FY 2007 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: Feb 2006
Exhibit R-2

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603123N
PROGRAM ELEMENT TITLE: FORCE PROTECTION ADVANCED TECHNOLOGY

COST: (Dollars in Thousands)

Project Number & Title	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
Total PE	171,710	165,611	61,504	49,709	49,962	51,027	51,322
2912 FORCE PROTECTION ADVANCED TECHNOLOGY	66,163	64,724	58,831	46,903	47,026	47,900	47,997
3049 FORCE PROTECTION	8,092	5,687	2,673	2,806	2,936	3,127	3,325
9999 CONGRESSIONAL PLUS-UPS	97,455	95,200	0	0	0	0	0

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This Program Element (PE) addresses applied research associated with providing the capability of Platform and Force Protection for the U.S. Navy. This program supports the development of technologies associated with all naval platforms (surface, subsurface, terrestrial and air) and the protection of those platforms. This PE supports the Future Naval Capabilities (FNC) in the areas of Sea Shield and Cross Pillar Enablers. The goal of this program is to provide the ability to win or avoid engagements with other platforms or weapons and, in the event of engagement, to resist and control damage while preserving operational capability. Surface Ship & Submarine, Hull, Mechanical & Electrical (HM&E), Missile Defense, Fleet Force Protection and Defense against Undersea Threats, and Emerging Threats activities all support FNC efforts.

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

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B. PROGRAM CHANGE SUMMARY:

	FY 2005	FY 2006	FY 2007
FY 2006 President's Budget Submission	180,641	71,488	56,070
Congressional Action	0	95,200	0
Congressional Undistributed Reductions/Rescissions	-140	-1,077	0
Execution Adjustments	8,032	0	0
FY 2005 SBIR	-4,084	0	0
Program Adjustments	23	0	-2,234
Program Realignment	0	0	7,496
Rate Adjustments	0	0	172
Realignment of EM Railgun to PE 0602114N	-12,762	0	0
FY 2007 President's Budget Submission	171,710	165,611	61,504

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:
The overall goals of this applied research program are the development of technologies which focus on the warfighter and providing the ability to win or avoid engagements with other platforms or weapons and, in the event of engagement, to resist and control damage while preserving operational capability. Overall metric goals are to transition the 6.3 advanced technology projects into acquisition programs. Each PE Activity has

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unique goals and metrics, some of which include classified quantitative measurements.

Specific examples of metrics under this PE include:
- Improve performance of high speed craft to allow 4000 NM range in a craft capable of 50 kts maximum speed by FY 2007.
- Demonstrate improved performance of main propulsion electric motors and controllers (50% reduced weight and volume) by FY 2010.
- In-water successful demonstration of warhead lethality against specified threat at required Closest Point of Approach (CPA).
- Items included within the Missile Defense Activity description.

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PROJECT NUMBER: 2912 PROJECT TITLE: FORCE PROTECTION ADVANCED TECHNOLOGY

COST: (Dollars in Thousands)

Project Number & Title	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
2912 FORCE PROTECTION ADVANCED TECHNOLOGY	66,163	64,724	58,831	46,903	47,026	47,900	47,997

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project addresses applied research associated with providing the capability of Platform and Force Protection for the U.S. Navy. This project supports the development of technologies associated with all naval platforms (surface, subsurface, terrestrial, and air) and the protection of those platforms. It supports the Sea Shield and Cross Pillar Enablers -- Future Naval Capabilities (FNCs). The goals of this project are to provide the ability to win or avoid engagements with other platforms or weapons and, in the event of engagement, to resist and control damage while preserving operational capability.

The funding profile from FY 2006 to FY 2007 reflects the reorganization of Future Naval Capabilities (FNC) Program investments into Enabling Capabilities (ECs). As a result of this reorganization, the funding for each EC has been aligned to a Budget Activity 2 and Budget Activity 3 PE as appropriate. This Activity reflects the alignment of investments for the following ECs: Fortified Position Security, Over-the-Horizon Missile Defense, Two-Torpedo Salvo Defense, Defense of Harbor and Near-Shore Naval Infrastructure Against Asymmetric Threats, Sea Based Missile Defense of Ships & Littoral Installations, Aircraft Integrated Self-Protection Suites, and Hostile Fire Detection and Response Spirals 1 and 2.

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 2005	FY 2006	FY 2007
SURFACE SHIP & SUBMARINE HULL MECHANICAL & ELECTRICAL (HM&E)	38,574	23,478	20,244

Activity includes: Signature Reduction, Hull Life Assurance, and Advanced Capability Electric Systems. Signature Reduction addresses electromagnetic (EM), infrared (IR), and acoustic signature tailoring, both topside and underwater. Hull Life Assurance addresses development of new structural system approaches for

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surface ships and submarines, including the management of weapon effects to control structural damage and the improvement of structural materials. Advanced Capability Electric Systems area addresses electrical and auxiliary systems and component technology to provide improvements in system energy and power density, system operating efficiency, and recoverability from casualties. Advanced Damage Control Countermeasures addresses fire, smoke, and flooding detection using a volume sensor and the use of a hybrid water-mist for electronic space protection. This activity includes support to two FNC's Sea Strike and Cross Pillar Enablers.

Decrease in funding from FY 2005 to FY 2006 is due to the FY 2006 transition of further development of the electromagnetic gun technology to PE 0602114N.

FY 2005 Accomplishments:

- Continued development of diesel fuel reforming technology for molten carbonate and proton exchange membrane fuel cells.
- Continued development of advanced superconducting homopolar main propulsion motor with General Atomics.
- Continued development of superconducting synchronous main propulsion motor with American Superconductor.
- Continued technology efforts for reduced total ownership cost.
- Continued construction of Advanced Electric Ship Demonstrator (AESD).
- Continued development of electromagnetic gun technology, including focus on rail wear issues, energy storage, and pulsed power switching. Funding from PDM II will be applied to further develop electromagnetic gun technology, including focus on rail wear issues, energy storage, and pulsed power switching (transitions to PE 0602114N in FY 2006).
- Continued design and construction of 36.5 MW prototype HTS motor.
- Completed Quiet Electric Drive/submarine secondary propulsion unit (SPU).

FY 2006 Plans:

- Continue all efforts of FY 2005.
- Complete construction of Advanced Electric Ship Demonstrator (AESD).
- Initiate advanced technology portion of on-board vehicle power system by fabricating and beginning component tests (transitioned from FY 2005 efforts under PE 0602123N).

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FY 2007 Plans:

- Continue all efforts of FY 2006, less those noted as completed above.
- Transfer development of on-board vehicle power system technologies for future Marine Corps Battlefield Power System to PE 0603236N.
- Complete testing of superconducting synchronous main propulsion motor with American Superconductor.
- Initiate development of Integrated Damage Control Systems which includes Integrated Damage Control Communications and Advanced Magazine Protection System.

	FY 2005	FY 2006	FY 2007
FLEET FORCE PROTECTION AND DEFENSE AGAINST UNDERSEA THREATS	12,849	23,320	25,418

Fleet Force Protection and Defense against Undersea Threats addresses efforts that include applied research for complementary sensor and processing technologies for platform protection and shipboard technologies to increase the survivability of surface ship and submarine platforms against torpedo threats.

The first major goal of this activity is to develop complementary sensor and processing technologies for 21st century warfighting success and platform protection. Current small platforms (both surface and airborne) have little or no situational awareness (SA) or self-protection against air, surface, and asymmetric threats. This activity will provide tactical aircraft (TACAIR) and other platforms with effective threat warning and self-protection. The technology areas specific to platform protection will develop individual or multi-spectral [electro-optic (EO), infra-red (IR), radio frequency (RF), electromagnetic (EM), visual, and acoustic] sensors and associated processing. To defend platforms from current and advanced threats in at-sea littoral environments and in port, these technologies must improve multi-spectral detection and distribution of specific threat information.

The Fleet Force Protection portion of this activity includes support to the FNC Enabling Capabilities for Aircraft Integrated Self-protection Suites, Intent Determination – EO/IR Enhancements, Proof-of-Concept for Non-lethal Approach, Advanced Electronic Sensor Systems for Missile Defense, and Hostile Fire Detection and Response Spirals 1 and 2.

The second major goal of this activity is to develop enabling technologies that will increase the

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survivability of surface ship and submarine platforms against torpedo threats. Proposed technologies focus on defeating high priority threats including torpedoes (i.e. straight running, wake homing, acoustic homing, air dropped torpedoes, and salvoes of torpedoes). Technologies developed will minimize shipboard impact and require no shipboard organizational maintenance. Two major efforts are ongoing: 1) The Next Generation Countermeasure (NGCM) is a mobile adaptive acoustic countermeasure (CM) for defeating threat torpedoes; NGCM capabilities will include acoustic communication links to enable connectivity from each CM to other CMs (in the group) and to the host platform; and 2) The Anti-Torpedo Torpedo (ATT)/Tripwire provides technologies that enable an ATT to engage threat torpedoes detected by a surface ship towed sensor system. The ultimate goal is to develop technologies to enable a torpedo defense capability, including ship self-defense against salvo torpedo attacks, to fill the FNC Sea Shield Warfighting Capability Gap/Enabling Capability: Platform Defense against Undersea Threats. This will be accomplished by providing a capability to prevent a single salvo of two threat torpedoes fired at high value Naval platforms from hitting those platforms. Ultimately the efforts should deliver a netted set of decoys and an anti-torpedo-torpedo for use in defeating a 2-torpedo salvo attack against a surface or subsurface platform.

The funding increase from FY 2005 to FY 2006 reflects additional demonstration activity.

FY 2005 Accomplishments:

Sensors & Associated Processing -
- Continued the Integrated Defensive Electronic Countermeasures Pre-Planned Product Improvement (IDECM P3I) effort by laboratory demonstration of a coated carbon fiber cable that survives 27 times longer than Zylon under direct flame at temperatures >1800 degrees Fahrenheit.
- Continued the Electro-Optic/Infrared (EO/IR) Laser Jammer for Tactical Aircraft (TACAIR) effort by performing a laboratory demonstration of the upgraded multiband laser towards a goal of 5W in all bands.
- Continued the End User Terminal (EUT) effort by conducting a side-by-side laboratory demonstration of the Dismounted-Digital Automated Computing Terminal (D-DACT) including the integrated 256 color Organic Light Emitting Diode (OLED) display with a Liquid Crystal Display D-DACT.
- Continued the Shipboard EO/IR Closed Loop Self-Protection effort by demonstrating a pulse-gated visible receiver operating at 10kHz frame rate.
- Initiated and completed development of the conformal solid-state beam director for the EO/IR Laser Jammer for TACAIR.
- Initiated the Laser Detection and Ranging (LADAR) piece of the Distributed Aperture System (DAS) for

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target imagery and identification. The LADAR build will be a low power breadboard model.

Underwater Platform Self-Defense -
- Continued open loop in-water data collection experiments to collect ATT one-on-one (1x1) sensor data for improving operations in the wake.
- Continued open loop in-water data collection efforts to evaluate the ATT two-on-two (2x2) salvo sonar technologies for emulated salvo threat during relevant engagement geometries.
- Continued in-tank tests evaluating the ability of ATTs to transmit and receive acoustic communication between vehicles.
- Completed open loop in-water data collection experiments to collect ATT one-on-one (1x1) sensor data of an emulated salvo threat during relevant engagement geometries.
- Completed requirements analysis for ATT warhead safe-and-arm inertial measurement unit.
- Initiated open loop in-water experiments to evaluate ATT salvo four-on-four (4x4) engagement technologies.

FY 2006 Plans:

Sensors & Associated Processing -
- Continue all efforts of FY 2005.
- Complete land based testing of optical design and data processing systems for DAS.
- Complete international effort to develop new and improved algorithms for DAS IRSTs to cope with at-sea environmental effects.
- Complete the Laser Detection and Ranging (LADAR) piece of the Distributed Aperture System (DAS) for target imagery and identification and DAS IRST testing.
- Initiate and complete the integration of the Gallium Arsenide (GaAs) transmitter with an ALE-55 sized Fiber-Optic Towed Decoy (FOTD) and onboard power supply for IDECM P3I.
- Initiate and complete the EUT effort by a field demonstration of the full capabilities of the integrated personal communications, situational awareness, and gunfire detection system including the Monocular Display with a super video graphics adapter (SVGA) resolution of 800x600 pixels.
- Initiate the Integrated EO/IR Self Protection Suite for Rotary Wing Aircraft effort by evaluation and demonstration of an uncooled missile warning system (MWS) sensor operating in the visible/near-infrared (500-1100 nanometer) spectral band.
- Initiate development work on improving imaging technologies (EO/IR/Laser) to support the Integrated Radar Optical Sighting & Surveillance (IROSS) Shipboard Protection System (SPS) Spiral for IROSS.

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Underwater Platform Self-Defense -
• Continue all efforts of FY 2005, less those noted as completed above.
• Complete open loop in-water data collection efforts to evaluate the ATT two-on-two (2x2) salvo sonar technologies for emulated salvo threat during relevant engagement geometries.
• Initiate closed loop in-water data collection experiments to collect ATT one-on-one (1x1) sensor data for improving operations in the wake.
• Initiate conduct of in-water demonstration of free swimming NGCM.
• Initiate in-water demonstration of NGCM controlled mobility.
• Initiate closed loop data collections to evaluate ATT two-on-two (2x2) salvo technologies for improving operations outside the wake.

FY 2007 Plans:

Sensors & Associated Processing -
• Continue all efforts of FY 2006, less those noted as complete above.
• Continue developing technologies to support the Intelligent Video Surveillance project which includes integration of object recognition and tracking algorithms, machine vision, and multiple networked video streams into different classes of EO/IR sensors. (Transferred into this PE from PE 0602131M in FY 2007.)
• Transfer completion of the Shipboard EO/IR Closed Loop Self-Protection effort to PE 0603271N. Completion efforts include a final at-sea demonstration of the Shipboard Integrated Electro-optic Defense System (SHIELDS) hardware, which consists of a Mid-wave IR (MWIR) camera operating in the 2-5um wavelength spectral band.
• Transfer development work on improving imaging technologies (EO/IR/Laser) supporting Integrated Radar Optical Sighting & Surveillance (IROSS) Shipboard Protection System (SPS) Spiral for IROSS to PE 0602131M.
• Complete the EO/IR Laser Jammer for TACAIR effort by performing laboratory demonstration of both the conformal solid-state beam director and common jam code countermeasure jamming capability by demonstrating a 95% jamming effectiveness for all Tier 1 and 2 IR threats.
• Complete the IDECM P3I effort by performing flight tests against single and multiple, simultaneous threats employing the complete system capabilities, including new towline capable of continuous operation at temperatures exceeding 1800 degrees Fahrenheit, 80W output continuous wave RF decoy, and Electronic Countermeasure (ECM) techniques.

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Underwater Platform Self-Defense -
• Continue all efforts of FY 2006, less those noted as complete above.
• Complete closed loop in-water data collection experiments to collect ATT one-on-one (1x1) sensor data for improving operations in the wake.
• Complete closed loop in-water data collection efforts to evaluate the ATT two-on-two (2x2) salvo sonar technologies for improving operations outside the wake.
• Complete evaluation of NGCM mobility capabilities by in-tank tests.
• Complete open loop in-water demonstration of ATT one-on-one (1x1) engagement in the wake.
• Complete conduct of in-water demonstration of free swimming NGCM.
• Initiate and complete clear-water preliminary demonstration of ATT salvo two-on-two (2x2) engagement.
• Initiate closed loop in-water experiments to evaluate ATT salvo four-on-four (4x4) engagement technologies.
• Initiate and complete demonstration of NGCM acoustic communication technologies and transition them to PMS415.
• Initiate and complete conduct of in-water demonstration of full duplex adaptive signal generation capability for NGCM.
• Initiate development of technologies to support the Underwater Threat Neutralization project which include a scalable low frequency continuous wave acoustic weapon for use against underwater asymmetric threats.
• Initiate in-tank experiments at Naval Undersea Warfare Center, Division Newport to evaluate NGCM group behavior technology.

	FY 2005	FY 2006	FY 2007
MISSILE DEFENSE (MD)	6,022	9,160	10,165

This activity describes Missile Defense Science and Technology (S&T) projects of the Sea Shield Future Naval Capability (FNC) program including:
• Advanced Area Defense Interceptor (AADI) S&T planning and data analysis effort for Navy-Marine Corps Air-Directed Surface-to-Air Missile (ADSAM) live firing demonstration at White Sands Missile Range in FY 2008. The metric for AADI is execution of an ADSAM demonstration by the Navy and Marine Corps that establishes the basis for further development of an operational Naval Integrated Fire Control/Counter-Air (NIFC-CA) capability.
• Distributed Weapons Coordination (DWC) open architecture combat system algorithms for theater air and

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missile defense (TAMD) automated battle management aids (ABMA), including common threat evaluation (CTE) and preferred shot recommendation (PSR) functions that will enable fleet units to defend against air and missile attacks with increased effectiveness and efficiency. Metrics for DWC include (a) increased effectiveness of combat resources through a theater-wide threat evaluation process; (b) increased efficiency of weapons resources through weapon assignment and preferred shot recommendations considering TBMD and Area/Ship Defense capability operating simultaneously; and (c) reduced “free riders” (threats not fired at) due to ineffective use of resources (unengaged targets) by 50% (threshold) 80% (objective). Transition to acquisition in FY 2007.

- Distributed Sensor Coordination (DSC) algorithms for airborne sensor management in ADSAM and multi-threat air defense engagements. The metric for DSC is effective coordination of airborne sensor resources to support NIFC-CA capability, evaluated using laboratory Monte Carlo simulations within simulated stressing air defense environments. Transition to acquisition in FY 2008.
- Littoral Affordability (classified program). Metrics for this project are classified. Transition to acquisition in FY 2006.
- Naval Interceptor Improvements (NII) technology upgrades for STANDARD Missile 6 (SM-6) Block II future TAMD missile. The metrics for this new project will be defined in a transition agreement to be signed with the Navy acquisition customer upon project initiation in 2007 for an enhanced performance envelope for engaging advanced theater missiles in terminal phase while meeting or exceeding required performance against modern air threats. Transition anticipated in FY 2011.

Funding increase in FY 2006 is due to acceleration of DWC efforts. Funding increase in FY 2007 is caused by the addition of the new NII project.

FY 2005 Accomplishments:

- Continued AADI ADSAM demonstration planning and coordination efforts.
- Continued Littoral Affordability effort (classified program).
- Continued development of DSC algorithms and operational concept for TAMD sensor management.
- Continued testing and demonstration of DWC combat system algorithms developed under PE 0602123N.

FY 2006 Plans:

- Continue AADI, DSC and DWC efforts of FY 2005.
- Complete Littoral Affordability effort (classified program).

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FY 2007 Plans:

- Continue AADI planning and coordination for FY 2008 Navy ADSAM live-fire demonstration.
- Continue testing and demonstration of DSC algorithms.
- Complete testing and demonstration of DWC algorithms.
- Initiate NII project.

	FY 2005	FY 2006	FY 2007
HIGH SPEED CRAFT TECHNOLOGY	8,718	8,766	3,004

X-Craft is envisioned as an S&T platform designed for Littoral Combat Ship (LCS) risk reduction and mission module demonstration. A high-speed, all-aluminum catamaran, it displaces 1400 tons at full load. Performance requirements are 50 knots at combat load (about 1200 tons), 40 knots in sea state 4, and a 4000 nautical miles range without replenishment. It will be capable of landing two helicopters up to the size of SH-60R, transporting and operating autonomous vehicles, and carrying several reconfigurable mission modules in standard Twenty-foot Equivalent Unit (TEU) boxes. The crew will be minimal and the vessel will be built to commercial American Bureau of Shipping (ABS) standards.

Decrease of funding in FY 2007 is due to the completion of the X-Craft.

FY 2005 Accomplishments:

- Continued development of drag reduction and lifting body technology on an alternative platform using lifting bodies. Full-scale sea trials scheduled late FY 2005.
- Completed construction of LSC(X) and delivered to fleet.
- Initiated efforts to install lifting body and drag reduction systems on alternative high speed platforms.
- Initiated and completed certification testing of the X-Craft.

FY 2006 Plans:

- Complete sea trials and produce report on technology developments.

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• Initiate further development of drag reduction and lifting body technology on additional alternative platforms. Support demonstration and evaluation of lifting body hull forms.

FY 2007 Plans:

• Continue development of drag reduction and lifting body technology and lifting body hull forms.

C. OTHER PROGRAM FUNDING SUMMARY:
RELATED RDT&E:

NAVY RELATED RDT&E:
PE 0204152N (E-2 Squadrons)
PE 0205601N (HARM Improvement)
PE 0206313M (Marine Corps Communications Systems)
PE 0601153N (Defense Research Sciences)
PE 0602123N (Force Protection Applied Research)
PE 0602131M (Marine Corps Landing Force Technology)
PE 0602235N (Common Picture Applied Research)
PE 0602271N (RF Systems Applied Research)
PE 0603235N (Common Picture Advanced Technology)
PE 0603271N (RF Systems Advanced Technology)
PE 0603502N (Surface and Shallow Water Mine Countermeasures)
PE 0603561N (Advanced Submarine System Development)
PE 0603563N (Ship Concept Advanced Design)
PE 0603564N (Ship Preliminary Design and Feasibility Studies)
PE 0603609N (Conventional Munitions)
PE 0603640M (USMC Advanced Technology Demonstration (ATD))
PE 0604307N (Surface Combatant Combat System Engineering)
PE 0604518N (Combat Information Center Conversion)
PE 0604558N (New Design SSN)

NON NAVY RELATED RDT&E: Not applicable.

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D. ACQUISITION STRATEGY:
Not applicable.

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PROJECT NUMBER: 3049 PROJECT TITLE: FORCE PROTECTION

Project Number & Title	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
3049 FORCE PROTECTION	8,092	5,687	2,673	2,806	2,936	3,127	3,325

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: Includes funds to develop and demonstrate advanced technologies that support platform self-protection. The new capabilities include the areas of all-weather, day/night protection of naval platforms and forces against all weapon threats, counter-stealth, and countermeasures. Demonstrate capabilities that support the ability to prevent or control platform damage while preserving operational capability. Hull life assurance addresses development of new structural system approaches for surface ships and submarines, including the management of weapons effects to control structural damage and the improvement of structural materials. Distributed intelligence for automated survivability addressees both the basic technology of automating damage control systems, as well as, distributed auxiliary control with self-healing capability. Realignment of the FNCs has resulted in Force Protection efforts to be included in the FNC Sea Shield. The efforts in this project will focus on protection of Naval Installations beginning in FY 2006. Other efforts (water-mist and volume sensor work) will move to PE 0603123N Project R2912 in FY 2006.

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 2005	FY 2006	FY 2007
EMERGING THREATS	8,092	5,687	2,673

This activity includes: Efforts in hull life assurance and survivability. It addresses the management of weapon effects to control structural damage and the improvement of structural materials. Advanced technologies developed, critical to protecting naval installations, will provide seamless full spectrum protection against asymmetric terrorist attack by improving the ability to: sense developing and immediate threats; shape our responses through improved situational awareness and decision making; shield personnel, mission critical facilities, infrastructure, and operating fleet assets; maintain essential functions; and sustain and restore critical services in the aftermath of an incident. Technologies developed will also seek

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to reduce the required manpower and skill levels devoted to the force protection mission.

FY 2005 Accomplishments:

- Continued development of lower cost/higher performance Force Protection sensors and automated detection algorithms, and decision support tools.
- Completed development of real-time volume sensor by verifying algorithms.
- Completed intermediate-scale testing of hybrid water-mist system.
- Completed data collection and field test of volume sensor.
- Initiated and completed validation of full scale ship test performance of the real-time volume sensor on ex-USS Shadwell.
- Initiated and completed validation of full-scale ship performance trials of hybrid water-mist system on ex-USS Shadwell.

FY 2006 Plans:

- Continue all efforts of FY 2005, less those noted as completed above.
- Initiate Shipboard EO/IR Closed Loop Self Protection efforts.
- Initiate development of lower cost/higher performance Force Protection sensors, automated detection algorithms, and decision support tools.

FY 2007 Plans:

- Continue all efforts of FY 2006.
- Transfer the Shipboard EO/IR Closed Loop Self Protection efforts to PE 0602271N and 0603271N in FY 2007.
- Initiate interim demonstration of prototype Force Protection sensors.
- Initiate development of intrusion/incident response countermeasures for Force Protection.

C. OTHER PROGRAM FUNDING SUMMARY:
NAVY RELATED RDT&E:
PE 0601153N (Defense Research Sciences)
PE 0602123N (Force Protection Applied Research)
PE 0602235N (Common Picture Applied Research)

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PE 0603235N (Common Picture Advanced Technology)
PE 0603502N (Surface and Shallow Water Mine Countermeasures)
PE 0603561N (Advanced Submarine System Development)
PE 0603563N (Ship Concept Advanced Design)
PE 0603564N (Ship Preliminary Design and Feasibility Studies)
PE 0604558N (New Design SSN)
PE 0604561N (SSN-21 Developments)

NON NAVY RELATED RDT&E: Not applicable.

D. ACQUISITION STRATEGY:
Not applicable.

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PROJECT NUMBER: 9999 PROJECT TITLE: Congressional Plus-Ups

CONGRESSIONAL PLUS-UPS:

	FY 2005	FY 2006
AC SYNCHRONOUS HIGH TEMPERATURE SUPERCONDUCTOR (HTS)ELECTRIC MOTOR	3,381	0

Continued manufacture of 36.5MW motor. Completed fabrication of rotor, stator, and frame. Procured load device and began test preparations.

	FY 2005	FY 2006
ADVANCED DEVELOPMENT AND DEMONSTRATION OF ELECTRIC ACTUATOR TECHNOLOGY	964	0

Initiated efforts including testing, validating performance, and establishing the range of possible shipboard applications of a quarter-scale actuator.

	FY 2005	FY 2006
AFFORDABLE, INTERMEDIATE MODULUS COTS CARBON FIBER QUALIFICATION PROGRAM FOR AIRCRAFT AND MISSILES	969	0

Initiated the qualification of intermediate modulus carbon fibers for use in polymer reinforced composite components for applications in JSF and Global Hawk, JUCAV and the F18.

	FY 2005	FY 2006
AGILE PORT AND HIGH SPEED SHIP TECHNOLOGY	4,825	4,500

FY 2005 - The Strategic Mobility-21 program is separately called out for FY 2005 but is a continuation of some FY 2004 work in Agile Port Technology. Addressed the development and utilization of a candidate inland port facility (Victorville) operating in conjunction controlled military and commercial cargo movement operations. The program will further involve both military and commercial port and terminal systems in the Southern California region. Developed the supporting architectures for the comprehensive plan developed as part of the FY 2004 effort. The Strategic Mobility 21 program for FY 2005 is presently being further defined and drafted

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for approval and operational contracting in 2005 in conjunction with an Operational Concept Document that is in development with USMC and USA guidance and related FY 2004 Agile Port funding.

FY 2006 - This effort supports agile port and high speed technology research.

	FY 2005	FY 2006
AT-SEA DECONTAMINATION PLATFORM DEVELOPMENT AND CONCEPTUAL DESIGN	964	1,000

FY 2005 - Initiated a feasibility assessment of potential advanced ship decontamination system designs that could be used while at-sea including the predicted decontamination success rates for various Chemical/Biological/Radiological Warfare constituents, anticipated costs for forward fit and backfit onto Navy ships, and development of an optimum system design for Navy ships.

FY 2006 - This effort supports at-sea decontamination platform development and conceptual design research.

	FY 2005	FY 2006
AUTONOMOUS TECHNOLOGIES IN SUPPORT OF SEA POWER 21	0	1,700

This effort supports reasearch of autonomous technologies in support of sea power 21.

	FY 2005	FY 2006
AVIATION GROUND ADVANCED TECHNOLOGY	967	1,300

FY 2005 - Continued development and demonstration of the Aviation Ground Navigation System (AGNAS).

FY 2006 - This effort supports aviation ground advanced technology research.

	FY 2005	FY 2006
BRAIDED REDUCED RECOIL ROPE FOR HAND AND MOORING LINES	964	0

Initiated testing to prove that a braided 12-strand Reduced Recoil Rope will meet or exceed performance requirements as specified by the Navy. Testing will include sequential break failure, coefficient of friction

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testing, torque and rotation testing and abrasion resistance testing.

	FY 2005	FY 2006
COMPOSITE TWISTED RUDDER	969	0

Completed development of a composite twisted rudder and started initial qualification tests. This rudder has a non-uniform cord shape optimized to minimize the angle of attack of the water flow, thereby minimizing cavitation. The composite rudder will not corrode, is lighter and easier to fabricate, and may have lower lifecycle cost.

	FY 2005	FY 2006
COPPER-CERAMIC SOLID OXIDE FUEL CELL TECHNOLOGY	0	1,000

This effort supports copper-ceramic solid oxide fuel cell technology research.

	FY 2005	FY 2006
DD(X) ADVANCED SHIP SERVICE FUEL CELL (SSFC) POWER PLANT	0	1,000

This effort supports DD(X) advanced Ship Service Fuel Cell(SSFC) power plant research.

	FY 2005	FY 2006
DEPLOYABLE FIBER OPTIC FORCE PROTECTION SYSTEM	1,737	0

Initiated optimized 3D underwater hydrophone tracking algorithms and demonstrate deployable fiber optic force protection system.

	FY 2005	FY 2006
DEVELOPMENT OF SULFER TOLERANT COPPER-BASED SOLID OXIDE FUEL CELL (SOFC)	967	0

Initiated research to investigate sulfur tolerant copper-based anode catalyst materials for solid oxide fuel

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cells for future Navy applications. This includes test fixture fabrication, anode cell materials development, and associated testing.

	FY 2005	FY 2006
DOCKSHOCK	4,149	0

Initiated demonstration of a suitable shock generation device and system engineering for a full scale test capability.

	FY 2005	FY 2006
ELECTROMAGNETIC RAIL GUN TEST MUNITION	0	1,100

Initiated efforts including testing, validating performance, and establishing the range of possible shipboard applications of a quarter-scale actuator.

	FY 2005	FY 2006
ELECTROMAGNETIC PROPULSION COST REDUCTION	1,358	0

Initiated efforts to identify dual use technologies to reduce the cost of military and civilian applications of linear motor systems.

	FY 2005	FY 2006
ENABLING MATERIALS FOR MEMS FABRICATION AND PACKAGING	0	4,500

This effort supports enabling materials for MEMS fabrication and packaging research.

	FY 2005	FY 2006
EXTREME TERRAIN MEDICAL EVACUATION VEHICLE PILOT	1,640	0

Initiated the design, fabrication, and testing of a medical evacuation demonstrator vehicle capable of

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achieving high speeds and improved ride quality over extreme terrain conditions. This vehicle incorporated advanced mobility technologies to improve crew safety and casualty evacuation performance. The vehicle is designed to be internally transportable in the new MV-22 tilt-rotor aircraft for increased expeditionary utility.

	FY 2005	FY 2006
FORCE PROTECTION DIGITAL DIRECTION FINDER	0	2,100

This effort supports for protection digital direction finder research.

	FY 2005	FY 2006
FOURTH GENERATION NAVAL PROPULSION PERMANENT MAGNET MOTOR	0	1,500

This effort supports fourth generation naval propulsion permanent magnet motor research.

	FY 2005	FY 2006
FUTURE NAVAL CAPABILITIES - CREW MODELING AND SIMULATION (FNC-CMS)	2,507	0

Initiated efforts to develop, validate and verify crew modeling and simulation that can be used as part of the Navy ship system design. This provides for a robust capability to determine the tactical and maintenance workload changes associated with new systems and significant systems changes.

	FY 2005	FY 2006
HIGH PERFORMANCE SANDWICH PANEL CONSTRUCTION TECHNIQUES	3,860	1,250

FY 2005 - Initiated the execution of three primary project tasks 1) develop a prototype manufacturing system, incorporating breakthrough process control and quality assurance (PC/QA) technology that is capable of cost-effectively producing steel sandwich panels; 2) Design a full manufacturing system capable of meeting the size, volume, quality and cost requirements of the US Navy; and 3) Manufacture demonstration panels of the size and shape needed in order to qualify the product for the targeted platforms including the CVN 21 class aircraft carriers.

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FY 2006 - This effort supports high performance sandwich panel construction techniques research.

	FY 2005	FY 2006
HIGH SPEED PERMANENT MAGNET GENERATOR	6,269	0

Continued design and construction of an approximately 3MW prototype high speed permanent magnet generator.

	FY 2005	FY 2006
HIGH TEMPERATURE SUPERCONDUCTING GENERATORS	0	3,500

This effort supports high temperature superconducting generators research.

	FY 2005	FY 2006
HIGH-SPEED POWER NODE SWITCHING CENTER	1,351	0

Initiated design and fabrication of a high-speed switching center based on state-of-the-art technology for shipboard applications.

	FY 2005	FY 2006
INTEGRATED ADVANCED COMMUNICATIONS TERMINAL	964	1,000

FY 2005 - Initiated efforts to develop the design and interface methodology to enable advanced integration of a variety of communications terminal architectures. This alleviates the necessity for duplicative common communication terminal components.

FY 2006 - This effort supports integrated advanced communications terminal research.

	FY 2005	FY 2006
LARGE UNMANNED UNDERSEA VEHICLE (LUUV) TEST BED	1,643	4,200

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FY 2005 - Initiated design modifications to the existing Large Unmanned Undersea Vehicle (UUV) Test Bed that will facilitate advanced UUV systems and scaled advanced submarine propulsion systems demonstrations. This included development of a front end/controller interface architecture, modular section design concepts, vehicle handling equipment design, vehicle maneuvering and control design concepts, and land based testing of subsystems selected from the proposed design concepts.

Fy 2006 - This effort supports LUUV test bed resreach.

	FY 2005	FY 2006
LIFE CYCLE PROGRAM SUPPORT FOR UNMANNED SYSTEMS	0	3,400

This effort supports life cycle program support for unmanned systems research.

	FY 2005	FY 2006
LIGHT STRIKE MEDICAL EVACUATION VEHICLE PILOT	0	1,700

This effort supports light strike medical evacuation pilot research.

	FY 2005	FY 2006
M-65 BISMALEIMIDE CARBON FIBER PREPREG RESIN SYSTEM QUALIFICATION FOR USE WITH AUTOMATED PLACEMENT MACHINES	0	2,700

This effort supports the M-65 Biamaleimide Carbon Fiber prepreg resin system qualification for use with automated placement machines research.

	FY 2005	FY 2006
MISSILE WARNING SYSTEM	2,413	3,000

FY 2005 - Initiated development of a 2-color mid-wave infrared (MWIR) sensor technology for improved missile warning receiver (MWR) performance over current systems operating in the ultraviolet (UV). Specific efforts will address fabricating mercury-cadmium-telluride (MCT) focal plane arrays in a 2-color, stacked diode, 256-by-256 pixel architecture on 6-inch silicon wafer substrates for greatly improved affordability; and

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developing a common sensor design to include visible and near-infrared (Vis/NIR) pulsed laser guidance detection along with 2-color MWIR missile plume detection in a single threat warning receiver, greatly reducing the cost and logistics burden of separate receivers.

FY 2006 - This effort supports missile warning system research.

	FY 2005	FY 2006
MOBILE MANUFACTURING AND REPAIR CELL	0	3,500

This effort supports mobile manufacturing and repair cell research.

	FY 2005	FY 2006
MULTI-FUEL PORTABLE FUEL CELL POWER PROJECT	0	1,000

This effort supports multi-fuel portable fule cell power project research.

	FY 2005	FY 2006
MULTI-MISSION WARHEAD FOR ULTRA-LIGHT TORPEDO	2,220	0

Initiated investigation, by analysis and full scale experiments to determine the effects on performance of combining defensive (omnidirectional) and offensive (directed energy) warhead technologies into a single multimode warhead for the 6.75" torpedo.

	FY 2005	FY 2006
MULTIPOLAR MOTOR	0	1,000

This effort supports multipolar motor research.

	FY 2005	FY 2006
NCDR - LIGHTWEIGHT, RUGGEDIZED RECONNAISSANCE ROBOT	0	1,300

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This effort supports the NCDR-lightweight, ruggedized reconnaissance robot.

	FY 2005	FY 2006
NON-LINE OF SIGHT (NLOS) FOR UNMANNED SYSTEMS	4,149	0

Initiated modifications to hardware prototypes for the Omni-Directional Inspection System (ODIS), which provides an electronically transmitted view of the underside of a vehicle. Each ODIS is composed of a high-resolution camera mounted on a sophisticated, omni-directional mobile platform that transmits video back to an Operator. This system can potentially reduce the risk to Military Police in screening vehicular traffic into secure areas.

	FY 2005	FY 2006
PLANAR SOLID OXIDE FUEL CELL CLUSTER DEMONSTRATION	0	5,100

This effort supports planar solid oxide fuel cell cluster demonstration reasearch.

	FY 2005	FY 2006
POROUS SILICON-BASED DIRECT METHANOL FUEL CELL	0	1,750

This effort supports porous silicon-based direct methanol fuel cell research.

	FY 2005	FY 2006
PROJECT M	1,832	1,000

FY 2005 - Completed improvements to the Look-Ahead Detection Sensors (LADS) and an Engineering Development Model (EDM) of the shock mitigating seat. Fabricated, tested and delivered to SOCOM. (An EDM differs from an advanced development model (ADM) in that it is more robust and can be considered the prototype of a model that can be manufactured in large quantities.) The EDM operates as a semi-active system---not a totally active system.

FY 2006 - This effort supports Project M.

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	FY 2005	FY 2006
PURE HYDROGEN SUPPLY FROM LOGISTICS FUEL	0	2,500

This effort supports pure hydrogen supply from logistics fuel research.

	FY 2005	FY 2006
REDUCED SHIP CREW BY VIRTUAL PRESENCE	0	1,000

This effort supports reduced ship crew by virtual presence research.

	FY 2005	FY 2006
REMOTE ENERGETIC MATERIAL MANUFACTURING FOR PYROTECHNIC INFRARED DECOYS	0	1,300

This effort supports research of remote energetic material manufacturing for pyrotechnic infared decoys.

	FY 2005	FY 2006
SHIP SERVICE FUEL CELL	0	3,000

This effort supports ship service fuel cell research.

	FY 2005	FY 2006
SMART SENSOR WEB ADVANCED TECHNOLOGY	1,737	0

Initiated efforts to develop and demonstrate an all digital interferometric signal detection and direction finder system.

	FY 2005	FY 2006
STRATEGIC MOBILITY 21 DEPLOYMENT TECHNOLOGY	4,149	2,600

FY 2005 - Funded a number of projects that dealt with the application of transportation technologies to

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complementary Navy and civilian uses. Agile port efforts took the basic logistic cost estimates and arrangements derived from the FY 2004 effort and examined an alternative magnetic levitation technology to break the log jam between the port and an inland distribution center, or for military use between the depot and the port of embarkation. The fluid dynamic optimization synthesis design models were selectively applied to a number of dual use multi-hull vessel candidate designs. Completed the concept design development of a very high power axial water jet design, tested at model scale in FY 2004. Further technical development efforts on the large trimaran involved computational evaluations of the critical areas of hull form optimization, selected propulsion arrangements, and structural design issues involving regulatory approval.

FY 2006 - This effort supports strategic mobility 21 deployment technology research.

	FY 2005	FY 2006
SUPERCONDUCTING DC HOMOPOLAR MOTOR FOR ELECTRIC DRIVE SHIPS	3,574	1,200

FY 2005 - Continued brush technologies that will allow the full scale motor to meet fleet application requirements. Continued design of the 36.5MW motor and power system.

FY 2006 - This effort supports the superconducting DC homopolar motor for electric drive ships research.

	FY 2005	FY 2006
TADIRCM ANTIMISSILE TECHNOLOGY	6,559	0

Initiated development of advanced component technologies for the Tactical Aircraft Directed Infrared Countermeasures (TADIRCM) Early Operational Analysis (EOA) pod effort. These include: (a) high power, multi-band mid-wave infrared (MWIR) lasers with improved beam quality, beam stability, efficiency and output power that can operate at the elevated temperatures and high-G/high vibration environment of a tactical jet pod installation; (b) MWIR transmitting fiber optics to improve coupling of the multi-band laser to the jam head beam director; (c) low profile, light weight, shared-axis fine trackers and beam directors with reduced pointing jitter and advanced auto-bore-sight capability that are suitable for high-G/high vibration operation; and (d) advanced missile warning receivers with low-cost fully athermalized and achromatic optics and advanced processing algorithms for rapidly geo-locating surface-to-air missile launch sites.

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	FY 2005	FY 2006
TECHNOLOGIES FOR FUTURE NAVAL CAPABILITIES	1,254	0

Continued to develop realistic features to the test-bed model of the unmanned surface vehicle to be employed in the development of control and monitoring algorithm. Continued establishing techniques to evaluate the performance and the viability of the models, simulations and signal processing.

	FY 2005	FY 2006
UNIVERSAL SOLID STATE BREAKER	0	1,000

This effort supports universal solid state breaker research.

	FY 2005	FY 2006
UNMANNED FORCE AUGMENTATION SYSTEM	974	3,000

FY 2005 - Initiated efforts to conduct research, development and testing of advanced unmanned aerial vehicle (UAV) technologies, including the design and integration of an avionics suite and flight demonstration of the system. If successful, this effort will provide the Navy with a much-improved shipboard landing capability for fixed wing unmanned aircraft.

FY 2006 - This effort supports unmanned force augmentation system research.

	FY 2005	FY 2006
UNMANNED SYSTEMS TECHNOLOGIES FOR EXPLOSIVE ORDNANCE DISPOSAL	4,158	1,300

FY 2005 - Initiated development of S&T tools and capabilities necessary for the military and law enforcement Explosive Ordnance Disposal (EOD) technicians to meet the various EOD, Improvised Explosive Device (IED), and Unexploded Ordnance (UXO) challenges and reduce the risk to the personnel by developing unmanned systems to perform these dangerous and critical missions.

FY 2006 - This effort supports unnmanned systems technologies for explosive ordnance disposal research.

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	FY 2005	FY 2006
VARICRAFT	6,079	0

Produced a contract design for the vessel, procured items relating to the propulsion plant, produced the integrated propulsion plant and the completed detail construction design.

	FY 2005	FY 2006
WAVE POWER DEMONSTRATION PROJECT	3,286	0

Explored more efficient methods of converting wave energy to electrical energy and developed an improved mooring system.

	FY 2005	FY 2006
WAVE POWERED ELECTRIC POWER GENERATING SYSTEM FOR NAVAL BASE	0	1,500

This effort supports wave powered electric power generating system for naval base research.

	FY 2005	FY 2006
WIDE BANDGAP SEMICONDUCTOR SUBSTRATE MATERIALS	4,341	5,600

FY 2005 - Initiated development of semiconductor materials capable of higher power levels and greater temperature ranges than currently employed silicon-based materials.

FY 2006 - This effort supports wide bandgap semiconductor substrate materials research.

	FY 2005	FY 2006
WIRELESS CONDITION-BASED MAINTENANCE MONITORING FOR SHIPYARD EQUIPMENT AND FACILITIES	0	3,200

This effort supports wireless condition-based maintenance monitoring for shipyard equipment and facilities research.

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	FY 2005	FY 2006
WIRELESS SENSOR SYSTEM	0	1,400

This effort supports wireless sensor system research.

	FY 2005	FY 2006
X – CRAFT	10,282	10,500

FY 2005 - Completed construction of LSC(X) (aka “X-Craft”) and delivered to fleet in June 2005. Installed active rudder system to provide steering redundancy and increase directional stability. Installed various “fleet ready” upgrades to allow use of vessel in fleet exercises in support of LCS risk reduction. Upgrades included damage control systems, C4I and shock-mitigating seats. Operated vessel in support of LCS risk reduction.

FY 2006 - This effort supports X-craft research.

	FY 2005	FY 2006
ZEUS LIGHT STRIKE VEHICLE HYBRID ELECTRIC PILOT	0	1,000

This effort supports reasearch of the Zeus light strike vehicle hybrid electric pilot.