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

BUDGET ACTIVITY: 2 PROGRAM ELEMENT: 0602123N
PROGRAM ELEMENT TITLE: Force Protection Applied Research

COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 2000 ACTUAL	FY 2001 ESTIMATE	FY 2002 ESTIMATE
Force Protection Applied Research	**	**	117,072

** The Science and Technology Program Element (PEs) were restructured in FY 2002. The work described in FY 2000 & 2001 was funded in PE(s) 0602111N, 0602121N, 0602122N, 0602232N, 0602233N, 0602234N, 0602270N, and 0602633N

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 e.g. electric warship technologies, including directed energy, subsurface, terrestrial and air) and the protection of those platforms. The goal of this project 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.

The technology areas specific to the platforms themselves are: signature control, structural systems, power and automation, and propulsion and dynamic control. Signature control addresses electromagnetic (EM), infrared (IR) and acoustic signature tailoring. Structure 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. The power and automation area addresses development and automation of propulsion, electrical and auxiliary systems for efficient operation and fight through capability. The propulsion and dynamic control area addresses hydrodynamic technologies, including the signature aspects of the hull-propulsor interface.

Although it also applies to platform protection, the technology area specific to force protection is the development of individual or multi-spectral (Electro-Optic (EO), IR, Radio Frequency (RF), EM, visual and acoustic) sensors and associated processing. To defend the force from current and advanced threats in an at-sea and littoral environment, sensor systems capable of over-the-horizon multi-spectral detection and distribution of specific “weapons laying” information throughout the Theater are required. Also required are optimization of sensor and shooter assignment based

upon threat priority and weapon systems capable of early engagement to provide a depth-of-fire to increase probability of kill against all targets threatening the force.

Aircraft Technology develops manned and unmanned airborne platform technologies for future joint warfighting capabilities to promptly engage regional forces in decisive combat on a global basis. These technologies enable employment of a range of capabilities more suitable to actions at the lower end of the full range of military operations, allowing achievement of military objectives with minimum casualties and collateral damage.

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

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

PROGRAMS PLANS AND ACCOMPLISHMENTS:

Ship & Submarine Hull, Mechanical, & Electrical (HM&E)	**FY00**	**FY01**	**FY02** **$56,064**
Initiate	• Quiet Electric Drive -Reduced scale control demo • Topside Structures & Signature Control - Integrated topside signature reduction • Electromagnetic Signature Control -Alternative Uses for Degaussing/Deamping	• Advanced Machinery Support System - ¼ scale machinery raft demo • Electromagnetic Signature Control - Active and passive degaussing/ deamping control techniques • Hull Structures	• Automated Damage Control - Advanced Damage Counter-measures • Acoustic Signature Control - Surface Ship Acoustic Control • Electromagnetic Signature Control - Advanced Degaussing/Deamping - Near Field Deamping • Enabling technologies for all

	• Hull Structures - Hull life assurance methodology • Weapons Effects - Shock/acoustic mount design methods - Improved magazine protection - Improved survivability to air and underwater threats • Maneuvering & Seakeeping - Low-signature turning and maneuvering predictions - Validation of advanced maneuvering prediction codes • Integrated Hull/Propulsor - Noise model for reduced complexity propulsors - Minimal cavitation propulsor designs - Magnetostrictive Actuators for Marine Propeller Pitch and Flow Control • Advanced Electrical Systems - Advanced energy management and control concepts - High Voltage Switch technology - High Voltage Passive Component technology	- Double-hull signature reduction technologies for electromagnetic signatures - Joining major components of Hybrid Composite Hulls - Hybrid Composite Hull response to explosive load - Reliability assessment for composite and hybrid composite hulls - Small scale acoustic testing of double hull • Integrated Hull/Propulsor - End-to-end hydrodynamic signature prediction capability - Assessment of non-rotating propulsion devices - Stern Flaps • Advanced Electrical Systems - Solid-state technology for high power distribution systems	Electric Platforms (DoD Initiative) • Advanced Electrical Systems -Electric Actuators and Auxiliary System Components
Continue	• Quiet Electric Drive • Advanced Machinery Support System	• Quiet Electric Drive • Advanced Machinery Support System	• Quiet Electric Drive • Advanced Machinery Support System

	• Automated Damage Control • Topside Structures & Signature Control • Acoustic Signature Control • Electromagnetic Signature Control • Hull Structures • Weapons Effects • Maneuvering & Seakeeping • Integrated Hull/Propulsor • Advanced Electrical Systems	• Automated Damage Control • Topside Structures & Signature Control • Acoustic Signature Control • Electromagnetic Signature Control • Hull Structures • Weapons Effects • Maneuvering & Seakeeping • Integrated Hull/Propulsor - Magnetostrictive Actuators for Marine Propeller Pitch and Flow Control • Advanced Electrical Systems	• Automated Damage Control • Topside Structures & Signature Control • Acoustic Signature Control • Electromagnetic Signature Control • Hull Structures • Weapons Effects • Maneuvering & Seakeeping • Integrated Hull/Propulsor - Stern Flaps - Magnetostrictive Actuators for Marine Propeller Pitch and Flow Control • Advanced Electrical Systems

Sensors & Associated Processing	**FY00**	**FY01**	**FY02** **$14,278**

Initiate	• Infrared (IR) Search and Track (IRST)/Laser Detection and Ranging (LADAR) For Non Cooperative Target Recognition (NCTR) • Ship based IRST • Spectrally Balanced Decoy Materials against Advanced IR Surface-to-Air and Air-to-Air Missiles (SAMs-AAMs) • Shipboard Laser Acquisition System for Self protection	• 3rd Generation Airborne IRST For E-2C • Integrated Electro-Optic (EO)/IR ship self-protection	• MSW Missile Warning System • EO/IR Laser Jammer for TACAIR • Shipboard EO/IR Closed loop Self Protection • EO/IR Self Protection for Small Ground Vehicles • EUT++ (Higher Power/BW) • EO/IR Laser-based Jammer • Imaging IR Countermeasures • Long wave IR decoy Material • Electrical IR Decoy Launcher
Continue	• Multicolor IR Threat Warning for tactical missile launch detection • Electrical IR Decoy Launcher • Hyperspectral/Imaging for Surveillance and Targeting (HI-STAR)	• Ship based IRST • Shipboard Laser Acquisition System for self-protection • Electrical IR Decoy Launcher	• 3rd Generation Airborne IRST For E-2C • Ship based IRST • Electrical IR Decoy Launcher • Integrated EO/IR ship-self protection
Complete	• E-2C Surveillance IRST Sensor • Shipboard IR decoy countermeasures against modern Air-to-Surface Cruise Missile seekers	• Spectrally Balanced Decoy Material against Advanced IR SAMs-AAMs • Multicolor Threat Warning for tactical missile launch detection • Hyperspectral/Imaging for Surveillance and Targeting (HI-STAR)	• Shipboard Laser Acquisition System

Missile			

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Defense/Directed Energy	**FY00**	**FY01**	**FY02** **$33,804**
Initiate	• Risk reduction relating to Distributed Collaborative Engagement & Network Centric Warfare and enhanced command decision		• Affordable Components for Wide Area Protection • Infrared Sensors • Littoral Affordability • Directed Energy and Advanced Electric Weapons • Theater Sensor Resource management technology
Continue		• Technologies to Enhance Command Decision - Development of decision aid and sensor technologies designed to enhance Command decision to engage	• Advanced Methods for Air Defense to include command decision • Composite Threat Evaluation and Weapons Assignment (TEWA) • Advanced Energetics and Payload Delivery Technologies

Navy Air Vehicle Technology	**FY00**	**FY01**	**FY02** **$10,288**
Initiate	• Prediction of dynamic load effects on structural fatigue life for 1) rotary- and 2) fixed-wing aircraft. • Development and real-time hardware demonstration of flight systems damage and failure diagnostics /		

	prognostics approaches for reconfigurable flight control, condition-based maintenance, and improved pilot situational awareness to improve safety, survivability, and affordability.		
Continue	• Abrupt Wing Stall (AWS) Modeling • Corrosion-Fatigue Interaction • Shipboard Handling of V/STOL • Adaptive and Intelligent • Flight Control System (FCS) Simulation Study • Adaptive Fault-tolerant Flight Control System for Ship-Board Auto-Land	• Abrupt Wing Stall (AWS) Modeling • Dynamic load effects on structural fatigue • Corrosion-Fatigue Interaction • Automated/Assisted Maneuvering Flight Control System (FCS) Development and Simulation • Adaptive Fault-tolerant Flight Control System for Ship-Board Auto-Land • Development, Simulation, and Real-Time Hardware Demo of Flight Systems Damage & Diagnostics	• Dynamic load effects on structural fatigue • Automated/Assisted Maneuvering Flight Control System (FCS) Development and Simulation • Adaptive Fault-tolerant Flight Control System for Ship-Board Auto-Land • Development, Simulation, and Real-Time Hardware Demo of Flight Systems Damage & Diagnostics
Complete	• CFD methods validated in predicting quasi-steady flow fields, shockwave/flow separation interactions and boundary layer transition effects. Validated several design concepts using CFD and the wind tunnel. Correlated buffet onset with flight and wind tunnel. Identified wing	• Initial non-real-time simulation of adaptive control for shipboard auto-land of unconventional aircraft • Intelligent and Adaptive Guidance and Control Law Simulation Study for Automated/Assisted Maneuvering • Development of design guidelines & procedures to	• Non-Real-Time Simulation of Automated/Assisted Maneuvering Approaches to improve lethality and survivability for Naval Mission tasks. • Non-Real-time individual component simulation testing for flight systems damage and failure diagnostics / prognostics approaches for reconfigurable

	mid-span location as the most susceptible to AWS.	prevent AWS	flight control, condition-based maintenance, and improved pilot situational awareness • AWS flow model development, demonstration of aircraft design guidelines and figures

Underwater Platform Self Defense	**FY00**	**FY01**	**FY02** **$2,638**
Initiate			• Next Generation Countermeasures (NGCM)
Continue	• Anti-torpedo Torpedo component development in propulsion, Microelectromechanical Systems (MEMS), and Guidance and Control (G&C)	• Anti-torpedo Torpedo component development in propulsion, MEMS, and G&C	• Anti-torpedo Torpedo (ATT) component development in propulsion, MEMS, and G&C

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PROGRAM CHANGE SUMMARY:

	FY 2000	FY 2001	FY 2002
FY 2001 President's Budget	**	**	-
Adjustments from FY 2001 President's Budget:			
PE Restructure			82,147
Minor Adjustments			-101
NWCF Adjustments			-99
Non-Pay Inflation Adjustment			125
Additional Program Adjustment			35,000
FY 02 PRESBUDG Submission	**	**	117,072

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CHANGE SUMMARY EXPLANATION:

Funding: Not Applicable.
Schedule: Not Applicable.

OTHER PROGRAM FUNDING SUMMARY:

NAVY RELATED RDT&E:
PE 0601153N (Defense Research Sciences)
PE 0603123N (Force Protection Advanced Technology)
PE 0603502N (Surface and Shallow Water MCM)
PE 0603513N (Shipboard System Component Development)
PE 0603514N (Ship Combat Survivability)
PE 0603553N (Surface Anti-Submarine Warfare)
PE 0603561N (Advanced Submarine Systems Development)
PE 0603563N (Ship Concept Advanced Design)
PE 0603564N (Ship Preliminary Design and Feasibility Studies)
PE 0603573N (Advanced Surface Machinery Systems)
PE 0603721N (Environmental Protection)

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PE 0603726N (Merchant Ship Naval Augmentation Program)
PE 0604558N (New Design SSN Development)
PE 0604561N (SSN-21 Development Program)

NON-NAVY RELATED RDT&E:
PE 0602270A (Electronic Warfare Technology)
PE 0602204F (Aerospace Avionics)
PE 0602131M (Marine Corps Landing Force Technology)
PE 0603569E (DARPA S&T Program)

SCHEDULE PROFILE: Not applicable.