FY 2006/2007 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: Feb 2005
Exhibit R-2

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603114N
PROGRAM ELEMENT TITLE: POWER PROJECTION ADVANCED TECHNOLOGY

COST: (Dollars in Thousands)

Project Number & Title	FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
Total PE	229,851	135,758	82,538	84,043	81,395	113,630	121,596	63,449
R2487 DP-2 VECTORED THRUST AIRCRAFT PROGRAM	4,806	7,429	0	0	0	0	0	0
R2821 INTEGRATED HYPERSONIC AEROMECHANICS TOOL PROGRAM (IHAT)	3,387	0	0	0	0	0	0	0
R2823 PRECISION STRIKE NAVIGATOR (PSN)	968	0	0	0	0	0	0	0
R2911 POWER PROJECTION ADVANCED TECHNOLOGY/IHPRPT	167,827	85,324	82,538	84,043	81,395	113,630	121,596	63,449
R3022 JOINT NON LETHAL WEAPONS	0	311	0	0	0	0	0	0
R9008 FREE ELECTRON LASER (FEL)	2,074	2,179	0	0	0	0	0	0
R9010 VARIABLE ENGINE NOZZLE	1,444	0	0	0	0	0	0	0
R9012 MAGDALENA RIDGE OBSERVATORY	10,087	0	0	0	0	0	0	0
R9134 HIGH SPEED ANTI-RADIATION DEMONSTRATION (HSAD)	4,942	4,953	0	0	0	0	0	0
R9136 ADVANCED LIFTING BODY RESEARCH PROGRAM	4,831	4,953	0	0	0	0	0	0
R9292 ADVANCED THIN FILM COATINGS	4,812	1,684	0	0	0	0	0	0

BUDGET ACTIVITY: 03
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R9293	HI SPD, HEAVY LIFT, SHALLOW DRAFT-CAPABLE WATERCRAFT							
	7,383	0	0	0	0	0	0	0
R9294	INTEGRATED HIGH PAYOFF ROCKET PROPULSION TECHNOLOGY PROGRAM (IHPRPT)							
	987	0	0	0	0	0	0	0
R9295	LARGE AREA MULTI-SPECTRAL SAPPHIRE WINDOWS FOR AIRBORNE RECON							
	1,639	0	0	0	0	0	0	0
R9296	LADAR-LASER RADAR							
	2,924	2,081	0	0	0	0	0	0
R9297	LOW POWER MEGA-PERFORMANCE UAV PROCESSING ENGINES							
	1,442	1,981	0	0	0	0	0	0
R9298	LOW-COST TERMINAL IMAGING SEEKER							
	2,924	4,457	0	0	0	0	0	0
R9299	ADVANCED TECHNOLOGIES FOR PRINTED WIRING ASSEMBLY FABRICATION							
	4,096	3,368	0	0	0	0	0	0
R9302	UNCOOLED HIGH RESOLUTION INFRARED SENSORS							
	3,278	0	0	0	0	0	0	0
R9432	CENTER FOR COASTLINE SECURITY TECHNOLOGY							
	0	2,477	0	0	0	0	0	0
R9446	ADVANCED ELECTRIC DRIVES							
	0	1,485	0	0	0	0	0	0
R9447	ARTICULATED STABLE OCEAN PLATFORM							
	0	991	0	0	0	0	0	0
R9449	HIGH OPERATING TEMPERATURE MIDWAVE INFRARED SENSORS							
	0	1,684	0	0	0	0	0	0
R9450	MULTI-FUNCTIONAL, HIGH-PERFORMANCE DUAL BAND IMAGING							
	0	1,684	0	0	0	0	0	0
R9451	QUIET HIGH SPEED PROPULSION							
	0	3,566	0	0	0	0	0	0
R9452	SPACE SURVEILLANCE TECHNOLOGY							

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	0	3,467	0	0	0	0	0	0
R9453	ULTRA-SHORT PULSE LASER MICROMACHINING						
	0	1,684	0	0	0	0	0	0

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program develops and demonstrates advanced technologies, including Directed Energy, for naval weapon systems, and Electric Warship. This Program Element (PE) includes elements of the following Future Naval Capabilities (FNCs); Time Critical Strike (TCS), Autonomous Operations (AO), and Knowledge Superiority Assurance (KSA). Within the Naval Transformation Roadmap, this investment will achieve one of four key transformational capabilities required by Sea Strike as well as technically enable elements of both Sea Shield and Force Net.

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

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603114N
PROGRAM ELEMENT TITLE: POWER PROJECTION ADVANCED TECHNOLOGY

PROGRAM CHANGE SUMMARY:

	FY 2004	FY 2005	FY 2006	FY 2007
FY 2005 President's Budget Submission	260,688	92,359	69,501	66,634
Cong Rescissions/Adjustments/Undist. Reductions	0	-1,363	0	0
Congressional Action	0	50,600	0	0
Execution Adjustments	-24,987	0	0	0
FNC Realignment	0	0	1,875	7,268
Non-Pay Inflation Adjustments	-244	0	0	0
Program Adjustments	-3,528	-5,838	11,038	9,733
Rate Adjustments	0	0	124	408
SBIR Assessment	-2,078	0	0	0
FY 2006/2007 President's Budget Submission	229,851	135,758	82,538	84,043

PROGRAM CHANGE SUMMARY EXPLANATION:
Technical: Not applicable.

Schedule: Not applicable.

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603114N PROGRAM ELEMENT TITLE: POWER PROJECTION ADVANCED TECHNOLOGY
PROJECT NUMBER: R2911 PROJECT TITLE: POWER PROJECTION ADVANCED TECHNOLOGY/IHPRPT

COST: (Dollars in Thousands)

Project Number & Title	FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
R2911 POWER PROJECTION ADVANCED TECHNOLOGY/IHPRPT	167,827	85,324	82,538	84,043	81,395	113,630	121,596	63,449

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This Project includes elements of the following Future Naval Capabilities (FNCs): Time Critical Strike (TCS); Autonomous Operations (AO).

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 2004	FY 2005	FY 2006	FY 2007
PRECISION STRIKE TECHNOLOGY	33,923	37,797	52,044	49,263

This project focuses on the development of high speed (Mach 3 to Mach 4+) propulsion technologies that will support the development of strike weapons that will significantly decrease the launch to engagement timeline. Investments under this activity were previously reported under the Time Critical Strike Future Naval Capability (FNC). This new Activity breakout provides improved clarification of the overall investment scope. Increase in FY 2006 and FY 2007 is due to a program adjustment for HyFly and NAI RATTLRS.

FY 2004 Accomplishments:
- National Aerospace Initiative Revolutionary Approach To Time-critical Long Range Strike (NAI RATTLRS): Completed System Definition of the design leveraging the Integrated High-Performance Turbine Technology project's Joint Expendable Turbine Engine Concepts (JETEC) thrust. Initiated studies to identify potential concepts that address performance of the first flight demonstration vehicle, and depict the evolution into weaponized configurations.
- Exploitation and Deployment Efforts: Completed casting of HyFly Airframe. Completed Sled Test to demonstrate stage separation.

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FY 2005 Plans:
- NAI RATTLRS: Initiate inlet/engine/nozzle integration and component testing. Initiate fabrication of long lead flow path hardware and ground testing of airframe configurations. Initiate design & risk reduction activities which lead to preliminary design.
- Exploitation and Deployment efforts: Continue HyFly project efforts by conducting unpowered flights to demonstrate aircraft separation and booster powered flight.

FY 2006 Plans:
NAI RATTLRS: $8,500
Hy-Fly: $11,500
- NAI RATTLRS: Complete a preliminary design review of the proposed concept. Fabricate safe separation flight test vehicles and flight test hardware. Accelerate technical development of individual components.
- Exploitation and Deployment efforts: Complete two fully powered HyFly flights to demonstrate flight worthiness.

FY 2007 Plans:
NAI RATTLRS: $18,000
HyFly: $2,000
- NAI RATTLRS: Complete final component demonstrations and validations along with a critical design review. Conduct system checkouts and fabrication of flight demonstration vehicles. Perform a safe separation flight test.
- Exploitation and Deployment efforts: Complete four fully powered HyFly flights to demonstrate flight performance.
- Electromagnetic Gun (EM) Gun: Develop and fabricate a full scale proof of concept 32 mega joules (muzzle energy) demonstrator for testing of integrated launch package in 2009. Conduct testing of capacitor based pulse forming network system to 32 mega joules (of 100 required) of stored power with prototypical rail gun system.

	FY 2004	FY 2005	FY 2006	FY 2007
JOINT UNMANNED COMBAT AIR SYSTEM	102,591	0	0	0

The Office of Naval Research supports the Defense Advanced Research Project Agency (DARPA) - led Joint Unmanned Combat Air Systems (J-UCAS) effort (formerly Unmanned Combat Aerial Vehicle - (Naval Version)), in conjunction with Air Force, to develop and demonstrate technical feasibility, military utility and operational

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value for a networked system of high performance, weaponized unmanned air vehicles to effectively and affordably prosecute 21st century combat missions – including suppression of enemy air defenses, collaborative electronic attack, penetrating surveillance, and deep strike – within the emerging global command and control architecture. Multi-year funding in this project will provide for two robust flight demonstrations to encourage innovation, fully explore the potential, and develop options for reduced risk transition to acquisition.

The technical challenges of J-UCAS include: (1) suitability of an advanced low observable air vehicle for carrier based launch and recovery, (2) integrated manned/unmanned air and deck operations, and (3) associated Mission Control System (MCS) carrier integration. Two full flight demonstrations are planned to include simulation and surrogate buildups, carrier air operations, catapult launch and arrested landing, deck and mission operations.

FY 2004 Accomplishments:
- Continued design and planning tasks. Initiated detailed air vehicle, surrogate, and MCS software design and air vehicle fabrication. Performed mission control at sea demonstration and preliminary, midterm and critical design reviews. This effort transitions to DARPA in FY 2005.

	FY 2004	FY 2005	FY 2006	FY 2007
TIME CRITICAL STRIKE	19,809	31,163	8,868	15,374

This activity supports the Future Naval Capability program in Time Critical Strike (TCS). The specific mission of TCS integrates surveillance, indications and warnings, target identification, targeting, fire order generation and dissemination, engagement and kill mechanisms, and damage assessment processes to address critical mobile targets, urban targets, short dwell targets and deeply buried targets. TCS technologies reduce the time to conduct strike in all functional areas of the kill chain. This activity includes support to the following TCS related Enabling Capabilities: Advanced Sensors; Automated Control of Large Sensor Networks; Advanced Naval Fires Technology; Dynamic Target Engagement & Enhanced Sensor Capabilities; Hostile Fire Detection and Response; Marine and Unmanned Vehicles Tactical Intelligence Surveillance & Reconnaissance (ISR); Mine Countermeasures Capacity; and Rapid Covert Surveillance System Deployment and Light Weight Torpedo Improvement.
Decrease in funding from FY 2005 to FY 2006 is due to completion of initiatives. Increase in funding from FY 2006 to FY 2007 is due to new initiatives.

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FY 2004 Accomplishments:
- Advanced Gun Barrel & Targeting Technology (AGTT): Continued development and scaled testing of advanced composite liners for gun (Naval, 5") systems.
- Real Time Execution Decision Support: Completed software implementation and system and unit level test.
- Cruise Missile Real Time Retargeting (CMRTR): Continued development of V.3 and V.4 sensors for low cost terminal seeker, and test subcomponents of V.3 sensor.
- Precision Strike Navigator (PSN): Continued development of chemical and mechanical processes for low cost precision Fiber Optic Gyro (FOG) Inertial Measurement Unit (IMU), and provide low accuracy unit for evaluation.
- High-Speed Anti Radiation Missile (HSARM): Continued development and subsystem test of an advanced dual mode anti-radiation missile seeker incorporating advanced seeker, aperture, guidance and control technologies for a ramjet-powered missile airframe.
- Hyper Spectral Imaging: Completed integration of visible sub-system with near and far infra-red spectrometers, optical train, selected position/pointing system reference, and enhanced detect algorithms for real time processor.

FY 2005 Plans:
- AGTT: Continue prior year efforts and begin large scale gun prototyping with materials selected.
- CMRTR: Continue program by performing full system test of V.3 sensor, continue development of V.4 sensor for low cost terminal seeker, integrate V.2, V.3 sensors with V.4, and perform V.4 subsystem tests.
- PSN: Continue development of low cost precision FOG IMU and deliver updated high accuracy unit ready for evaluation.
- HSARM: Complete development, subsystem, and system level flight test demonstration of an advanced dual mode anti-radiation missile seeker for a ramjet-powered missile airframe. Classified effort will develop classified seeker technology for time critical targeting.
- Low-Cost Guided Imaging Rocket: Complete effort to develop a low-cost rocket system that uses an imaging seeker which can be used against a wide variety of targets.
- Ground Moving Target Indicator (GMTI) Capability: Begin initial planning for a low-cost, single board radar system suitable for use on a long endurance Unmanned Air Vehicle (UAV).

FY 2006 Plans:
- AGTT: Take completed analytical modeling and scaled prototypes of advanced liner coatings and aluminum composite metal matrix material designs and complete fabrication of a full scale composite barrel test section.

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- HSARM: Complete classified effort to develop seeker technology for time critical targeting.
- GMTI Capability: Initiate task to provide a low-cost, single board radar system suitable for use on a long endurance UAV.
- Ultra Endurance UAV: Initiate effort to provide affordable, high endurance platform/propulsion with Commercial Off the Shelf (COTS) and modified COTS components for persistent ISR, targeting, Bomb Damage Assessment/Bomb Damage Indication (BDA/BDI), and weapon delivery.

FY 2007 Plans:
- AGTT: Complete testing and transition improved coatings and composite 155mm full scale Naval Gun Advanced Prototype Barrel with advanced longer life bore liner. Transition effort to DD(X) R&D effort.
- GMTI Scout: Complete the preliminary design of a low-cost, single board GMTI radar system suitable for use on a long endurance UAV.
- Ultra Endurance UAV: Complete the preliminary design for long endurance UAV propulsion components with payload capacity greater than 250 pounds. The design will include the capability for ship recovery and to dispense sensor fused weapons.
- Near Real Time BDA/BDI System: Complete assessment of existing BDA and BDI tools and procedures to determine the current state of the technology. Initiate task to provide near real time battle damage information required to evaluate mission effectiveness. This task will exploit existing sensors and if necessary modify sensors to meet requirements.
- Image Video Analysis: Initiate effort to provide the capability to detect targets and assess battle damage from imagery and video captured by various manned and unmanned platforms.
- Real-Time Ground Moving Target: Initiate task to provide the capability to detect and fix moving targets in near real time. Conduct system level analyses to determine the feasibility of detecting and fixing moving targets using image processing of streaming video in near real-time from a UAV (or other image/video provider).
- Affordable, Persistent ISR: Initiate task to provide a theater-quality low-cost ISR system integrated on a long endurance UAV. Conduct system analyses and trade studies to determine the technical feasibility of fielding an Electro-Optic/Infrared system, determine the recurring cost for the sensor system, and identify any high risk technology issues.

	FY 2004	FY 2005	FY 2006	FY 2007
AUTONOMOUS OPERATIONS (AO)	11,504	16,364	21,626	19,406

The Autonomous Operations (AO) Future Naval Capability (FNC) activity aims to enhance the mission capability

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and operational utility of Naval forces by developing technologies that will dramatically increase the autonomy, performance, and affordability of Naval organic Unmanned Vehicle systems. By defining and focusing risk reduction overarching Intelligent Autonomy (IA) Science and Technology principles, transitional products will be developed in four areas: Unmanned Air Vehicles (UAV) Technology, which includes IA reasoning, technologies to enhance “see and avoid” capabilities, object identification, vehicle awareness, and vehicle and mission management; Unmanned Undersea Vehicles (UUV), which will demonstrate the technical feasibility for a UUV system to effectively search, detect, track and trail undersea threats while maintaining a robust communications link to enable appropriate command, control and transmission of collected data; Unmanned Ground Vehicles (UGV), which focus on the increasing utility of UGV systems in urban and littoral terrain to Marine Corps units; and UAV Propulsion, which will develop innovative propulsion and power technologies unique to Naval UAVs operating from surface combatants. This activity also contains a task from the Knowledge Superiority Assurance FNC.
Increase in funding from FY 2004 to FY 2006 is due to new initiatives. Decrease in funding from FY 2006 to FY 2007 is due to completion of initiatives.

FY 2004 Accomplishments:
- IA Task: Continued testing and demonstrating intelligent vehicle technologies. Completed high fidelity simulation of tightly integrated path replanning and on-board mapping with AO UUV development effort.
- UAV Technology: Continued developing and performing simulation testing of sensors and sensor software and the development of multi-modal interface control. Continued development of UAV networking and communication with loaned Joint Tactical Radio System (JTRS) prototype radios for demonstration in the FIRESCOUT.
- UUV: Continued work developing and demonstrating undersea operations for Maritime Reconnaissance (MR) and Undersea Search and Survey (USS). Demonstrated integrated Intelligence Surveillance & Reconnaissance (ISR) mast and ElectroMagnetic/ElectroOptic scout sensors on a 21" diameter UUV along with advanced autonomous control software including ISR sensor cueing, autonomous path planning, and obstacle avoidance.
- UGV: Completed work on mobility UGV test bed. Transitioned to Marine Corps for System Development Design.
- UAV Propulsion: Continued development of thermal management, integrated power generation, and integrated inlet/engine control in future naval UAV propulsion systems as a part of the Integrated High Performance Turbine Engine Technology (IHPTET) Program. Conducted ground test of the enhanced next-generation commercial gas generator core.

FY 2005 Plans:
- IA Task: Continue in-water and simulation testing and demonstrating of dynamic replanning and autonomous vehicle control technologies. Conduct in-water demonstration of maritime situation awareness technology and

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simulation testing of dynamic replanning capability in a simulated warfare environment integrated with a Naval control station.
- UAV Technology: Continue work developing and performing simulation testing of sensors and sensor software and the development of multi-modal interface control. Develop and conduct testing of self-awareness sensor software and sub-system self-awareness sensors. Demonstrate UAV networking and communication with loaned JTRS prototype radios for demonstration in FIRESCOUT.
- UUV: Continue work developing and demonstrating undersea operations for MR technologies, including transition of ISR Mast and advanced autonomy for 21-in UUV and autonomous docking station for small UUVs; continue development and testing of USS and Communications/Navigation Aids technologies.
- UAV Propulsion: Conduct ground test of the XTE-67/A1 UAV demonstrator engine with Naval-unique technologies and integrate with the enhanced next-generation commercial core and a Mach 3.5 capable expendable turbine engine for missile applications. This meets IHPTET phase III Joint Expendable Turbine Engine Concept goals and is a foundation for the Versatile Affordable Advanced Turbine Engine program.

FY 2006 Plans:
- IA Task: Complete testing and demonstration of dynamic replanning technologies including high-fidelity simulation of multiple classes of Naval unmanned vehicles in a simulated warfare environment, hardware, and in-water demonstrations. Continue testing and demonstration of multi-vehicle cooperation technologies.
- UAV Technology: Continue testing and demonstration of multi-modal interface control. Complete performing simulation testing of sensors and sensor software.
- UUV: Transition USS and Communication Navigation Aid products to Program Management Office-Explosive Ordnance Disposal and Office of Naval Intelligence (ONI-34); standup Submarine Track and Trail (STT) efforts in the areas of advanced undersea sensors, communications, and autonomy.
- UAV Propulsion: Continue ground test of the XTE-67/A1 UAV demonstrator engine with naval-unique technologies and integrate with the enhanced next-generation commercial core and a Mach 3.5 capable expendable turbine engine for missile applications.
- Reconfigurable Surveillance UAV's (RSU): This effort will develop surveillance UAV's that can be reconfigured to support different packages in order to better provide protection to the warfighters.

FY 2007 Plans:
- IA Task: Complete testing and demonstration of multi-vehicle cooperation technologies including high-fidelity simulation of multiple heterogeneous Naval unmanned vehicles in a simulated warfare environment, hardware, and in-water demonstrations.
- UAV Technology: Complete testing and demonstration of multi-modal interface control.

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- UUV: Continue STT efforts in the areas of advanced undersea sensors, communications, and autonomy.
- UAV Propulsion: Continue ground test of the XTE-67/A1 UAV demonstrator engine with naval-unique technologies and integrate with the enhanced next-generation commercial core and a Mach 3.5 capable expendable turbine engine for missile applications.
- RSU: Complete development of reconfigurable surveillance UAV's for warfighter protection.

C. OTHER PROGRAM FUNDING SUMMARY:

Navy RELATED RDT&E:

PE 0601153N Defense Research Sciences
PE 0602114N Power Projection Applied Research
PE 0602236N Warfighter Sustainment Applied Research
PE 0603123N Force Protection Advanced Technology
PE 0603782N Mine and Expeditionary Warfare Advanced Technology
PE 0603236N Warfighter Sustainment Advanced Technology
PE 0603790N NATO Research and Development
PE 0305204N Tactical Unmanned Aerial Vehicles
PE 0603502N Surface and Shallow Water Mine Countermeasures
PE 0603654N Joint Service Explosive Ordnance Development
PE 0602131M Marine Corps Landing Force Technology

NON-NAVY RELATED RDT&E: These PEs adhere to Defense S&T Reliance agreements with oversight provided by the Joint Director of Laboratories.

PE 0603285E Advanced Aerospace Systems
PE 0603709D8Z Joint Robotics Program
PE 0604709D8Z Joint Robotics Program - EMD
PE 0602203F Aerospace Propulsion
PE 0603216F Aerospace Propulsion and Power Technology
PE 0603205F Flight Vehicle Technology

D. ACQUISITION STRATEGY:

Not applicable.

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PROGRAM ELEMENT: 0603114N PROGRAM ELEMENT TITLE: POWER PROJECTION ADVANCED TECHNOLOGY
PROJECT NUMBER: R3022 PROJECT TITLE: JOINT NON LETHAL WEAPONS

Project Number & Title	FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
R3022 JOINT NON LETHAL WEAPONS	0	311	0	0	0	0	0	0

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project develops technology for non-lethal weapons and supports the Joint Non-Lethal Weapons Office. This project was transferred to Program Element 0603651M in FY 2005.

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 2004	FY 2005	FY 2006	FY 2007
JOINT NON-LETHAL WEAPONS (NLW) PROGRAM	0	311	0	0

This project develops the next-generation Non-Lethal Weapons (NLWs) and includes efforts to ensure optimum weaponization and use of these NLWs. Next-generation NLW systems focus on long-range localized Non-Lethal (NL) effects to identified threat individuals (or groups of individuals) and/or their threat weapons systems operating in complicated environments such as urban areas, crowds, buildings, vehicles, boats and also in close proximity to high-value civilian establishments. This project was transferred to Program Element 0603651M in FY 2005.

C. OTHER PROGRAM FUNDING SUMMARY:
Not Applicable.

D. ACQUISITION STRATEGY:
Not Applicable.

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PROJECT NUMBER: Various PROJECT TITLE: Congressional Plus-Ups

CONGRESSIONAL PLUS-UPS:

R2487	FY 2004	FY 2005
DP-2 VECTORED THRUST AIRCRAFT PROGRAM	4,806	7,429

FY04 - This effort developed and installed vehicle redesigns, including improved NASA-designed cascade vanes. Test failure occurred during buildup to controlled hover. Continued development of control system hardware.
FY05 - This effort will install additional vehicle improvements to increase hover performance and reliability: lightweight fuselage and wing, robust nozzle box and cascade mechanism. Resume controlled hover tests and complete sustained controlled hover, in and out of ground effects.

R2821	FY 2004	FY 2005
INTEGRATED HYPERSONIC AEROMECHANICS TOOL PROGRAM (IHAT)	3,387	0

This effort developed a prototype aeromechanical tool for modeling control technologies for future hypersonic flight vehicles. FY 2004 tasks added additional functionality to the existing modules and added the following new modules: Mission, Lethality, and Cost Index.

R2823	FY 2004	FY 2005
PRECISION STRIKE NAVIGATOR (PSN)	968	0

This effort fabricated a pre-production transceiver device using the Precision Strike Navigator (PSN) prototype facility at Army Missile Command. The effort continued process development for low cost manufacture of the unique PSN devices and their applications.

R9008	FY 2004	FY 2005
FREE ELECTRON LASER	0	2,179

This effort will develop a capability to support the operation of a 7 MeV high current injector in the free electron laser facility. The task will include processing and characterization of super conducting radio frequency cavities which will be assembled in a cryounit for a systems test.

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R9008	FY 2004	FY 2005
HEL-LOW ASPECT TARGET TRACKING (HEL-LATT)	2,074	0

This effort completed upgrades to seaLite beam director tracking system. New cameras, optical systems were installed. Multiple High Power Laser tests against targets were conducted.

R9010	FY 2004	FY 2005
VARIABLE ENGINE NOZZLE	1,444	0

This effort conducted a lab demonstration of a variable displacement van pump and initiated Phase II integration with a demonstration engine.

R9012	FY 2004	FY 2005
MAGDALENA RIDGE OBSERVATORY	10,087	0

This effort built a testbed to explore how optical interferometry sensitivity can be improved, with techniques to include combining adaptive optics with medium size telescopes; provided next generation design technology for Navy optical interferometry; and developed significant academic resources to draw on for the Navy’s future needs.

R9134	FY 2004	FY 2005
HIGH SPEED ANTI-RADIATION DEMONSTRATION (HSAD)	4,942	4,953

FY04: This effort developed a producible digital control actuator system for the missile aft steering system of the High Speed Anti-Radiation Demonstration (HSAD) airframe, developed design concepts and built multiple proof of concept subcomponent prototypes.
FY05: This effort will mature key areas in the propulsion elements of the HSAD advanced anti-radiation guided missile. The efforts will better characterize the subsystem performance with addition testing, ramjet fuel development, insensitive munitions development, propulsion system optimization studies and propulsion requirements development through operational/mission analysis.

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R9136	FY 2004	FY 2005
ADVANCED LIFTING BODY RESEARCH PROGRAM	4,831	4,953

FY04 - This effort studied known issues in the further development of lifting body technology that was demonstrated in a series of vessels, culminating in the large lifting body vessel SEA FLYER.
FY05 - This effort will work on issues arising from commercialization efforts coming from technology transfer.

R9136	FY 2004	FY 2005
HIGH SPEED, HEAVY-LIFT, SHALLOW DRAFT-CAPABLE WATERCRAFT DEMONSTRATION	7,383	0

This effort developed a design for a dual-use, SWATH-like craft. Commercial use is as a ferry in regions of high tidal variations. Military use would be as a half-scale demonstrator of beachable, littoral transport.

R9292	FY 2004	FY 2005
ADVANCED THIN FILM COATINGS	4,812	1,684

FY04 - This effort developed and demonstrated light-weight paint pigments and thin light-weight flexible organic light emitting diode film technologies for Naval Aviation applications on MV-22.
FY05 - This effort will demonstrate light-weight, durable paint-replacement film development and manufacturing. The goal of this task is to reduce the cost, weight, and maintenance associated with paint replacement films for military aircraft.

R9294	FY 2004	FY 2005
INTEGRATED HIGH PAYOFF ROCKET PROPULSION TECHNOLOGY PROGRAM (IHPRPT)	987	0

This effort developed and demonstrated advanced propulsion technologies that increase the kinematic performance of weapons systems while meeting the goals of the Integrated High Payoff Rocket Propulsion Technology program.

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R9295	FY 2004	FY 2005
LARGE AREA MULTI-SPECTRAL SAPPHIRE WINDOWS FOR AIRBORNE RECONNAISSANCE	1,639	0

This effort developed large area, high transmission, low cost, high durability entrance windows for integrated electro-optic and infrared sensors for Navy, Marine Corps and Army platforms.

R9296	FY 2004	FY 2005
LADAR-LASER RADAR	2,924	2,081

FY04 - This effort developed an improved missile seeker to search larger areas at faster speed to improve performance against occluded targets. Funds were used to develop improvements to the ladar electronics that reduce system noise and improve performance of the seeker.
FY05 - This effort will develop autonomous target recognition techniques, using ladar data, that can be employed in an anti-ship role.

R9297	FY 2004	FY 2005
LOW POWER MEGA-PERFORMANCE UAV PROCESSING ENGINES	1,442	1,981

FY04 - This effort developed microcode for 3D synthetic aperture radar on existing 64 node 23 giga-loating point operations per second (GFLOPS) Sequential Instruction Multiple Data (SIMD) processing chip and laid out real-time 256 node chip to achieve 104 GFLOPS.
FY05 - This effort will develop and deliver a SIMD integrated processing chip capable of 96 GFLOPS along with macro code software modules to process synthetic aperture radar onboard a small tactical unmanned aerial vehicle.

R9298	FY 2004	FY 2005
LOW-COST TERMINAL IMAGING SEEKER	2,924	4,457

FY04 - This effort developed a low cost rocket system that uses an imaging seeker and can be used against a wide variety of targets. Funds provided developed a simulation environment to support requirements analysis

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and preliminary design and initiated development of a fully compliant inertial measurement unit.
FY05 - This effort will conduct additional modeling and simulation to improve characterization of the performance of the system and data collection and develop algorithms to improve the system performance in signal processing.

R9299	FY 2004	FY 2005
ADVANCED TECHNOLOGIES FOR PRINTED WIRING ASSEMBLY FABRICATION (PWB-HVPC)	4,096	3,368

FY04 - This effort developed vertical interconnect technology for silicon wafer scale circuitry onto Printed Wiring Boards (PWBs). Conducted advanced multilayer PWB ultrasonic analysis by employing direct sequence spread spectrum technology.
FY05 - This effort will develop technologies and techniques to reverse engineer and repair multilayer printed circuit boards in Navy systems. Technologies include applying discrete sequence spread spectrum technologies for high resolution imaging of multilayer boards and laser assisted through hole and line metallization on boards.

R9302	FY 2004	FY 2005
UNCOOLED HIGH RESOLUTION INFRARED SENSORS	3,278	0

This effort developed uncooled infrared sensors based on advanced metal doped, ion-implanted, organic polymer based materials. This effort produced high resolution 640x480 infared sensors. Experimental devices have demonstrated higher performance, ease in fabrication, higher uniformity, and substantially lower fabrication costs than current inorganic material sensors.

R9432	FY 2004	FY 2005
CENTER FOR COASTLINE SECURITY TECHNOLOGY	0	2,477

This effort will develop and deliver visible and infrared sensors for harbor and coastal 24 hour all weather surveillance. Sensors will be integrated on underwater, surface, and airborne unmanned vehicles as well as at the Naval Surface Warfare Center Carderock’s South Florida Test Facility along with attendant signal processing.

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R9446	FY 2004	FY 2005
ADVANCED ELECTRIC DRIVES	0	1,485

This effort will support advanced electric drives.

R9447	FY 2004	FY 2005
ARTICULATED STABLE OCEAN PLATFORM	0	991

This effort will develop a numeric tool for general articulated offshore platforms using simulation models previously developed.

R9449	FY 2004	FY 2005
HIGH OPERATING TEMPERATURE MIDWAVE INFRARED SENSORS	0	1,684

This effort will develop and evaluate high performance medium wavelength infrared sensors of pixel size 320x240 with 640x480 goal for Navy, Marine Corps, and Army needs.

R9450	FY 2004	FY 2005
MULTI-FUNCTIONAL, HIGH-PERFORMANCE DUAL BAND IMAGING	0	1,684

This effort will research and develop sensor issues associated with multi-band infared and radio frequency sensors for detection and track of asymmetric maritime threats.

R9451	FY 2004	FY 2005
QUIET HIGH SPEED PROPULSION	0	3,566

This effort will develop an advanced hub-driven podded propulsor design for surface ship and submarine applications. The system will have the attributes of reduced low-speed acoustic and electromagnetic signatures, be power dense, and provide high-speed platform performance.

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R9452	FY 2004	FY 2005
SPACE SURVEILLANCE TECHNOLOGY	0	3,467

This effort will support space surveillance technology.

R9453	FY 2004	FY 2005
ULTRA-SHORT PULSE LASER MICROMACHINING	0	1,684

This effort will develop and deliver femtosecond lasers for micromachining of silicon and other materials.