smart wires for Aircraft • Non-destructive evaluation (NDE) methods for ship shaft health monitoring • Single coat corrosion control coatings for ship tanks • New wash-down process for USMC vehicles • Full Annular Combustor • Reduced Sensorload Diagnostics • Phase III Fan • Evaluate new corrosion prevention compounds (interior surfaces and avionics) • Assess new NDE technologies for inspection of corrosion degradation • Assess application of high force actuators for naval structures • Develop high strain – high force Actuators for conditioned-based maintenance
Continue	• Evaluate corrosion sensors for	• Friction stir welding for ship	• Evaluate system performance of

	ballast tanks • Evaluate weldability of stainless steel • Novel cost-reducing processing carbon heat shields • Demonstrate nanostructured coatings in selected components • Develop advanced single crystal transducer materials for medical assessment (battlefield) • Integrated Lightweight (Lt-weight) Combustor • Advanced Finger Seal • Advanced 2 stage fan • Composite Turbine Vane • Develop more affordable, higher performance ship steels • Improved filler metal for more affordable and reliable welding of High Strength Low Alloy (HSLA) steels • Develop upgraded seawater valves • Ultrasonic corrosion/erosion detection technology • Environmentally acceptable coatings for nonmagnetic ship hulls	steels • Corrosion sensors in operational ships ballast tanks • Environmentally acceptable coatings for non-magnetic ship hulls • Evaluate upgraded seawater valves in operational ships to reduce cost • Advanced carbon/carbon processes for missile heat shields • Evaluate advanced transducer materials • Advanced 2 stage fan • Composite Turbine Vane • High DN Bearing • Reduced Cost IBRs • Integrated Engine Health Management • Innovative composite casting technologies for ship shafts and seals • Develop oxidation resistant Mo alloys • Develop more affordable, higher performance ship steels • Evaluate weldability of stainless steel • Ausform finishing of rotocraft gears	hybrid composite concrete with fault monitoring • Friction stir welding for ship steels • Develop thermal barrier coatings for Mo alloys • Composite Turbine Vane • High DN Bearing • Reduced Cost IBRs • Integrated Engine Health Management • Tiled Blade Technology • Active Turbine Tip Control • Life Extending Control • Develop multi-functional transducer materials • Innovative composite casting technologies for ship shafts and seals • Develop more affordable, higher performance ship steels • Develop oxidation resistant Mo alloys • Cd replacement technologies • Corrosion resistant application technologies • Environmentally acceptable coatings for nonmagnetic ship hulls • Environmental barrier coatings for ceramics/composites

		• Demonstrate new MIL-100S welding wire for shipbuilding	• Ausform finishing of rotocraft gears/transition • Weldability of stainless steel • Advanced carbon/carbon processes for heat shields
Complete	• Carbon fiber reinforced rods in concrete (piers) • Radio-activated corrosion sensor systems for H-60 • Advanced Fan Structures • Next Generation Cooling	• Ultrasonics corrosion/erosion detection technology • Nanostructured Ni and Al based alloys, transition to shipboard use for repair, refurbishment, and life extension • Integrated Lt-weight Combustor • Advanced Finger Seal	• Transition upgraded seawater valves to acquisition • Advanced 2 Stage Fan • Corrosion sensors ballast tanks • Filler materials for HSLA steels

(U) Medical Technologies improve warfighter safety and enhance personnel performance capabilities under adverse conditions, enhance diagnosis of medical emergencies and treatment of casualties, and prevent costly occupational injury and disease in hazardous environments. Requirements which support technology development in these areas include: improving warfighting capabilities through enhanced supply and long-term storage of pre-positioned medical supplies such as blood; providing better stress endurance/control for key personnel; and providing enhanced casualty care onboard amphibious casualty receiving ships.

Medical Technol-ogies	**FY00**	**FY01**	**FY02-$12,298**
Initiate	• New methods to detect and assess environmental pathogens, toxicants, and ultrafine particles • Prophylactic agents for the prevention of oxygen toxicity and decompression sickness • Oxygen tolerance/toxicity in	• Clinical strategies to protect and restore hearing and balance • Impact of thermal stress on operational performance • Predictive measures for oxygen-induced seizures • Assessment of submarine	• Hemostatic dressing with microbicide • Casualty management tool within OMFTS and special operations • High intensity focused ultrasound device for hemostasis • Assessment of currently available hemoglobin-based oxygen carriers

	repeated and chronic hyperbaric conditions • Development of hemoglobin substitute • Evaluation of small volume resuscitation fluids in combined hemorrhage and head trauma • Evaluation of eicosenoid inhibitors in combined hemorrhage and blunt chest trauma • Evaluation of hypertonic saline resuscitation effects on the development of lung injury	watchstanding schedules • Model for clearance of (insoluble) smoke particles from the lung • Evaluation of effects of novel drugs on cellular energetics following hemorrhage • Evaluation of novel oxygen carrying resuscitation fluids • Evaluation of novel agents to reduce metabolic demand during injury • Gas diffusion enhancer assessment with prolonged circulation time • Evaluation of small volume resuscitation fluids in combined hemorrhage and head trauma	for treatment of hemorrhagic shock • Evaluation of novel pain control strategies • Evaluation of hibernation induction trigger for metabolic downregulation in hemorrhage • Evaluation of novel resuscitation fluid additives • Assessment of commercial technologies for man-portable injectable water system • Development of a smart uniform • Development of technologies for enhanced body protection against battlefield munitions • Methods to regenerate auditory and vestibular hair cells in animal models • Injury prevention and fitness optimization of next generation CVN and smart ship crews • Applied genomics (e.g. development of DNA-based prophylactics and therapies)
Continue	• Methods to determine naval aviator performance during training and in the Fleet • Evaluation of sensor technology to detect multiple toxicants • Methods to predict and counteract deleterious effects	• Prophylactic agents for the prevention of oxygen toxicity and decompression sickness • Oxygen tolerance/toxicity in repeated and chronic hyperbaric conditions • Methods to predict and counteract deleterious effects	• Model for clearance of (insoluble) smoke particles from the lung • Clinical strategies to protect and restore hearing and balance • Impact of thermal stress on operational performance

	of low-to-high frequency acceleration (motion) in operational environments • Evaluation of effects of mild hypothermia on hemorrhagic shock outcomes • Novel therapeutics for resuscitation of hemorrhagic shock • Treatment enhancements for shock; novel resuscitation fluid additives in severe hemorrhage • Investigate chemical properties of hibernation induction trigger • Evaluation of novel reperfusion injury inhibitors on hemorrhagic shock • Evaluation of effects of Food and Drug Administration (FDA) approved resuscitation fluids on the inflammatory response • Evaluation of selected cytokines as predictive indicators of trauma outcome • Immune modulators for prevention of multiple organ failure • Evaluation of potassium ATPase inhibitor in hemorrhagic shock	of low-to-high frequency acceleration (motion) in operational environments • Evaluation of effects of mild hypothermia on hemorrhagic shock outcomes • Evaluation of novel therapeutics for resuscitation of hemorrhagic shock • Treatment enhancements for shock; novel resuscitation fluid additives in severe hemorrhage • Investigation of chemical properties of hibernation induction trigger • Development of hemoglobin substitute • Evaluation of hypertonic resuscitation fluids in combined hemorrhage and head trauma • Evaluation of hypertonic saline resuscitation effects on the development of lung injury • Evaluation of novel reperfusion injury inhibitors on hemorrhagic shock • Immune modulators for prevention of multiple organ failure • Effects of FDA approved resuscitation fluids on the	• Develop predictive measures for oxygen-induced seizures • Assessment of submarine watchstanding schedules • Methods to predict and counteract deleterious effects of low-to-high frequency acceleration (motion) in operational environments • Oxygen tolerance/toxicity in repeated and chronic hyperbaric conditions • Prophylactic agents for the prevention of oxygen toxicity and decompression sickness • Evaluation of effects of mild hypothermia on hemorrhagic shock outcomes • Evaluation of novel therapeutics for resuscitation of hemorrhagic shock • Treatment enhancements for shock; novel resuscitation fluid additives in severe hemorrhage • Investigation of chemical properties of hibernation induction trigger • Evaluation of novel oxygen-carrying resuscitation fluids • Development of hemoglobin substitute • Evaluation of novel reperfusion injury inhibitors on hemorrhagic

		resuscitation fluids on the inflammatory response • Evaluation of selected cytokines as predictive indicators of trauma outcome	shock • Evaluation of effects of novel drugs on cellular energetics following hemorrhage • Gas diffusion enhancer assessment with prolonged circulation time • Evaluation of novel agents to reduce metabolic demand during injury
Complete	• Model of cardiac sensitivity to toxic chemicals • Human limitations of glare and flashblindedness from low-to medium power laser technology • Spatial thinking ability assessment in submarine personnel • Neuromodulators to treat non-freezing cold injury • Peroxynitrite scavenger in hemorrhagic shock • Small animal model of tissue transplantation immune modulation • Gas diffusion enhancer assessment in small animal hemorrhage model (transition)	• Methods to determine naval aviator performance during training and in the Fleet • Evaluation of sensor technology to detect multiple toxicants • New methods to detect and assess environmental pathogens, toxicants, and ultrafine particles • Potassium ATPase inhibitor in hemorrhagic shock (transition) • Evaluation of eicosenoid inhibitors in combined hemorrhage and blunt chest trauma • Immune modulators for prevention of multiple organ failure • Evaluation of immunological function during harsh operational conditions • Evaluation of small volume resuscitation fluids in	• Evaluation of effect of hypertonic fluids on head injury (transition) • Evaluation of hypertonic saline resuscitation effects on the development of lung injury • Evaluation of effects of FDA-approved resuscitation fluids on the inflammatory response • Evaluation of selected cytokines as predictive indicators of trauma outcome (transition)

		combined hemorrhage and head trauma	

(U) Environmental Quality (EQ) technologies enable sustained world-wide Navy operations, in compliance with all local, state, regional, national and international laws, regulations and agreements. Technology development in this area supports the Chief of Naval Operations (CNO) prioritized Navy S&T requirements and leads to systems and processes that provide the Fleet with environmentally compliant forward presence, ashore and afloat. Specifically, this area supports requirements to minimize the curtailment of military operations due to ship, shore and aircraft compulsory compliance with national and international environmental regulations, and to sustain Naval forces anywhere in a timely and environmentally compliant manner.

Environ-mental Quality	**FY00**	**FY01**	**FY02-$1,772**
Initiate	• Shipboard non-oily wastewater bioreactor treatment system process controller development • Pollutant sensor technology for Navy industrial wastewater treatment plants (IWTP)/control systems • Metal hydride battery technology for Navy aircraft • Laser induced surface improvement (LISI) technology for carrier non-skid • Dense Medium Plasma technology feasibility for treating shipboard oily and non-oily wastewater • Compliant marine coatings test facility	• Air and noise pollutant emissions control and treatment technologies for Navy platforms and assets	• Advanced environmentally compliant antifouling (AF) hull coatings for ships and submarines and compliant anticorrosion (AC) coatings for ship and submarine structures • Advanced ship and submarine liquid, air, solid emission control technology in compliance with Uniform National Discharge Standards (UNDS) and Marine Pollution Convention/ International Maritime Organization (MARPOL/IMO) • Biofouling/biocorrosion control mechanisms • Advanced pollution prevention/ waste treatment technologies for ship, submarine and shoreside applications

			• Automated underwater hull paint removal and application technology
Continue	• Biofouling control technology for submarine heat exchangers • Automated dry-dock ship painting and applique technology for elimination of over-spray and hazardous air pollutants (HAPS) • Integrated Navy sediment characterization and methodology	• Shipboard non-oily wastewater bioreactor treatment system process controller development • Pollutant sensor technology for Navy IWTP control systems and development of applique technology for ship hull and structures • Metal hydride battery technology development for Navy aircraft systems • Compliant marine coatings test facility • Automated dry dock ship paint application, overspray collection and treatment technology development.	• Air and noise pollutant emissions control/treatment technologies for Navy platforms • Compliant marine coatings test facility
Complete	• Liquid carbon dioxide shipboard pollution prevention control technology; terminated because of lack of cost effectiveness. • Information and data for establishing scientifically sound Navy copper discharge standards; transition to CNO N45, NAVSEA 05R and SERDP. • Neural net classification algorithm for Navy shipboard Oil Content Monitors (OCM);	• Integrated characterization of Navy-contaminated marine sediments • Submarine heat exchanger fouling control technology • Dense Medium Plasma technology development for ship wastewater treatment was terminated in this PE and referred to 6.1 basic research program (PE 0601153N) for obtaining a better understanding of the process	• Shipboard non-oily wastewater bioreactor treatment system process controller development • Copper sensor technology for Navy IWTP and applique technology for ship hulls and structures • Metal hydride technology for lighter, more reliable and environmentally acceptable batteries for aircraft and systems • Automated dry dock ship paint application, overspray control,

	transition to NAVSEA 05R, PE 0603721N. • LISI feasibility for ship non-skid; transition to NAVSEA/NAVAIR, PE 0603721N		collection and treatment technologies

(U) Biocentric technologies (BT) provide novel solutions for Naval needs based upon the applications of biosensors, biomaterials, and bioprocesses. This program brings the power of modern biotechnology methods to bear on Naval problems and reduces the technical risk associated with basic research advances by conducting demo-centric technology development programs. Topic areas include advanced sensors for force protection against weapons of mass destruction, novel methods for radar and acoustic signature reduction, chemical sensing in the marine environment for unexploded ordnance detection, green synthesis of energetic materials, and novel energy sources for chemical and biological sensors deployed in the littorals.

Biocentric Technolgies	**FY00**	**FY01**	**FY02-$6,276**
Initiate	• Bio-molecular barcodes for unique identification and tracing of materials • Chemical Sensing in the Marine Environment-Characterization of chemical plume structures in very shallow waters	• Chemical Sensing in the Marine Environment-Locating the source of chemical plumes in very shallow waters using sensors on autonomous underwater vehicles • Novel biosensors for explosives for underwater applications	• Green synthesis of energetic materials using enzymes tailored for optimized yields. • TNT and other explosives sensors as autonomous underwater vehicle payloads • Energy harvesting benthic fuel cells using bioelectrochemical mechanisms at the water-sediment interface • Chemical sensing from autonomous underwater vehicles for special forces applications

Continue	• Characterization of elastomeric polypeptides for Naval applications • Chemical Sensing in the Marine Environment-Characterization of source strengths of underwater unexploded ordnance • Chemical Plume Tracing inverse methods development • Radar absorbing and antenna isolation materials based upon metallized lipid tubules • Green enzymatic synthesis of explosives and related compounds.	• Chemical Sensing in the Marine Environment-Characterization of source strengths of underwater unexploded ordnance • Chemical Sensing in the Marine Environment-Characterization of chemical plume structures in very shallow waters • Radar absorbing and antenna isolation materials based upon metallized lipid tubules • Bio-molecular barcodes for unique identification and tracing of materials	• Chemical Sensing in the Marine Environment-Locating the source of chemical plumes in very shallow waters using sensors on autonomous underwater vehicles • Chemical Sensing in the Marine Environment-Characterization of chemical plume structures in very shallow waters • Novel biosensors for explosives for underwater applications
Complete	• Fate and transport of explosive chemical signatures due to biological and chemical degradation	• Characterization of elastomeric polypeptides for Naval applications • Chemical Plume Tracing inverse methods development • Green enzymatic synthesis of explosives and related compounds.	• Radar absorbing and antenna isolation materials based upon metallized lipid tubules • Bio-molecular barcodes for unique identification and tracing of materials • Chemical Sensing in the Marine Environment-Characterization of source strengths of underwater unexploded ordnance

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(U) PROGRAM CHANGE SUMMARY:

	FY 2000	FY 2001	FY 2002
FY 2001 President's Budget			0
Appropriated Value			
Adjustments from FY 2001 President's Budget			
PE Restructure			70,776
NMCI Reimbursable Adjustment			+194
NWCF Rate Adjustment			+308
Non-Pay Inflation			+66
Minor Program Adjustment			-50
FY 2002 President's Budget Submission	**	**	71,294

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(U) CHANGE SUMMARY EXPLANATION:
(U) Funding: Not applicable.
(U) Schedule: Not applicable.

(U) OTHER PROGRAM FUNDING SUMMARY:

(U) NAVY RELATED RDT&E:
(U) PE 0602114N Power Projection Applied Research
(U) PE 0602123N Force Protection Applied Research
(U) PE 0602435N Ocean and Atmospheric Technology
(U) PE 0602235N Common Picture Applied Research
(U) PE 0603236N Warfighter Sustainment Advanced Technology
(U) PE 0603513N Shipboard System Component Development
(U) PE 0603561N Advanced Submarine System Development
(U) PE 0603563N Ship Concept Advanced Design
(U) PE 0603573N Advanced Surface Machinery Systems
(U) PE 0603729N Warfighter Protection Advanced Technology
(U) PE 0604558N New Design SSN Development
(U) PE 0604561N SSN-21 Development
(U) PE 0604771N Medical Development (Engineering)

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(U) NON-NAVY RELATED RDT&E:
- (U) PE 0601102A Defense Research Sciences
- (U) PE 0602105A Materials Technology
- (U) PE 0602211A Aviation Technology
- (U) PE 0602303A Missile Technology
- (U) PE 0602601A Combat Vehicle and Automotive Technology
- (U) PE 0602705A Electronics and Electronic Devices
- (U) PE 0602709A Night Vision Technology
- (U) PE 0602716A Human Factors Engineering Technology
- (U) PE 0602785A Manpower, Personnel and Training Technology
- (U) PE 0602786A Warfighter Technology
- (U) PE 0602787A Medical Technology
- (U) PE 0603002A Medical Advanced Technology
- (U) PE 0603003A Aviation Advanced Technology
- (U) PE 0601102F Defense Research Sciences
- (U) PE 0602102F Materials
- (U) PE 0602202F Human Effectiveness Applied Research
- (U) PE 0602203F Aerospace Propulsion
- (U) PE 0602204F Aerospace Sensors
- (U) PE 0602702F Command, Control and Communications
- (U) PE 0603202F Aerospace Propulsion Subsystems Integration
- (U) PE 0603216F Advanced Propulsion and Power Technology
- (U) PE 0602712E Materials and Electronics Technology
- (U) PE 0603716D8Z Strategic Environmental Research Program
- (U) PE 0603851D8Z Environmental Security Technical Certification Program

(U) SCHEDULE PROFILE: Not applicable.