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

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N
PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH

COST: (Dollars in Thousands)

Project Number & Title	FY 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
FORCE PROTECTION APPLIED RESEARCH	154,217	194,477	131,310	103,940	120,510	135,150	146,206

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

This PE addresses applied research associated with providing the capability of Platform and Force Protection for the U.S. Navy. It supports the development of technologies associated with all naval platforms (surface, subsurface, terrestrial, and air) and the protection of those platforms. The goal 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. Within the Naval Transformational Roadmap, this investment directly supports the Theater Air and Missile Defense transformational capability required by Sea Shield and the Ship to Objective Maneuver key transformational capability. This is accomplished by improvements in platform offensive performance, stealth, and self defense. This PE supports the Future Naval Capabilities (FNC) Program in the areas of Sea Shield, Sea Strike, Cross Pillar Enablers and Enterprise and Platform Enablers (EPE).

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

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N
PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH

B. PROGRAM CHANGE SUMMARY:

	FY 2007	FY 2008	FY 2009
FY 2008/FY 2009 President's Budget Submission	160,168	155,936	133,846
Congressional Action	0	41,300	0
Congressional Undistributed Reductions/Rescissions	0	-1,254	0
Execution Adjustments	-3,014	0	0
Program Adjustments	0	0	-2,176
Rate Adjustments	0	0	-360
SBIR Assessment	-2,937	-1,505	0
FY 2009 President's Budget Submission	154,217	194,477	131,310

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:
This PE supports the development of technologies associated with all naval platforms (surface, subsurface, terrestrial and air) and the protection of those platforms. Each PE Activity has unique goals and metrics, some of which include classified quantitative measurements. Overall metric goals are focused on achieving sufficient improvement in component or system capability such that the 6.2 applied research projects meet the need of or produce a demand for inclusion in advanced technology that may lead to incorporation into acquisition programs or industry products available to acquisition programs.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N
PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH

Specific examples of metrics under this PE include:
- Reduce the weight of current structural protection systems by 30% maintaining current energy absorption capabilities by FY 2007.
- Provide improvements in electrical component and device technology as to allow a 50% reduction in motor propulsion and motor controllers weight and volume by FY 2009.
- Increase the hydrodynamic efficiency of current hull designs by 5% by FY 2010.
- Reduce electromagnetic vulnerability of ship hulls by 50% by FY 2011.
- Torpedo defense thresholds will be validated by modeling and simulation to satisfy the overall system performance specification of a Probability of Survival (PS) of the US Navy platform as specified in the draft Capabilities Development Document (CDD) for Surface Ship Torpedo Defense.
- Additional metrics are included within the Missile Defense Activity description.

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

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

COST: (Dollars in Thousands)

Project Number & Title	FY 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
FORCE PROTECTION APPLIED RESEARCH	154,217	194,477	131,310	103,940	120,510	135,150	146,206

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. It supports the development of technologies associated with all naval platforms (surface, subsurface, terrestrial, and air) and the protection of those platforms. The goal 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. Within the Naval Transformational Roadmap, this investment directly supports the Theater Air and Missile Defense transformational capability required by Sea Shield and the Ship to Objective Maneuver key transformational capability by virtue of improvements in platform offensive performance, stealth, and self defense. This effort supports the FNC in the areas of Sea Shield, Cross Pillar Enablers, and Enterprise and Platform Enablers (EPE).

The funding profile reflects the FY 2007 reorganization of FNC Program investments into Enabling Capabilities (ECs). As a result of this reorganization, funding for each EC has been aligned to a Budget Activity 2 and Budget Activity 3 PE as appropriate. This project reflects the alignment of investments for the following ECs: Fortified Position Security, Over-the-Horizon Missile Defense, Anti-Ship Missile Defense Technologies, 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, Advanced Threat Aircraft Countermeasures, Helicopter Low-Level Operation, Four Torpedo Salvo Defense, Shipboard Force Protection in Port and Restricted Waters - Detection and Classification, Underwater Total Ship Survivability, Compact Power Conversion Technologies, Affordable Submarine Propulsion and Control Actuation, and Advanced Electronic Sensor Systems for Missile Defense.

FY 2008 reflects the initiation of the Large Vessel Stopping Program in response to the Chief of Naval Operations' Navy Strategic Plan which specified that the Navy must combat Weapons of Mass Destruction (WMD) at sea and ashore. FY 2009 reflects the transfer of power conversion technologies for multi-function motor drives, bi-directional power conversion modules, and power management controllers from PE 0602236N/Cost

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

Reduction Technologies.

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 2007	FY 2008	FY 2009
STOPPAGE OF LARGE SURFACE VESSELS AT SEA	0	7,147	7,859

The Chief of Naval Operations (CNO) in the Navy Strategic Plan (NSP) has specified that the Navy must combat Weapons of Mass Destruction (WMD) at sea and ashore. To support this requirement, the Navy must be able to temporarily stop ships that are suspected of carrying WMDs or their component materials. This activity addresses the development of key technologies that will enable the Navy to use non-lethal methods for temporarily stopping and delaying non-cooperative large, greater than 20 meters or 300 gross tons, vessels at sea that will not comply with voice commands or warning devices. The technologies will be deployable by ship or aircraft and should be capable of disabling the vessel at safe distances from high-valued assets and infrastructures.

Funding increase from FY 2008 to FY 2009 is due to the natural growth of the program as technology development efforts increase.

FY 2008 Plans:

- Initiate evaluation of potential propeller entanglement device materials.
- Initiate propulsion drive-train damage predictions.
- Initiate assessment of delivery options for a large linear propeller entanglement device
- Initiate a component level proof of concept demonstration for externally inhibiting seawater cooling flow to ship propulsion equipment.
- Initiate the identification and assessment of potential commercial maritime vessel electronic vulnerabilities within representative propulsion and maneuvering control systems.
- Initiate a scaled component level proof of concept demonstration for a large vessel momentum reduction concept and determine the feasibility of seaborne or airborne delivery of a prototype system.

FY 2009 Plans:

- Continue all efforts of FY 2008.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

	FY 2007	FY 2008	FY 2009
SURFACE SHIP & SUBMARINE HULL MECHANIC & ELECTRICAL (HM&E)	55,282	84,681	82,120

Efforts include: signature reduction, hull life assurance, hydromechanics, distributed control for automated survivability (includes damage control), and advanced electrical power systems. Signature reduction addresses electromagnetic, infrared, and acoustic signature tailoring, both topside and underwater. 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. Hydromechanics addresses hydrodynamic technologies, including the signature aspects of the hull-propulsor interface and maneuvering. Distributed intelligence for automated survivability addresses both the basic technology of automating damage control systems, as well as, distributed control of systems utilizing self-healing capability. Advanced electrical power systems efforts address electrical and auxiliary system and component technology to provide improvement in energy and power density, operating efficiency and recoverability from casualties. Advanced Naval Power efforts include: Compact Power Conversion Technologies that reduce the cost of high power conversion equipment required to enable more-electric and all-electric ships. This activity also supports Global War on Terror (GWOT) Counter IED – Extramural activity which supports applied research for force protection of Naval platforms. Technologies are being developed that focus on prediction, prevention, detection, neutralization, and mitigation of improvised explosive devices in the maritime/littoral environment.

Energy and Power technology efforts caused a major funding increase from FY 2007 to FY 2008. In addition, planned growth for Payload Implosion and Platform Damage Avoidance (FNC Project) and the Solid Oxide Fuel Cell efforts contributed to the FY 2008 increase. The decrease in funding from FY 2008 to FY 2009 is due to the completion of studies and demonstrations, particularly in the area of Energy and Power.

FY 2007 Accomplishments:

Survivable Platforms - Reduced Signatures
- Continued advanced numerical acoustic codes (and gridding methods for those codes) for submarines.
- Continued mmWave Signatures measurement to identify key signature characteristics.
- Continued Alternating Current (AC) propagation experiments.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

- Continued the next generation Infrared Electro-Optic Visual (IR/EO/VIS) model for surface ships by development of mitigation strategy supporting low observable infrared platforms, development of supporting physics, and prototype measurement techniques.
- Continued development of quiet control surface design tool based on control surface flow noise studies.
- Continued modeling of electric warship components and system electromagnetic signatures.
- Continued hull machinery noise measurements.
- Continued IR and radar detectability prediction capability.
- Continued investigation of distributed pump-jet propulsion (DPJP) acoustic performance.
- Continued surface ship super-conductive degaussing with laboratory demonstration loop for Electromagnetic (EM) field accuracy measurements and control methods.
- Continued testing on Advanced Electric Ship Demonstrator (AESD) to assess energy propagation and acoustic radiation mechanisms and to develop mitigation concepts for surface ships.
- Continued IR assessment of two advanced treatments.
- Continued first of a series of IR validation experiments and critical sensitivity analysis.
- Continued Improved Corrosion Related Magnetic (CRM) Field Prediction Model to design compensation systems to reduce ship’s CRM signature
- Completed development of surface ship acoustic flow noise model (joint effort with Dutch Navy).
- Completed flow noise evaluations of surface ships with the Advanced Electric Ship Demonstrator (AESD).
- Completed and delivered ship IR scene model.
- Completed and delivered assessment and predictive capability for another source of Radio Frequency (RF) and IR signatures.
- Completed AC field propagation modeling part of electric warship components and system electromagnetic signatures effort by delivering EM field propagation models.
- Completed surface ship superconductive degaussing system laboratory evaluations of single and multiple loop systems, operating parameters, mutual interference, control stability, and a second generation High-Temperature Superconductor (HTS) wire studies.
- Initiated assessment of ship bistatic Radar Cross Section (RCS).
- Initiated large-scale tests on AESD to develop signature prediction and design tools for surface ship incorporating a variety of propulsion technologies including external podded propulsion.
- Initiated experimental effort to characterize electric drive motor signature mechanisms and verify modeling and simulation approaches for signature prediction.

Survivable Platforms - Hull Life Assurance
- Continued development of global surface wave measurement capability for ship models.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

- Continued Dynamic Behavior of Composite Ship Structures (DYCOSS) (joint effort with Dutch Navy).
- Continued development of structural analysis codes describing failure mechanism of sandwich composites.
- Continued Explosion Resistant Coatings (ERC) effort, providing US input to trilateral agreement with UK and Australia.
- Continued Joint US/Japan Advanced Hull Materials & Structures Technology (AHM&ST) addressing hybrid hull concept and hybrid (steel/composite) joints in ship construction.
- Continued composite and composite-metal hull performance characterization and testing including structural loading, thermal stress and signatures.
- Initiated effort on an advanced class of polymers as a follow-on to current ERC for application against advanced threats (GWOT).

Survivable Platforms - Distributed Intelligence for Automated Survivability
- Continued development of modeling and simulation methods for robust design and virtual testing of integration of shipboard auxiliary systems including their control systems.
- Continued research into advanced HM&E system reconfiguration approaches, including agent-based control systems and algorithms, and model-based reasoning.
- Completed land-based test site (Purdue University and Naval Surface Warfare Center, Carderock Div.) that will evaluate Integrated Engineering Plant (IEP) conceptual architectures to provide improved survivability of auxiliary systems that support combat systems.

Advanced Platforms - Advanced Platform Concepts and Designs
- Continued validation of asymmetric hull forms with experimental data.
- Continued development of analytical models to further define submarine modular hull concepts.
- Continued development of reliability based design and structural analysis code development.
- Continued development design tools for integrated antenna and composite topside.
- Continued circulation control analysis for three-dimensional flow effects.
- Continued development of test vessel and technology to evaluate performance and signature associated with electrically driven waterjets (AWJ-21) and Rim-drive motor.
- Continued aperstructures microwave communication system.
- Continued concept for Ultra High Frequency (UHF)/Very High Frequency (VHF) aperstructures opportunistic array (Advanced Hull-form Inshore Demonstrator - AHFID).
- Completed and delivered navigation radar aperstructures.

Advanced Platforms - Hydromechanics

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

- Continued experimental database/computational tools development for extreme submarine maneuvers (e.g., crashback).
- Continued the validation of circulation control and advanced control surfaces with experiments.
- Continued to investigate improved maneuvering simulation capability for submarines.
- Continued validation of Reynolds Average Navier-Stokes (RANS) code for advanced waterjet propulsor performance predictions.
- Continued development of two-phase flow waterjet concept, Detached Eddy Simulation (DES) method for crashback prediction and numerical prediction method(s) of waterjet cavitation.
- Continued modeling of turbulent flow interaction with propeller Leading Edge (LE) and Trailing Edge (TE) and modeling and simulation of rough-wall boundary layer noise.
- Continued prediction and validation of constrained and unconstrained capsize motions using advanced codes.
- Completed validation of computational tools for ducted propulsor design/analysis.
- Completed experiments of submarine crashback.
- Completed prediction of constrained (heave and roll) capsize motions using advanced codes.
- Initiated development of podded propulsor design/analysis tools.

Advanced Naval Power Systems - Advanced Electrical Power Systems
- Continued demonstration of dynamic stability of an advanced intelligent, reconfigurable, solid-state-based, zonal-electrical power system that reconfigures within 10 milliseconds.
- Continued designing software for the system manager for the Universal Control Architecture (UCA).
- Continued development of thermal management technology for shipboard power distribution.
- Continued investigation of potential applications of silicon-carbide in future high voltage and high power applications.
- Continued improvements in electrical component and device technology allowing a reduction in motor propulsion and motor controllers weight and volume.
- Continued development of technologies to support dynamic reconfiguration of shipboard systems under conditions of stressing scenarios and/or system degradation.
- Continued multi-year program to directly convert thermal energy to electricity. Such a capability would allow elimination of the steam cycle on an electric warship.
- Continued development of pulsed power technologies, to include pulsed alternators and capacitors.
- Continued research into high power controller and generator applications by using mixed winding, high-phase-order induction machines actuated with multi-phase and multi-level inverters and rectifiers.
- Continued studies of alternative cooling systems for future shipboard radar systems.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

• Continued studies of system design impact on the thermal performance and reliability of two-phase pumped cooling loops.
• Continued development of structural macroscopic 3-dimensional battery.
• Continued control surface actuator project focused on the technologies needed to define the design space for control surface actuators supporting submarines.
• Initiated development of automated HVAC system architectures for future Naval platforms.

Advanced Naval Power Systems - Novel Power and Energy Transfer Systems
• Continued ship service fuel cell development.

Naval Research Laboratory (NRL)
• Continued Biofilms on Scaffolds and Characterize Spatial Distribution and Chemistries. (NRL)
• Continued development of Bacterial Mixture to Optimize Charge Generating Capacity. (NRL)
• Continued High Surface Area Conducting Electrodes for use as Biofilm Scaffolds. (NRL)
• Continued technology development for alternate approaches to high voltage fast turn off switches. (NRL)
• Continued technology development for wafer bonded high voltage power switches. (NRL)
• Continued efforts to synthesize new metal sulfides as catalysts for fuel cells and evaluate their electrochemical performance. (NRL)
• Completed fuel cell evaluation of carbide based catalysts as sulfur tolerant polymer fuel cell anodes (NRL).
• Completed scale-down (10x smaller) and testing of a biofilm-enhanced micro-microbial fuel cell (NRL)
• Initiated development of heterojunction power switching devices. (NRL)

FY 2008 Plans:

Survivable Platforms - Reduced Signatures
• Continue all efforts of FY 2007, less those noted as completed above.
• Complete hull machinery noise measurements.
• Complete development of test vessel and technology to evaluate performance and signature associated with electrically driven waterjets (AWJ-21) and Rim-drive motor (RIMJET).
• Complete modeling of electric warship components and system electromagnetic signatures with electric motor source control through motor configuration, off ship EM field control through compensation and investigation of other sources of EM fields.
• Initiate development of modeling methods and noise control concepts for modular/reconfigurable submarine

architectures.
- Initiate investigation into hull treatment concepts for acoustic signature/vibration control for surface ships.
- Initiate development of advanced RF metamaterials for platform signature control.
- Initiate development of LPI technologies for surface ship emissions including communication, navigation, electronic warfare, and combat systems.

Survivable Platforms - Hull Life Assurance
- Continue all efforts of FY 2007.
- Initiate Payload Implosion and Platform Damage Avoidance efforts.

Survivable Platforms - Distributed Intelligence for Automated Survivability
- Continue all efforts of FY 2007, less those noted as completed above.

Advanced Platforms - Advanced Platform Concepts and Designs
- Continue all efforts of FY 2007, less those noted as completed above.

Advanced Platforms - Hydromechanics
- Continue all efforts of FY 2007, less those noted as completed above.
- Complete prediction and validation of unconstrained capsize using advanced codes.
- Initiate prediction and validation of damaged stability and capsize.
- Initiate non-body-of-revolution tool development for advanced submarine configurations.

Advanced Naval Power Systems - Advanced Electrical Power Systems
- Continue all efforts of FY 2007.
- Complete studies of the thermal performance and reliability of two-phase pumped cooling loops.
- Complete research into high power controller and generator applications by using mixed winding, high-phase-order induction machines actuated with multi-phase and multi-level inverters and rectifiers.
- Initiate development of shipboard waste heat driven chiller systems.

Advanced Naval Power Systems - Novel Power and Energy Transfer Systems
- Continue all efforts of FY 2007.
- Continue ship service fuel cell development.
- Initiate program to develop and demonstrate 3 - 50 kW class solid oxide fuel cell onboard mobile power

generation capabilities having compatibility with future logistics fuels to enable rapid recharge of batteries and direct power for C4ISR equipment.

Naval Research Laboratory (NRL)
- Continue all efforts of FY 2007, less those noted as completed above.

FY 2009 Plans:

Survivable Platforms - Reduced Signatures
- Continue all efforts of FY 2008, less those noted as completed above.
- Complete testing on AESD to assess energy propagation and acoustic radiation mechanisms and to develop hull treatment concepts for surface ships.
- Complete experimental effort to characterize electric drive motor signature mechanisms and verify modeling and simulation approaches for signature prediction.
- Complete CRM Field Prediction Model with final validation by measurement of full scale ship to verify CRM Field Prediction against actual Impressed Current Cathodic Protection (ICCP) system layout for measured ship and magnetic/electric fields measured at Navy Magnetic Silencing Range Facility.
- Initiate development of signature modeling approaches for electric actuation and alternate electric drive system architectures.
- Initiate development of Low probability Intercept (LPI) technologies for surface ship emissions including communication, navigation, electronic warfare, and combat systems.

Survivable Platforms - Hull Life Assurance
- Continue all efforts of FY 2008.

Survivable Platforms - Distributed Intelligence for Automated Survivability
- Continue all efforts of FY 2008.
- Initiate Second Generation distributed systems model development.
- Initiate demonstration of real-time modeling of multiple distributed systems – utilizing small scale demonstrator.
- Initiate demonstration of Genetic Algorithm(s) for determining optimal distributed system control strategy.
- Initiate development of a hardware in-the-loop small scale demonstrator for fluid/thermal/electrical distributed systems.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

- Initiate development of Survivability Analysis Algorithms Operable on a Total Ship Modeling Environment.

Advanced Platforms - Advanced Platform Concepts and Designs
- Continue all efforts of FY 2008.

Advanced Platforms - Hydromechanics
- Continue all efforts of FY 2008, less those noted as completed above.
- Complete development of two-phase flow waterjet concept.
- Complete prediction and validation of unconstrained capsize using advanced codes.

Advanced Naval Power Systems - Advanced Electrical Power Systems
- Continue all efforts of FY 2008, less those noted as completed above.
- Complete demonstrations of improvements in electrical component and device enabling technology allowing a reduction in motor propulsion and motor controllers weight and volume.
- Complete demonstration of Ship and Submarine Electric Actuator basic technology.
- Complete studies of alternative cooling systems for future shipboard radar systems.

Advanced Naval Power Systems - Novel Power and Energy Transfer Systems
- Continue all efforts of FY 2008.
- Continue analytical model and reduced scale component development of power conversion technologies for multi-function motor drives, bi-directional power conversion modules, and power management controllers focusing on closing technology gaps associated with Alternative Integrated Power System (IPS) Architectures. (Transitioned from PE 0602236N/Cost Reduction Technologies)
- Initiate research into the development of fuel chemistries, materials, and energy conversion technologies for optimal performance in Naval power systems.

Naval Research Laboratory (NRL)
- Continue all efforts of FY 2008.
- Complete development of heterojunction power switching devices. (NRL)

	FY 2007	FY 2008	FY 2009
ADVANCED ENERGETICS	11,563	18,087	2,238

Advanced Energetics efforts address technology development to provide substantial improvements in energetic

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

material systems and subsystems, primarily in terms of performance, but also addressing safety, reliability, and affordability concerns. Goals include: advanced energetic materials for warheads, propellants, and reactive material based subsystems for both defensive and offensive applications. Efforts include: development of new fuels, oxidizers, explosive ingredients and formulations; and reliable simulation tools and diagnostics to develop and design superior-performance, and/or reduced-vulnerability systems tailored to specific warfighter missions.

Increased funding in FY 2008 supports maturation and transition of promising technologies in the areas of enhanced performance formulations, insensitive explosives, detonation merging techniques, and reactive materials that have been developed under the Advanced Energetics focused efforts. These technologies will be integrated and transitioned into propellant and warhead concepts within S&T munitions programs in PEs 0602114N, 0603114N, 0602747N, and 0602000D8Z. Decreased funding in FY 2009 is due to the conclusion and transition of these focused Advanced Energetics efforts. Remaining funding will be used to complete transition efforts and to develop next generation concepts as described below.

FY 2007 Accomplishments:

- Continued Advanced Energetics research in technology development for the next generation reactive material warhead concepts (formulations, material properties, target interaction, lethality models, and experiments) for highly reactive materials, high density reactive materials and novel reactive structural materials.
- Continued Advanced Energetics research in development and evaluation of advanced explosive/propellant/reactive ingredients and formulations for next generation higher performing systems.
- Continued Advanced Energetics research in development of advanced directed hydro-reactive material warhead concepts to enhance performance of undersea warheads.
- Continued proof of concept efforts to develop insensitive explosives, propellants, and munitions without compromising performance. This work involves development of high quality, small particle energetic ingredients, novel processing techniques, and advanced energy conversion concepts; and involves both theoretical and experimental efforts.
- Continued Advanced Energetics research in advanced multiphase blast concepts employing dense metalized explosives to enhance performance of air and underwater blast warheads.
- Continued Advanced Energetics research in development and diagnostics of novel energy conversion concepts to enhance performance, more efficiently exploit available energy, and more effectively couple energy to target for air, surface, and underwater warhead application.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

FY 2008 Plans:

- Continue all efforts of FY 2007.

FY 2009 Plans:

- Continue research in technology development for the next generation reactive material warhead concepts (formulations, material properties, and energy release experiments) for highly reactive materials, high density reactive materials and novel reactive structural materials. Transition application specific target interaction, lethality modeling and ordnance specific experiments and demonstrations to Electro-magnetic Rail Gun, PE 0603114N.
- Continue development of novel energy conversion concepts to enhance performance, more efficiently exploit available energy, and more effectively couple energy to target. Limit efforts to analytical and laboratory scale proof of concept experimental efforts.
- Continue development and evaluation of energetic ingredients and formulations for next generation higher performance applications. Conclude scale-up development and testing. Transition to Integrated High Payoff Rocket Propellant Program, PE 0602114N.
- Complete proof of concept efforts to develop insensitive explosives, propellants, and munitions without compromising performance. Transition to Future Naval Capabilities Program.
- Complete development of and transition directed hydro-reactive material warhead concepts to Undersea Warheads Program, PE 0602747N.
- Complete research in advanced multiphase blast concepts employing dense metalized explosives to enhance performance of air and underwater blast warheads.

	FY 2007	FY 2008	FY 2009
FLEET FORCE PROTECTION AND DEFENSE AGAINST UNDERSEA THREATS	13,888	12,963	11,937

Fleet Force Protection and Defense against Undersea Threats efforts 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 and to develop the capability to interdict underwater asymmetric threats to ships and infrastructure in harbors. Current small platforms (both surface and airborne) have little to no situational awareness (SA) or self-protection against air, surface,

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

and asymmetric threats. (Asymmetric threat efforts are co-funded by PE 0602131M.) A goal of this activity is to provide these platforms with effective self-protection. The technology areas specific to platform protection will develop individual, multispectral (EO, IR, RF, EM, visual, and acoustic), or chemical sensors/biosensors and associated processing. To defend platforms from current and advanced threats in at-sea littoral environments and in port, these technologies must improve multispectral detection and distribution of specific threat information.

Another goal of this activity is to develop a torpedo defense capability to fill Sea Shield Warfighting Capability Gap/Enabling Capability: Platform Defense against Undersea Threats, including Four Torpedo Salvo Defense. This provides a capability to prevent any of the torpedoes, in up to four-torpedo salvos fired at high value units, from hitting those units. Specific technology includes two efforts. The first is Next Generation Countermeasure (NGCM), a mobile adaptive acoustic countermeasure with acoustic communication links among countermeasures. The second is Anti-Torpedo Torpedo (ATT)/Tripwire Demonstration, of an ATT to engage the detected threat torpedoes.

This activity supports the Fleet and Force Protection FNC and includes support to Sea Shield and Sea Strike Pillars and FNC Enabling Capabilities for: Aircraft Integrated Self-protection Suite; Fortified Position Security; Advanced Electronic Sensor Systems for Missile Defense; and Shipboard Force Protection in Port and Restricted Waters - Detection and Classification. Budget Activity 2 sensor efforts are co-funded by PEs 0602235N and 0602271N.

FY 2007 Accomplishments:

Sensors & Associated Processing
- Continued the Shipboard EO/IR Closed Loop Self-Protection System effort by initial laboratory testing of the Mid-wave Infrared and Visible Laser System (MIRVLS) generating 15W in the 3-5um region.
- Continued the End User Terminal (EUT) effort by developing a prototype 2-way amplifier for the Secure Net (SECNET) 11 card that will increase by a factor of 9 the secure transmit/receive range between Dismounted-Data Automated Communications Terminals (D-DACT) in an urban environment.
- Continued development of compact sensor systems in support of responsive Intelligence, Surveillance, and Reconnaissance (ISR). (NRL)
- Continued efforts on Antibodies for biowarfare agents to be synthetically modified with enzymes and studied via surface plasmon resonance to gain a better understanding of the impact tagging these recognition sites have on molecular recognition (kinetics and selectivity) for sensor applications. (NRL)

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

- Continued efforts in biomimetic sonar systems for operation in air and aquatic environments based on bat echolocation neurophysiology and information processing algorithms.
- Continued design and fabrication of microfluidic nucleic acid extraction and enrichment methods and obtained funding for technology transfer. (NRL)
- Continued design and development of large (1.5m dia.) telescopes with associated adaptive optics for the Naval Prototype Optical Interferometer (NPOI). (NRL)
- Continued the design and development of integrated laser ground based, aircraft protection design to protect large aircraft from Infrared Surface to Air Missiles (SAMs) upon ingress and egress to an airport. (NRL)
- Continued development of solid projectile coilgun design, consumable casing material and improved railgun efficiency and developed method of reducing muzzle flash and surface wear of the rails. (NRL)
- Continued efforts in biomimetic signal processing: panoramic periscope for submarines and temporal pattern recognition for Systems for Security Breaching Noise Detection.
- Continued efforts in bioinspired quiet, efficient and maneuverable self-propelled line array using high-lift propulsors based on insect biomechanics.
- Continued the Integrated EO/IR Self-protection Suite for Rotary Wing Aircraft effort by performing a platform integration analysis and design review.
- Continued investigation of improved jam codes and closed-loop countermeasure techniques to integrate with the Shipboard Integrated Electro-Optic Defense Systems (SHIELDS) hardware for Shipboard EO/IR Closed Loop Self-protection.
- Continued the development of low-cost, lightweight radar absorbing material (RAM) based on metallized cellulose in the form of fibers, fabric and paper. (NRL)
- Continued design and testing of on-chip nucleic acid amplification and transfer technology. (NRL)
- Continued studies to develop catalytic activity profile of bioactive coatings against chemical agents. Designed and initiated fabrication of coatings to degrade both, chemical and biological agents. (NRL)
- Continued development of a portable detection system for defense against small arms fire and rocket propelled grenades (RPG) using Field Programmable Gate Arrays (FPGAs), infrared focal plane arrays (IRFPA), and filtering algorithms. (NRL)
- Continued advanced concept development to integrate object recognition and tracking algorithms, machine vision, multiple networked video streams into different classes of EO/IR sensors within the Intelligent Video Surveillance FNC product (transferred from PE 0602131M).
- Continued 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.)

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

- Completed first demonstration of high resolution imaging of faint sources using the combined adaptive optics and optical interferometry at NPOI. (NRL)
- Completed development of reagentless sensors for weapons of mass destruction/explosives, using engineered protein based components for detection of explosives (e.g., TNT, RDX) and other analytes in seawater.
- Completed synthesis and acquisition of all the components needed for the fabrication of durable multifunctional coatings. (NRL)
- Initiated integration of DNA and antibody array analysis and demonstrated capability for rapid screening and pathogen species confirmation. (NRL)
- Initiated design and fabrication of self-reporting coatings for system failure detection. (NRL)
- Transferred the Shipboard EO/IR Closed Loop Self-Protection effort to PE 0602271N.

Underwater Platform Self-Defense
- Continued advanced concept development of a scalable low frequency continuous wave acoustic weapon for use against underwater asymmetric threats (transferred from PE 0602131M).
- Completed ATT and NGCM efforts.

FY 2008 Plans:

Sensors & Associated Processing
- Continue all efforts of FY 2007, less those noted as completed above.
- Complete the Integrated EO/IR Self Protect Suite for Rotary Wing Aircraft by conducting a laboratory demonstration of the integrated Missile Warning Sensor (MWS) and multi-band fiber coupled laser jammer.
- Complete development of solid projectile coilgun design, consumable casing material and improved railgun efficiency and developed method of reducing muzzle flash and surface wear of the rails. (NRL)
- Complete the design and development of integrated laser ground based, aircraft protection design to protect large aircraft from Infrared SAMs upon ingress and egress to an airport. (NRL)
- Complete the Intelligent Video Surveillance project including integration of object recognition and tracking algorithms, machine vision, and multiple networked video streams into different classes of EO/IR sensors.
- Transfer biomimetic signal processing efforts, including panoramic periscope and temporal pattern recognition for security breaching noise detection to PE 0602236N.
- Transfer efforts in bioinspired quiet, and maneuverable self-propelled line array using high-lift propulsors based on insect biomechanics to PE 0602236N.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

- Transfer efforts in biomimetic sonar systems for operation in air and aquatic environments based on bat echolocation neurophysiology and information processing algorithms to PE 0602236N.
- Initiate new FNC EC Shipboard Force Protection in Port and Restricted Waters - Detection and Classification. This project will develop mission specific electro-optic/infrared sensors to detect, classify, and determine the intent of potential terrorist and special operations force threats to ships and craft inport and transiting restricted waters.

Underwater Platform Self-Defense
- Continue all efforts of FY 2007, less those noted as completed above.
- Complete the scalable low frequency continuous wave acoustic weapon for use against underwater asymmetric threats.
- Initiate development of low-cost, light weight swimmer detection and localization technologies.
- Initiate development of optimized microfluidic components suitable for explosive, chemical, and biological sensing applications, and initiate the development of models required to apply existing automated design tools to components with more complex physics and more general geometries. (NRL)

FY 2009 Plans:

Sensors & Associated Processing
- Continue all efforts of FY 2008, less those noted as completed above.
- Complete the development of low-cost, lightweight RAM based on metallized cellulose in the form of fibers, fabric and paper. (NRL)
- Initiate the Countermeasures for Advanced Imaging Infrared (IIR) Guided Missiles FNC effort by initiating IIR threat model development.
- Initiate the Countermeasures for Millimeter Wave Guided Missiles FNC effort by initiating requirements analysis.
- Initiate the Multifunction Capabilities for Missile Warning Sensors FNC effort by commencing data collection and analysis.

Underwater Platform Self-Defense
- Continue all efforts of FY 2008, less those noted as completed above.
- Continue development of low-cost, light weight swimmer detection and localization technologies.
- Initiate development of software encoded algorithms for the Anti-Torpedo Torpedo (ATT) sensor and controller that will enable ATT’s to successfully engage torpedo salvoes of up to four attacking units.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

	FY 2007	FY 2008	FY 2009
AIRCRAFT TECHNOLOGY	13,777	16,208	15,934

The Aircraft Technology activity develops high impact, scaleable naval air vehicle technologies, such as structures and flight controls for future and legacy air vehicles, integrated avionics, advanced electrical power systems, and aerodynamics, which significantly increase the naval warfighter's capabilities, effectiveness, readiness, and safety, while reducing life cycle cost. This activity directly supports the Naval Aviation Enterprise Science and Technology Strategic Plan, providing a robust and credible forward presence through flexible response and dominant power projection from the sea.

The funding increase from FY 2007 to FY 2008 is due to additional efforts in survivability/reduced observables technology (classified).

FY 2007 Accomplishments:

- Continued development of survivability/reduced observables technology (classified).
- Continued demonstration of system integration of a shaped memory alloy into a Reconfigurable Rotor Blade system for improved range and lifting capacity in a tilt rotor aircraft.
- Continued development of flight control, intelligent autonomy, command & control, and multi-vehicle cooperation technologies for UAV.
- Continued development of a Computational Fluid Dynamics (CFD) based integration system to maximize operational capability of autonomous aircraft by choosing optimal flight pattern for any environmental condition including low speed operations and brownout.
- Continued development effort to control flow and thermal dynamics in particle coating process and densification dynamics of large windows. (NRL)
- Completed design concepts and initiate technology development of an experimental vertical lift Unmanned Air vehicles (UAV).

FY 2008 Plans:

- Continue all efforts of FY 2007, less those noted as completed above.
- Continue vertical lift technology investments.
- Complete demonstration of system integration of a shaped memory alloy into a Reconfigurable Rotor Blade

system for improved range and lifting capacity in a tilt rotor aircraft.
- Complete development effort to control flow and thermal dynamics in particle coating process and densification dynamics of large windows. (NRL)

FY 2009 Plans:

- Continue all efforts of FY 2008, less those noted as completed above.
- Initiate research in fixed wing aircraft/vertical lift/rotorcraft technology areas such as aeromechanics, propulsion, active rotor control for enhanced ship board operations, structural concepts compatible with shipboard operations, autonomous operations in the shipboard and austere environment, and innovative vehicle concepts for naval application.

	FY 2007	FY 2008	FY 2009
MISSILE DEFENSE (MD)	4,847	14,353	11,222

This activity describes Missile Defense S&T projects of the Sea Shield FNC program, and non-FNC-related NRL research.
- Advanced Area Defense Interceptor (AADI) S&T planning effort for Navy - Marine Corps Air Directed Surface to Air Missile (ADSAM) live firing demonstration at White Sands Missile Range in FY 2008. To be completed in FY 2009 with funding in PE 0603123N, 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 automated battle management aids (ABMA), including common threat evaluation (CTE) and preferred shooter 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 shooter recommendations considering Theater Ballistic Missile Defense (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).
- 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.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

- Naval Interceptor Improvements (NII) technology upgrades for STANDARD Missile (SM) future fleet air defense missile. Metrics will be to achieve SM performance requirements in specified tactical rain environments and achieve SM performance requirements in all specified electronic countermeasures environments.
- Extended Distributed Weapons Coordination (EDWC) algorithms to extend DWC ABMA functionality to include coordination of passive defense measures (emission control, use of decoys, maneuvering). Metric will be improved probability of negation (Pneg) against advanced ballistic & cruise missile anti-ship threats that may be susceptible to decoys & jamming.
- Positive Control of Naval Weapons (PCNW) equipment and computer programs for an advanced multi-band weapon system / interceptor link to enable forward pass engagements and enhance link security in hostile environments. Metrics will be capabilities to receive in-flight update from TAMD systems including AEGIS combatants, airborne & land-based units, and ability to transmit status and target data to controlling unit and/or other interceptor missiles.
- Emerging technologies that support delivery of Technology Oversight Group (TOG)-approved FNC enabling capabilities (EC) structured to close operational capability gaps in missile defense.
- Non-FNC-related investigation of effects of charged particle layers on UHF to S-Band radars used to track space vehicles. (NRL)

The funding increase from FY 2007 to FY 2008 is for starting EDWC and PCNW projects as scheduled, as well as funding for culminating events in AADI ADSAM demonstration. The FY 2008-2009 decrease is due to diminished 6.2 activity in EDWC, PCNW, and NII and increased 6.3 activity funded for same projects in PE 0603123N.

FY 2007 Accomplishments:

- Continued program to investigate effects of charged particle layers on UHF to S-Band radars used to track space vehicles. (NRL)
- Performed additional AADI S&T planning and coordination for the FY 2008 Navy ADSAM live-fire demonstration taking place under PE 0603123N.
- Completed development and documentation of DWC and DSC algorithms.
- Initiated NII project.

FY 2008 Plans:

- Continue all efforts of FY 2007, less those noted as completed above.
- Initiate EDWC and PCNW efforts.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

FY 2009 Plans:

- Continue all FNC-related efforts of FY 2008.
- Complete non-FNC-related NRL program.

CONGRESSIONAL PLUS-UPS:

	FY 2007	FY 2008
ADPICAS	1,600	0

FY 2007 Accomplishments: Initiated development of intelligent composite active structures and systems to provide precision position control and vibration suppression for military and space structures to enhance their structural performance and reduce their fuel consumption. Applications include fighter jets, helicopters, smart rockets, satellites, and space stations. Phase IV effort in FY07 develops a laser long-distance satellite communication system. The laser long-distance satellite communication system will enhance the transit and receive capabilities.

	FY 2007	FY 2008
ADVANCED RECEIVE-WHILE-TRANSMIT SONAR FOR UUVS	2,192	0

FY 2007 Accomplishments: Initiated development of Advanced-Receive-While-Transmit Sonar for UUVs (Classified Effort).

	FY 2007	FY 2008
ADVANCED SIMULATION TOOLS FOR AIRCRAFT STRUCTURES MADE OF COMPOSITE MATERIALS	1,943	1,987

FY 2007 Accomplishments: Developed and tested object-based software analysis tools, for increased computational efficiency of the analytical code through the application of an advanced material strength criteria. The benefit of this tool is the support it lends toward the creation of an aircraft composite structural certification process.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

FY 2008 Plans: Continue the development and validation of tools and guidelines for the simulation of the structural and strength responses of airframe components made of fiber-reinforced composites, an area where the use of advanced computer-aided engineering technology is particularly important. This work will involve projects in which experimental validation of simulation models will be performed. An important aspect of the project is demonstration in an actual production setting the value of validated and verified simulation tools through the development of metrics in terms of improved quality and reduced life cycle costs. This project will demonstrate reduced life cycle costs of existing and new naval aircraft, reduce airframe concept to deployment time and increase the reliability of structural systems made of composite materials.

	FY 2007	FY 2008
ALTERNATIVE ENERGY RESEARCH	0	15,899

FY 2008 Plans: This effort supports Alternative Energy Research.

	FY 2007	FY 2008
APERSTRUCTURES	21,176	0

FY 2007 Accomplishments: Initiated efforts to demonstrate low observable integrated antenna technologies (aperstructures) using a series of structural (composite) and RF test articles. Addressed principal risk areas for future integrated ship-borne missile defense radars including structural integrity/shock, metrology and dynamic calibration, and deckhouse integration/signatures.

	FY 2007	FY 2008
BLAST RESISTANT ANECHOIC SPRAYABLE ELECTROMERIC COATING FOR SHIPS	1,000	0

FY 2007 Accomplishments: Developed blast resistant coating systems with improved mechanical and fire resistant properties, exceeding those that are currently commercially available. The new coatings can be applied to metal ship bulkheads and armored vehicles providing blast protection to the occupants. Previous efforts resulted in development of a coating systems with good blast resistant properties, but it included an intumescent coating to insulate the Polyurea from fire and thus can be applied to metal structures and provide blast protection.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

	FY 2007	FY 2008
CRITICAL COMPOSITE TECHNOLOGIES FOR ENABLING SPECIAL OPERATIONS FORCES (SOF) MEDIUM RANGE ENDURANCE CRAFT	4,981	994

FY 2007 Accomplishments: Completed construction and initiated operational evaluation of prototype composite craft to existing MK-V Patrol Boat.

FY 2008 Plans: Continue support to the Critical Composite Technologies for Enabling Special Operations Forces (SOF) Medium Range Endurance Craft program by advancing the technical approach for composite material design and hydrodynamic shock mitigation.

	FY 2007	FY 2008
DIRECT MOTOR DRIVEN WATERJETS	996	0

FY 2007 Accomplishments: Initiated technology development and demonstration of a direct electric motor driven waterjet propulsor for naval applications. This effort will develop a more efficient and power dense integrated rim-driven waterjet and mated power electronics that eliminates shafts and seals, decreases the system footprint and weight, and enhances propulsion system arrangement flexibility.

	FY 2007	FY 2008
FACIAL RECOGNITION TECHNOLOGY	996	0

FY 2007 Accomplishments: Continued development of technologies for facial (biometrics) recognition algorithms for heightened accuracy and speed for identification applications. Improved face recognition for outdoor non-cooperative subjects. Developed super-resolution for imagery from video. Developed new low-resolution matcher for long-range face imagery. Developed face forensics workstation.

	FY 2007	FY 2008
FORCE PROTECTION APPLIED RESEARCH	0	1,987

FY 2008 Plans: This effort supports Force Protection Applied Research.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

	FY 2007	FY 2008
HIGH FREQUENCY ACOUSTIC SIGNAL PROCESSOR SYSTEM	2,622	0

FY 2007 Accomplishments: Continued development of a real time, high frequency, acoustic signal processor to aid in Harbor Surveillance (Swimmer Detection), and Terrestrial Surveillance for Perimeter Security and Force Protection Applications both in CONUS and at forward deployed sites.

	FY 2007	FY 2008
HIGH TEMPERATURE SUPER CONDUCTING MAGNETIC ENERGY STORAGE	0	397

FY 2008 Plans: This effort supports development of a High Temperature Super Conducting Magnetic Energy Storage system.

	FY 2007	FY 2008
HIGH TOUGHNESS ALUMINUM STRUCTURES	0	1,193

FY 2008 Plans: This effort supports the High Toughness Aluminum Structures program.

	FY 2007	FY 2008
LARGE UNMANNED UNDERWATER VEHICLE TECHNOLOGIES	996	0

FY 2007 Accomplishments: Initiated development of technologies to allow the Navy to develop long range and high endurance large Unmanned Underwater Vehicles (UUVs) with short duration high speed capability to meet future operational surface and undersea requirements. Technologies developed by this effort include greater energy density storage and advanced propulsion and control systems that provide improved remote system operation and resource management.

	FY 2007	FY 2008
LITHIUM-ION CELL DEVELOPMENT	2,290	2,980

FY 2007 Accomplishments: Initiated development and evaluation of: (1) advanced slurry preparation methods;

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

(2) nano scale material electrodes; (3) metal based anode materials; (4) safer chemistry alternatives to the traditional cobalt oxide; and (5) applied research into the requirements and the approach for generating domestic supply of critical cell electrode materials.

FY 2008 Plans: Continue Lithium-Ion Cell program development.

	FY 2007	FY 2008
MAGNETIC REFRIGERATION TECHNOLOGY FOR NAVAL APPLICATIONS	1,644	3,180

FY 2007 Accomplishments: Continued development of advanced magnetocaloric materials and active magnetic regenerators towards demonstration of a high temperature span magnetic refrigerator. A breadboard system based on Navy requirements will be constructed. A repeatable hydriding process will be developed to obtain materials with large magnetic entropy change and controllable Curie temperatures.

FY 2008 Plans: Continue Naval Magnetic Refrigeration Technology program development.

	FY 2007	FY 2008
NANO-MAGNETIC MATERIALS FOR FUTURE MILITARY PROPULSION/ENERGY SYSTEMS	996	0

FY 2007 Accomplishments: Continued development of soft magnetic materials capable of meeting the demanding performance requirements of high power density electric machines and power electronics. This effort continues to focus on developing nanoengineered alloys that optimize the magnetic properties such as increased saturation magnetic flux levels and minimization of the magnetostrictive losses and electromagnetic noise levels, while retaining or improving the mechanical strength and temperature performance of the magnetic materials. A novel nanostructured magnetic alloy with significantly improved glass formability and an associated scale up pilot scale production process will be developed, with guidance from a system design study for 100kW core for a high frequency transformer. A prototype core component for a high frequency transformer will be fabricated and fully characterized.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

	FY 2007	FY 2008
NANOSTRUCTURED COMPOSITE MARINE COATINGS	1,993	0

FY 2007 Accomplishments: Initiated development of greatly improved coating systems designed to protect ships from marine environment, utilizing several recent technological breakthroughs. This effort focused on anticorrosion research at the University of New Hampshire's, Nanostructured Polymers Research Center which conducts applied research in the following areas including: New coatings to address corrosion; working with nanostructured composite marine coatings; and coatings with multiple microscopic additives that enhance their durability and performance, such as "Self-Healing Coating" in application of areas that are sensitive to stress. The purpose is to further refine the above technologies to develop novel coating additives for improved steel-coating adhesion, to develop coatings with sequential multistage curing for easier shipyard application and to enhance capabilities to improve micro and nano imaging characterization of steel-epoxy coatings to support and accelerate structured coating development.

	FY 2007	FY 2008
NAVAL AVIATION TECHNOLOGY EXPLORATION INITIATIVE	0	796

FY 2008 Plans: Initiate feasibility study to incorporate an early stage transformational technology development model into the Naval Aviation Enterprise (NAE) Science and Technology strategic plan. The strategic plan provides a roadmap for insertion of new technologies critical to meeting the current and future objectives of the Navy.

	FY 2007	FY 2008
OPTICAL RECOGNITION PROTOCOL FOR BIOLOGICS DETECTION	0	795

FY 2008 Plans: This effort supports the Optical Recognition Protocol for Biologics Detection program.

	FY 2007	FY 2008
PLANAR SOLID OXIDE FUEL CELL SYSTEM DEMONSTRATION AT UTC SIMCENTER	1,644	3,478

FY 2007 Accomplishments: Initiated design and test simulation capability necessary to conduct applied research on a solid oxide fuel cells capable of being used in national military applications.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

FY 2008 Plans: Continue Planar Solid Oxide Fuel Cell System Demonstrations at the University of Tennessee Chattanooga (UTC) SimCenter: National Center for Computational Engineering.

	FY 2007	FY 2008
PMRF FORCE PROTECTION LAB	3,109	1,987

FY 2007 Accomplishments: Continued force protection and security technologies by integrating, evaluating and demonstrating enabling technologies, tools, and processes. Approaches included integration of advanced sensor systems, novel sensor and data fusion processes, behavior modeling and analysis, and data mining and knowledge extraction techniques.

FY 2008 Plans: Continue PMRF Force Protection Lab development efforts.

	FY 2007	FY 2008
SHIPBOARD PRODUCTION OF SYNTHETIC LOGISTICS AND AVIATION FUEL	996	1,590

FY 2007 Accomplishments: Initiated the design, development and fabrication of the basic components for a synthetic shipboard logistic and aviation fuel generation capability.

FY 2008 Plans: Continue Shipboard Production of Synthetic Logistics and Aviation Fuel development efforts.

	FY 2007	FY 2008
SMALL WATERCRAFT PROPULSION DEMONSTRATOR	2,690	0

FY 2007 Accomplishments: Continued previous efforts to develop an advanced internal combustion engine to be used as part of a power-dense electric drive system for a small watercraft. Developed and tested a full-scale, laboratory tested prototype energy-dense power generation system.

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

	FY 2007	FY 2008
STABLIZED LASER DESIGNATION CAPABILITY	0	993

FY 2008 Plans (continuation of FY 2007 program in PE 0603123N): Continue development of system design requirements and target tracking algorithms for an enhanced, medium altitude laser designation capability for medium altitude aircraft operations that can address moving targets, as well as targets in a Global Positioning System (GPS)-jammed environment.

	FY 2007	FY 2008
UNDERSEA PERIMETER SECURITY INTEGRATED DEFENSE ENVIRONMENT	996	2,782

FY 2007 Accomplishments: Continued research on undersea perimeter security integrated defense environment. This is a networked pilot beta test site on the RI/CT waterfronts which incorporates surface and undersea sensor/visual technologies from partnering companies to create an automated underwater perimeter detection and response system for system users. The pilot project provides direct test bed information enhancing existing facility security procedures, 24x7.

FY 2008 Plans: Continue Undersea Perimeter Security Integrated Defense Environment development efforts.

C. OTHER PROGRAM FUNDING SUMMARY - NAVY RELATED RDT&E:
PE 0204152N E-2 Squadrons
PE 0205601N HARM Improvement
PE 0601153N Defense Research Sciences
PE 0602114N Power Projection Applied Research
PE 0602131M Marine Corps Landing Force Technology
PE 0602235N Common Picture Applied Research
PE 0602271N RF Systems Applied Research
PE 0602747N Undersea Warfare Applied Research
PE 0603114N Power Projection Advanced Technology
PE 0603123N Force Protection Advanced Technology
PE 0603235N Common Picture Advanced Technology
PE 0603271N RF Systems Advanced Technology

BUDGET ACTIVITY: 02
PROGRAM ELEMENT: 0602123N PROGRAM ELEMENT TITLE: FORCE PROTECTION APPLIED RESEARCH
PROJECT TITLE: FORCE PROTECTION APPLIED RESEARCH

PE 0603502N Surface and Shallow Water Mine Countermeasures
PE 0603513N Shipboard System Component Development
PE 0603553N Surface ASW
PE 0603561N Advanced Submarine System Development
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
PE 0604561N SSN-21 Developments

OTHER PROGRAM FUNDING SUMMARY - NON-NAVY RELATED RDT&E:
PE 0602270A Electronic Warfare Technology
PE 0602000D8Z Joint Munitions Technology
PE 0602204F Aerospace Sensors

D. ACQUISITION STRATEGY:
Not applicable.