

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 2

PROGRAM ELEMENT: 0602121N

PROGRAM ELEMENT TITLE: Ship, Submarine & Logistics Technology

COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
Ship, Submarine & Logistics Technology	52,926	61,445	44,563	45,734	43,149	42,911	42,382	CONT.	CONT.

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program element (PE) provides for surface ship, submarine, logistics, and environmental quality applied research that contributes to meeting joint warfare capabilities established by the Joint Chiefs of Staff; namely to promptly engage regional forces in decisive combat on a global level, to employ a range of capabilities more suitable to actions at the lower end of the full range of military operations which allow achievement of military objectives with minimum casualties and collateral damage, and to counter the threat of weapons of mass destruction and future ballistic and cruise missiles to the United States and deployed forces.

This PE develops affordable hull, mechanical, and electrical (HM&E) technology options for both surface ships and submarines. There are four technology thrusts for both surface ships and submarines: Signature Control, Structural Systems, Power and Automation, and Maneuvering and Seakeeping. They address electromagnetic and acoustic signature reduction, structural and weapon related survivability improvement, electrical and mechanical system efficiency, damage control, hydrodynamics, and alternative propulsion.

Logistics technologies increase operational readiness through effective management and movement of supplies ashore and at-sea, and advanced techniques for more cost-effective construction and maintenance of shore and offshore facilities. Technology development in these areas responds to a variety of requirements, including: the logistic support needed for amphibious

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landing, the diagnostic technologies that enable the implementation of a condition-based vs. time-based maintenance philosophy, and long distance logistics supply chains with short reaction time.

Environmental quality technologies enable sustained world-wide Navy operations, in compliance with all national and international laws, regulations and agreements. Technology development in this area supports the Chief of Naval Operations (CNO) prioritized Navy user and Science and Technology (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 compliance with international regulations; and to sustain Naval forces anywhere in a timely and environmentally compliant manner.

In addition, affordability for reduced acquisition and life-cycle costs is pursued within all technology thrusts. Concepts that reduce the cost of design, fabrication, outfitting, maintenance, and operation are being developed. This HM&E technology spans various Joint Mission Areas and supports the Joint Warfare Strategy "Forward ...From the Sea."

Due to the sheer volume of efforts included in this program element, the programs described in the Accomplishments and Plans sections are representative selections of the work included in this program element.

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

PROGRAM ACCOMPLISHMENTS AND PLANS:

1. FY 1999 ACCOMPLISHMENTS:

SURFACE SHIP STRUCTURAL SYSTEMS:

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INITIATED:

- Design tool for integrated composite topside structures. (Topside Structures)
- Development of survivable damage control (DC) sensor/system principles. (Weapons Effects)
- Concepts for affordable Hybrid Composite Hull capable of achieving "ALL" signature goals. (Hull Structures)

CONTINUED:

- Development of improved design criteria and tools for analyzing composite primary hulls. (Hull Structures)
- Development of stainless steel advanced double hull concepts. (Hull Structures)
- Development and assessment of future combatant topside structural concepts. (Topside Structures)
- Prediction of composite structural response to explosive loads transmitted in water or air. (Weapons Effects)

COMPLETED:

- Transition of probabilistic hull strength design methods to NAVSEA. (Hull Structures)
- Development of magazine protection concepts to reduce mass detonation. (Weapons Effects)
- Physical modeling studies of hull response to seaway loading. (Hull Structures)
- Prediction of total ship structural/systems damage to missile impact and penetration. (Weapons Effects)
- Demonstration and evaluation of dynamic failure tools for composite hull structures. (Hull Structures)

SURFACE SHIP POWER AND AUTOMATION:

INITIATED:

- Dynamic modeling and simulation of shipboard fuel cell based power systems. (Electrical)
- Simulation of machinery plant control system. (Mechanical Power and Auxiliary Systems)

CONTINUED:

- Development of heat pipe, thermal-electric and other advanced heat removal techniques for high heat load thermal management in distributed machinery and electrical systems. (Mechanical Power and Auxiliary Systems)
- Development of smart, survivable distributed machinery control concepts. (Mechanical Power and Auxiliary Systems)

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- Fire suppression and flooding prediction for automated damage control. (Damage Control)

COMPLETED:

- Shock and vibration testing of reduced scale fuel cell systems. (Electrical)
- Salt contamination testing of reduced scale fuel cell systems. (Electrical)
- Advanced damage control flooding sensor technology. (Damage Control)

SURFACE SHIP SIGNATURE CONTROL:

INITIATED:

- Development of next generation topside signature control concepts. (Topside Signature Reduction)
- Development of control technology for corrosion-related electric and magnetic fields. (Underwater Signature Reduction)

CONTINUED:

- Evaluation of ship hull concepts that meet low-observable requirements. (Topside Signature Reduction)
- Integration and validation of lightning prediction models for ships and for composite structures. (Electromagnetic Compatibility)
- Development of radar scattering prediction capabilities for surface ship resonances and surface currents at high frequencies. (Topside Signature Reduction/Electromagnetic Compatibility)
- Development and validations of numerical prediction models for eddy currents. (Underwater Signature Reduction)
- Development of measurements procedures and metrics for evaluation of residual ferromagnetic signatures of non-ferrous materials. (Underwater Signature Reduction)

COMPLETED:

- Assessment of the vulnerability of surface ships to eddy current signatures. (Underwater Signatures)

SURFACE SHIP MANEUVERING & SEAKEEPING:

INITIATED:

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- Development of numerical methods for predicting hydrodynamic hull loads. (Seaway Maneuverability, Motions and Loads)
- Development of an integrated propulsor/hull concept to improve signatures. (Integrated Propulsor/Hull)
COMPLETED:
- Development and validation of dynamic damage stability. (Seaway Maneuverability, Motions and Loads)

SUBMARINE SIGNATURE CONTROL:

INITIATED:

- Development of coating concepts to reduce submarine detection from active acoustic interrogation. (Structural Acoustics)
- Development of next-generation structural acoustics numerical modeling. (Structural Acoustics)
- Development of models to predict wake signatures in the littoral. (Hydrodynamic Signature Reduction)
- Development of optimum control concepts based on sampling/control of the electromagnetic fields that are exterior/interior to a double hull. (Electromagnetic Signature Reduction)

CONTINUED:

- Demonstration of proof-of-concept for controlling near-field electromagnetic signatures in shallow water. (EM Signature Reduction)
- Development of advanced degaussing/deamping techniques to integrate sensors/actuators into coatings. (Electromagnetic Signature Reduction)
- Development of methods to predict/reduce acoustic flow noise over appendages. (Hydroacoustics)
- Development of integrated models to assess noise of advanced propulsor. (Hydroacoustics)
- Development of technology to predict real-time acoustic signatures from on-board measurements. (Structural Acoustics)

COMPLETED:

- Small scale evaluation of quiet hull concepts. (Structural Acoustics)

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- Full-scale demonstration of control methodologies for far-field underwater electromagnetic signatures in deep and shallow water. (Electromagnetic Signature Reduction)

SUBMARINE STRUCTURAL SYSTEMS:

CONTINUED:

- Investigation of double hull concepts. (Advanced Structures)
- Development of equipment emulators to assess shock and acoustic applications. (Advanced Structures)
- Development of system requirements and sensor configurations to implement structural monitoring system. (Advanced Structures)

SUBMARINE POWER AND AUTOMATION:

INITIATED:

- Integrated modeling and simulation of electric motor with mounting, shaft, propulsor and machinery support systems to investigate overall acoustic noise reduction. (Machinery)
- Development of solid state circuit breaker technology for quiet operation. (Electrical)

CONTINUED:

- Technology assessment and development of alternative emergency power energy storage technologies. (Electrical)
- Verification of design tools for internal fluid systems. (Machinery)
- Development of most promising actuator technologies for improved performance of steering and diving systems. (Machinery)
- Development and validation analysis of 3-D design tools for quiet electric motors. (Electrical)

COMPLETED:

- Validation of 2-D analysis and design tools for quiet electric motors; transition to NAVSEA. (Electrical)
- Development of measurement techniques for electrical motor dynamics. (Electrical)

SUBMARINE MANEUVERING AND SEAKEEPING:

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INITIATED:

- Development of maneuvering control effectors to increase low speed control authority. (Maneuvering Systems)
- Hydroacoustic design and analysis for mixed-flow propulsors. (Advanced Propulsors)
- Validation of propulsor force prediction and transition to Hydrodynamics/Hydroacoustics Technology Center. (Maneuvering and Control)
- Development and validation of propulsor concepts utilizing active control to achieve significant system simplification, cost savings, or performance enhancement. (Advanced Propulsors)

CONTINUED:

- Improved simulation of maneuvering in extreme conditions. (Maneuvering and Control)

COMPLETED:

- Simulation of jam resistant maneuvering concepts. (Maneuvering and Control)
- Laboratory demonstrations of maneuvering concepts with improved control authority and jam resistance. (Maneuvering and Control)
- Inviscid inverse design and turbulent flow analysis of mixed flow propulsor concepts. (Advanced Propulsors)
- Turbulence evaluation of Advanced Stern Concept. (Maneuvering and Control)

POWER ELECTRONIC BUILDING BLOCKS (PEBB):

INITIATED:

- Development of advanced PEBB Fast-Turn-Off modules for all occurrences. (Electrical)
- Development of system regulation and stability concepts, algorithms. (Electrical)
- Dual Use PEBB commercialization. (Electrical)
- Development of energy generation and storage concepts and components. (Electrical)

CONTINUED:

- Evaluation of third-generation modules to demonstrate form, fit, and function of PEBB. (Electrical)

COMPLETED:

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PROGRAM ELEMENT TITLE: Ship, Submarine & Logistics Technology

- Proof of concept for third-generation modules to demonstrate form, fit, and function of PEBB. (Electrical)
- Transition of third-generation PEBB modules to PE 0603508N to support Electrically Re-configurable Ship demonstration. (Electrical)

LOGISTICS:

INITIATED:

- Development of sea-based logistics communications link. (Amphibious Logistics)

CONTINUED:

- Development of a high-power microwave built-in test set. (Maintenance)
- Improvement of throughput in higher sea states by identifying and developing new and emerging technologies that can be applied to critical lighterage operations. (Amphibious Logistics)
- Development of micro-electrical mechanical sensor systems. (Maintenance)
- Development of virtual sensors. (Maintenance)

COMPLETED:

- Development of magnetostrictive actuators for cargo/weapons elevator doors. (Replenishment)
- Development of advanced shipboard crane technology. (Replenishment)
- Development of metrology for high-speed optical interconnections. (Maintenance)
- Development of an infrared focal plane array test set. (Maintenance)
- Development of an assessment for using available hulls and sub-systems as low-cost components of systems for logistics or sea-basing operations. (Amphibious Logistics)
- Development of a diagnostic rule extraction technology. (Maintenance)
- Development of nondestructive techniques coupled with computer modeling to rapidly assess pier capacity to resist lateral loads. (Infrastructure)
- Development of technologies required for and easily transported high-sea-state modular platform system. (Amphibious Logistics)

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PROGRAM ELEMENT TITLE: Ship, Submarine & Logistics Technology

- Development of an autonomous marine booster pump. (Amphibious Logistics)
- Development of technology to significantly improve throughput by providing lighterage the ability to moor alongside ships and piers, enabling cargo transfer in higher sea states. (Amphibious Logistics)
- Development of a collaborative infrastructure assessment tool. (Infrastructure)

ENVIRONMENTAL QUALITY TECHNOLOGY:

INITIATED:

- Development of recording, tracking and assessment technologies for mitigating the effects of Navy operations on marine mammals and threatened endangered species. (Environmentally Compliant Platforms)
- Investigation of scope and magnitude of Navy problems relating to non-indigenous species (NIS) in ballast water. (Environmentally Compliant Platforms)
- Feasibility study of applique technology for underwater hull surfaces. (Environmentally Compliant Platforms)

CONTINUED:

- Development of pollution prevention technology for surface ships. (Environmentally Compliant Platforms)
- Heat exchanger fouling control technology for submarines. (Environmentally Compliant Platforms)
- Neural net classification technology for application to shipboard Oil Content Monitors (OCM). (Environmentally Compliant Platforms)
- Development of information and data for establishing scientifically sound basis for Navy copper discharge regulations. (Environmentally Compliant Platforms)
- Development of automated dry-dock painting of ship hulls. (Environmentally Compliant Platforms)
- Development of a Navy integrated approach to characterization on contaminated marine sediments. (Environmentally Compliant Platforms)

COMPLETED:

- Development of environmentally acceptable lubricant for aircraft carrier catapult system. Transitioned to Navy Advanced Development Program (PE0603721N). (Environmentally Compliant Platforms)

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- Electrochemical polishing technology for shipboard non-oily wastewater. Transitioned to Navy Advanced Development Program (PE063721N). (Environmentally Compliant Platforms)
- Non-fouling coating for ceramic oily wastewater treatment membranes. Transitioned to Navy Advanced Development Program (PE063721N). (Environmentally Compliant Platforms)
- Feasibility of liquid carbon dioxide treatment of ship bilgewater. Transitioned to Navy Advanced Development Program (PE063721N). (Environmentally Compliant Platforms)
- Industrial wastewater treatment technology development that included Molecular Recognition, Advanced Oxidation and Advanced Reverse Osmosis. Transitioned to the Environmental Security Technology Certification Program (ESTCP) (PE0603851D), Puget Sound Naval Shipyard and Naval Air Station North Island for Demonstration/Validation (PE0603721N) and implementation. (Environmentally Compliant Platforms)

2. FY 2000 PLAN:

SURFACE SHIP STRUCTURAL SYSTEMS:

INITIATE:

- Development of shock/acoustic mount design methods with energy absorbing structures. (Weapons Effects)
- Improved magazine protection. (Weapons Effects)
- Hull life assurance methodology. (Hull Structures)
- Improved survivability to future air and underwater threats. (Weapons Effects)

CONTINUE:

- Development of stainless steel advanced double hull concepts. (Hull Structures)
- Composite structural response prediction to explosion loads in water or air. (Weapons Effects)
- Design tool for integrated composite topside structures. (Topside Structures)
- Concepts of affordable Hybrid Composite Hull capable of achieving "ALL" signature goals. (Hull Structures)

COMPLETE:

- Future combatant composite topside structural concepts. (Topside Structures)

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PROGRAM ELEMENT: 0602121N

PROGRAM ELEMENT TITLE: Ship, Submarine & Logistics Technology

- Validation of predictive tools for seaway-induced loads. (Hull Structures)

SURFACE SHIP POWER AND AUTOMATION:

INITIATE:

- Demonstration of advanced thermal management techniques for mechanical and electrical systems. (Mechanical Power and Auxiliary Systems)
- Demonstration of smart, survivable distributed machinery control concepts on reduced scale systems. (Mechanical Power and Auxiliary Systems)
- Development of distributed machinery architecture concepts. (Mechanical Power and Auxiliary Systems)
- Demonstration of Advanced Fuel Cell technology (including combined cycle machines) with increased efficiency higher power density for auxiliary and propulsion applications. (Electrical)

CONTINUE:

- Dynamic modeling and simulation of shipboard fuel cell power systems. (Mechanical Power and Auxiliary Systems)
- Simulation of machinery plant control system. (Mechanical Power and Auxiliary Systems)
- Development of smart, survivable distributed machinery control concepts. (Mechanical Power and Auxiliary Systems)

COMPLETE:

- Fire suppression and flooding prediction for automated damage control. (Damage Control)
- Development of survivable DC sensor/system principles. (Weapons Effects)

SURFACE SHIP SIGNATURE CONTROL:

INITIATE:

- Development of integrated topside reduction and electromagnetic (EM) compatibility prediction capabilities for low-observable (LO) structures. (Topside Signature Reduction/EM Compatibility)
- Assessment of Alternative Uses for the Advanced Degaussing/Deamping Systems. (Topside Signature Reduction)

CONTINUE:

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- Development of measurement procedures and metrics to evaluate residual ferromagnetic signatures of non-ferrous materials. (Underwater Signature Reduction)
- Evaluation of ship hull concepts for low-observable requirements. (Topside Signature Reduction)
- Development of corrosion related signature reduction technologies for underwater electromagnetic signatures. (Underwater Signature Reduction)
- Development of next-generation topside signature control concepts. (Topside Signature Reduction)

COMPLETE:

- Development of radar scattering prediction capabilities for surface ship resonances and surface currents at high frequencies. (Topside Signature Reduction/Electromagnetic Compatibility)
- Development and validations of numerical prediction models for eddy currents. (Underwater Signature Reduction)
- Integration and validation of lightning prediction models for ships and for composite structures. (Electromagnetic Compatibility)

SURFACE SHIP MANEUVERING & SEAKEEPING:

INITIATE:

- Development of low-signature turning and maneuvering predictions. (Seaway Maneuverability, Motions and Loads)

CONTINUE:

- Development of numerical methods for predicting hydrodynamic hull loads. (Seaway Maneuverability, Motions and Loads)
- Development of integrated propulsor/hull concept to improve signature behavior. (Integrated Propulsor/Hull)

SUBMARINE SIGNATURE CONTROL:

INITIATE:

- Development of noise model for reduced complexity propulsors. (Hydroacoustics)

CONTINUE:

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- Development of models to predict wake signatures in the littoral. (Hydrodynamic Signature Reduction)
- Development of hull structural concepts with intrinsic acoustic benefit; integration of acoustic coatings and double hull concepts. (Structural Acoustics)
- Development of active and passive degaussing control techniques based on double hull construction. (Electromagnetic Signature Reduction)
- Development of advanced degaussing/deamping techniques to integrate sensors/actuators into coatings. (Electromagnetic Signature Reduction)
- Development of optimum control concepts based on sampling/control of the electromagnetic fields that are exterior/interior to a double hull. (Electromagnetic Signature Reduction)

COMPLETE:

- Development of integrated noise model for advanced propulsor. (Hydroacoustics)
- Development of methods to predict flow noise over appendages. (Hydroacoustics)
- Development of technology to predict real-time acoustic signatures from on-board measurements. (Structural Acoustics)
- Validation of non-linear, stress-magnetization finite element model. (Electromagnetic Signature Reduction)

SUBMARINE STRUCTURAL SYSTEMS:

CONTINUE:

- Development of preliminary double hull concepts. (Advanced Structures)
- Development of flanking path acoustic mitigation system. (Advanced Structures)

COMPLETE:

- Development of equipment emulators to assess shock and acoustic applications. (Advanced Structures)
- Development of system requirements and sensor configurations to implement structural monitoring system. (Advanced Structures)

SUBMARINE POWER AND AUTOMATION:

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INITIATE:

- Investigation of electric power distribution and machinery system automation for improved system performance and reduced manning. (Machinery and Electrical)
- Reduced scale demonstration of advanced control and motor design techniques. (Electrical)
- Development of hybrid acoustic filter for fluid systems. (Machinery)

CONTINUE:

- Integrated modeling and simulation of electric motor with mounting, shaft, propulsor and machinery support systems to investigate overall acoustic noise reduction. (Machinery)
- Development of most promising actuator technologies for improved performance of steering and diving systems. (Machinery)
- Development of solid state circuit breaker technology for quiet operation. (Electrical)
- Development and validation analysis of 3-D design tools for quiet electric motors. (Electrical)

COMPLETE:

- Technology assessment and development of alternative emergency power energy storage technologies. (Electrical)
- Verification of design tools for internal fluid systems. (Machinery)

SUBMARINE MANEUVERING AND SEAKEEPING:

INITIATE:

- Validation of advanced maneuvering prediction codes. (Maneuvering Systems)
- Development of minimal cavitation propulsor designs. (Advanced Propulsors)

CONTINUE:

- Demonstration of improved ability to simulate maneuvering in extreme conditions. (Maneuvering and Control)
- Development of maneuvering effectors to increased control authority at low speeds. (Maneuvering Systems)
- Hydroacoustic design and analysis for mixed flow propulsors. (Advanced Propulsors)

COMPLETE:

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- Validation of propulsor force prediction and transition to Hydrodynamics/Hydroacoustics Technology Center. (Maneuvering and Control)
- Viable mixed flow propulsor concept. (Advanced Propulsors)
- Establishment of propulsor concept based on active control. (Advanced Propulsors)
- Assessment of flow noise reduction over appendages. (Maneuvering and Control)

ADVANCED ELECTRICAL POWER MANAGEMENT:

INITIATE:

- Development of advanced energy management and control concepts based on advanced regulation, stability, generation and storage concepts and components. (Electrical)
- Development of High Voltage Switch technology. (Electrical)
- Development of High Voltage Passive Component technology. (Electrical)

CONTINUE:

- Development of Fast-Turn-Off modules for PEBB. (Electrical)
- Development of system regulation and stability concepts, algorithms, and components. (Electrical)
- Dual Use PEBB commercialization. (Electrical)
- Development of energy generation and storage concepts. (Advanced Concept Electrical Systems)

COMPLETE:

- Transition Cost and efficiency models for advanced electrical systems and solid-state components to PE 0603508N to support Electrically Re-configurable Ship Demonstrations. (Electrical)

LOGISTICS:

INITIATE:

- Development of a submersible cache for prepositioning equipment. (Amphibious Logistics)
- Development of existing assets for mobile piers. (Amphibious Logistics)

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CONTINUE:

- Development of sea-based logistics communication link. (Amphibious Logistics)
- Development of virtual sensors. (Maintenance)

COMPLETE:

- Development of high power microwave built-in test set. (Maintenance)
- Development of expeditionary mooring technology. (Maintenance)
- Development of micro-electrical mechanical sensor systems. (Maintenance)
- Development of collaborative infrastructure assessment tool. (Infrastructure)

ENVIRONMENTAL QUALITY TECHNOLOGY:

INITIATE:

- Development of advanced waste treatment system process control technology for surface ships and submarines, and ballast water NIS control technology for Navy vessels in order to address development of suitable Marine Pollution Control Devices (MPCD) in support of Uniform National Discharge Standards (UNDS) requirements. (Environmentally Compliant Platforms)
- Development of pollutant sensor technology for Navy wastewater treatment/control systems such as the Automated Underwater Hull Maintenance Vehicle (AUHMV) and Navy shipyard dry-dock industrial wastewater treatment devices. (Environmentally Compliant Platforms)

CONTINUE:

- Development of biofouling control technology for submarine heat exchangers. (Environmentally Compliant Platforms)
- Development of Navy ballast MPCD technology for NIS. (Environmentally Compliant Platforms)
- Development of recording, tracking and assessment technologies for mitigating the effects of Navy operations on marine mammals and threatened endangered species. (Environmentally Compliant Platforms)
- Development of automated dry-dock ship painting and applique technology for elimination of over-spray and hazardous air pollutants (HAPS). (Environmentally Compliant Platforms)

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- Integrated Navy sediment characterization and methodology. (Environmentally Compliant Platforms)

COMPLETE:

- Development of liquid carbon dioxide shipboard pollution prevention control technology for hazardous industrial rags and transition to Advanced Technology (PE0603712N) or Advanced Development Program (PE 0603721N). (Environmentally Compliant Platforms)
- Development of information and data for establishing scientifically sound Navy copper discharge standards in support of UNDS and transition to PE 0603721N for implementation. (Environmentally Compliant Platforms)
- Development of neural net classification algorithm for Navy shipboard OCMs, transition to PE 0603721N for advanced development, integration and implementation. (Environmentally Compliant Platforms)

3. FY 2001 PLAN:

SURFACE SHIP STRUCTURAL SYSTEMS:

INITIATE:

- Development of design concepts for joining major components of Hybrid Composite Hulls. (Composite Hull Concepts)
- Prediction of Hybrid Composite Hull response to explosive loads in water and air. (Composite Hull Concepts)
- Develop reliability assessment methods for composite and hybrid composite hulls. (Composite Hull Concepts)

CONTINUE:

- Hull life assurance methodology. (Hull Life Assurance)
- Improved magazine protection. (Weapons Effects)
- Shock/acoustic mount design with energy absorbing structures. (Weapons Effects)
- Improved survivability for future threats. (Weapons Effects)
- Concepts for affordable composite Hybrid Hull for achieving "ALL" signature goals. (Composite Hull Concepts)
- Composite Topside response to air explosion. (Topside Structures)

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COMPLETE:

- Composite Hull response to explosive loads in water and air. (Weapons Effects)
- Assessment of stainless steel advanced double hull concepts. (Hull Structures)
- Design criteria and tools for analysis of composite primary hulls. (Hull Structures)
- Design tool for integrated composite topside structures. (Topside Structures)

SURFACE SHIP POWER AND AUTOMATION:

CONTINUE:

- Development of distributed machinery architecture concepts. (Mechanical Power and Auxiliary Systems)
- Demonstration of Advanced Fuel Cell technology (including combined cycle machines) with increased efficiency higher power density for auxiliary and propulsion. (Electrical)

COMPLETE:

- Self-healing network and commercial off the shelf (COTS) automation demonstration. (Mechanical Power and Auxiliary Systems)
- Dynamic modeling and simulation of shipboard fuel-cell power systems.(Electrical)

SURFACE SHIP SIGNATURE CONTROL:

INITIATE:

- Development of double-hull signature reduction technologies for underwater electromagnetic signatures. (Underwater Signature Reduction)
- Development of advanced structural-acoustic signature reduction technologies. (Underwater Signature Reduction)

CONTINUE:

- Development of integrated topside reduction and EM compatibility prediction capabilities for LO structures. (Topside Signature Reduction/EM Compatibility)
- Development of next-generation topside signature control concepts. (Topside Signature Reduction)

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FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 2

PROGRAM ELEMENT: 0602121N

PROGRAM ELEMENT TITLE: Ship, Submarine & Logistics Technology

- Development of corrosion-related signature reduction technologies for underwater electromagnetic signatures. (Underwater Signature Reduction)

COMPLETE:

- Evaluation of ship hull concepts that meet low-observable requirements. (Topside Signature Reduction)
- Develop measurement procedures and metrics to evaluate residual ferromagnetic signatures of non-ferrous materials. (Underwater Signature Reduction)

SURFACE SHIP MANEUVERING & SEAKEEPING:

INITIATE:

- End-to-end hydrodynamic signature prediction capability. (Integrated Propulsor/Hull)

CONTINUE:

- Development of numerical methods for predicting hydrodynamic hull loads. (Seaway Maneuverability, Motions and Loads)
- Development of integrated propulsor/hull concept to improve signature behavior. (Integrated Propulsor/Hull)
- Development of low-signature turning and maneuvering predictions. (Seaway Maneuverability, Motions and Loads)

COMPLETE:

- Development of numerical methods for predicting hydrodynamic hull loads. (Seaway Maneuverability, Motions and Loads)
- Development of an integrated propulsor/hull concept to improve signature behavior. (Integrated Propulsor/Hull)

SUBMARINE SIGNATURE CONTROL:

INITIATE:

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DATE: February 2000

BUDGET ACTIVITY: 2

PROGRAM ELEMENT: 0602121N

PROGRAM ELEMENT TITLE: Ship, Submarine & Logistics Technology

- Development of active and passive degaussing/deamping control techniques based on non-ferromagnetic pressure hull/outer hull configurations. (Electromagnetic Signature Reduction)

CONTINUE:

- Development of optimum control concepts based on sampling/control of the electromagnetic fields that are exterior/interior to a double hull. (Electromagnetic Signature Reduction)
- Development of advanced degaussing/deamping to integrate sensors/actuators into coatings. (Electromagnetic Signature Reduction)

COMPLETE:

- Demonstration of proof-of-concept for controlling near-field electromagnetic signatures in shallow water. (Electromagnetic Signature Reduction)

SUBMARINE STRUCTURAL SYSTEMS:

INITIATE:

- Small scale acoustic testing of preliminary double hull concepts. (Advanced Structures)
- Development of airborne noise mitigation systems. (Advanced Structures)

CONTINUE:

- Development of preliminary double hull concepts. (Advanced Structures)

SUBMARINE POWER AND AUTOMATION:

CONTINUE:

- Development of most promising actuator technologies for improved performance of steering and diving systems. (Machinery)
- Reduced scale demonstration of advanced control and motor design techniques. (Electrical)
- Development of Hybrid acoustic filter for fluid systems. (Machinery)

COMPLETE:

- Development and validation analysis of 3-D design tools for quiet electric motors. (Electrical)

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DATE: February 2000

BUDGET ACTIVITY: 2

PROGRAM ELEMENT: 0602121N

PROGRAM ELEMENT TITLE: Ship, Submarine & Logistics Technology

- Development of solid state circuit breaker technology for quiet operation. (Electrical)

SUBMARINE MANEUVERING AND SEAKEEPING:

INITIATE:

- Assessment of non-rotating propulsion devices. (Advanced Propulsors)

CONTINUE:

- Validation of advanced maneuvering prediction codes. (Maneuvering and Control)

COMPLETE:

- Hydroacoustic analysis for mixed flow propulsors. (Advanced Propulsors)
- Demonstrate improved maneuvering simulation capability. (Maneuvering and Control)
- Demonstrate advanced concepts for improved maneuvering at low speeds and in shallow water. (Maneuvering and Control)

ADVANCED ELECTRICAL POWER MANAGEMENT:

INITIATE:

- Development of solid-state technology for high power distribution systems. (Electrical)

CONTINUE:

- Development of system regulation and stability concepts, algorithms, and components. (Electrical)
- Development of energy generation and storage concepts. (Electrical)
- Development of High Voltage Switch technology. (Electrical)
- Development of High Voltage Passive Component technology. (Electrical)

COMPLETE:

- Dual Use PEBB commercialization. (Electrical)
- Transition Cost and efficiency models for advanced electrical systems and solid-state components to PE 0603508N to support Electrically Re-configurable Ship Demonstrations. (Electrical)

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FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

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BUDGET ACTIVITY: 2

PROGRAM ELEMENT: 0602121N

PROGRAM ELEMENT TITLE: Ship, Submarine & Logistics Technology

- Development of advanced PEBB Fast-Turn-Off (FTO) modules. Transition FTO technology to PE 0603508N to support Electrically Re-configurable Ship Demonstrations. (Electrical)

LOGISTICS:

INITIATE:

- Development of shipboard integrated logistics system. (Maintenance)
- Development of strategic/tactical integrated logistics system. (Amphibious Logistics)

CONTINUE:

- Development of a submersible cache for pre-positioning equipment. (Amphibious Logistics)
- Development of a sea-based logistics communication link. (Amphibious Logistics)
- Development of existing assets for mobile piers. (Amphibious Logistics)
- Development of virtual sensors. (Maintenance)

ENVIRONMENTAL QUALITY TECHNOLOGY:

INITIATE:

- Development of advanced shipboard and submarine pollution prevention and liquid wastewater treatment technologies for compliance with Uniform National Discharge Standards (UNDS). (Environmentally Compliant Platforms)
- Development of advanced marine mammal threat mitigation technology. (Environmentally Compliant Platforms)
- Development of advanced air pollutant emissions control and treatment technologies for ships in support of International Maritime Organization (IMO) MARPOL requirements. (Environmentally Compliant Platforms)
- Development of advanced pollution prevention technology for Navy industrial wastewater treatment facilities to reduce costs and limit liability. (Environmentally Compliant Platforms)

CONTINUE:

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DATE: February 2000

BUDGET ACTIVITY: 2

PROGRAM ELEMENT: 0602121N

PROGRAM ELEMENT TITLE: Ship, Submarine & Logistics Technology

- Development of advanced waste treatment process control technology for surface ships and submarines and ballast water NIS control technologies for Navy vessels in support of UNDS. (Environmentally Compliant Platforms)
- Development of pollutant sensor technology for Navy shore facility wastewater control/treatment systems and development of applique technology for ship hull and structures. (Environmentally Compliant Platforms)

COMPLETE:

- Development of methodology and scheme for integrated characterization of Navy-contaminated marine sediments. (Environmentally Compliant Platforms)
- Development of submarine heat exchanger fouling control technology. (Environmentally Compliant Platforms)
- Development of recording, tracking and assessment technology for mitigation of Navy operations on marine mammals. (Environmentally Compliant Platforms)
- Automated dry dock ship paint application, overspray control, collection and treatment technologies. Transition to NAVSEA 04 and NAVFAC 15R for advanced development (PE 0603721N). (Environmentally Compliant Platforms)

B. PROGRAM CHANGE SUMMARY:

FY 1999

FY 2000

FY 2001

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FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

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BUDGET ACTIVITY: 2

PROGRAM ELEMENT: 0602121N

PROGRAM ELEMENT TITLE: Ship, Submarine & Logistics Technology

FY 2000 President's Budget:	55,456	43,786	42,967
Appropriated Value:	-	61,786	-
Adjustments from FY 2000 PRESBUD:			0
SBIR/STTR Transfer	-542	0	0
Execution Adjustment	-1,988	0	0
Congressional Rescissions	0	-341	0
Congressional Adds:			0
Stainless Steele Advanced Double Hull	0	5,000	0
Curved Plate Double Hull	0	8,000	0
3-D Printing Metalworking Technology		4,000	0
Bioenvironmental Hazards		1,000	0
Various Rate Adjustments		0	-301
Program Adjustments		0	1,857
Mil/Civ Pay Rates		0	40
FY 2001 PRESBUDG Submission:	52,926	61,445	44,563

CHANGE SUMMARY EXPLANATION:

Schedule: Not applicable.

Technical: Not applicable.

C. OTHER PROGRAM FUNDING SUMMARY:

OTHER APPROPRIATION FUNDS: Not applicable.

RELATED RDT&E:

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DATE: February 2000

BUDGET ACTIVITY: 2

PROGRAM ELEMENT: 0602121N

PROGRAM ELEMENT TITLE: Ship, Submarine & Logistics Technology

PE 0601153N (Defense Research Sciences)
PE 0602131M (Marine Corps Landing Force Technology)
PE 0602233N (Human Systems Technology)
PE 0602234N (Materials, Electronics, and Computer Technology)
PE 0602314N (Undersea Warfare Surveillance Technology)
PE 0602315N (Mine Countermeasures, Mining and Special Warfare Technology)
PE 0603502N (Surface and Shallow Water MCM)
PE 0603508N (Surface Ship & Submarine HM&E Advanced Technology)
PE 0603513N (Shipboard System Component Development)
PE 0603514N (Ship Combat Survivability)
PE 0603553N (Surface Anti-Submarine Warfare)
PE 0603561N (Advanced Submarine Systems Development)
PE 0603563N (Ship Concept Advanced Design)
PE 0603564N (Ship Preliminary Design and Feasibility Studies)
PE 0603569E (DARPA S&T Program)
PE 0603573N (Advanced Surface Machinery Systems)
PE 0603712N (Environmental Quality & Logistics Advanced Technology)
PE 0603721N (Environmental Protection)
PE 0603726N (Merchant Ship Naval Augmentation Program)
PE 0603792N (Advanced Technology Transition)
PE 0604558N (New Design SSN Development)
PE 0604561N (SSN-21 Development Program) Under the Tri-Service Reliance Agreement, the Navy has the lead for this Navy-unique program.

D. SCHEDULE PROFILE: Not applicable.

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