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

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N
PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY

COST: (Dollars in Thousands)

Project Number & Title	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
Total PE	83,365	73,056	61,725	42,739	42,971	47,424	52,282
2919 COMMUNICATIONS SECURITY	78,153	59,656	61,725	42,739	42,971	47,424	52,282
9999 CONGRESSIONAL PLUS-UPS	5,212	13,400	0	0	0	0	0

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This Program Element (PE) addresses the advanced technology development, test and evaluation of a dynamic distributed common picture based on emergent technologies that will improve situational awareness across command echelons. The promise of net-centricity and potential for persistent and pervasive sensing create greater demand for automated fusion of large volumes of multi-sensor data, techniques to coordinate deployment of multiple diverse sensors and tailored dissemination of information to support. The focus for this PE is to refine technologies that exploit information and networking technology to ensure mission success in unpredictable warfighting environments, such as the Global War on Terrorism, urban operations, and asymmetric warfare. To ensure Maritime Domain Awareness, we must be able to collect, fuse, and disseminate enormous quantities of data drawn from US joint forces and government agencies, international coalition partners and forces, and commercial entities. To further network centric capability, this project demonstrates technologies that support seamless information services afloat and ashore; collaborative decision-making among geographically dispersed warfighters; a common, consistent view of the battlespace geared to user requirements; system interoperability with coalition forces; real-time information access with quality of service guarantees; and information assurance. Technologies of interest provide access to, and automated processing of, information necessary to make decisions that lead to rapid, accurate decision-making that lead to decisive, precise, and desired engagement outcomes. The payoff is access to tailored information in near real time with corresponding increases in speed of command, improved decision-making, and reduction in manpower. The Common Picture Program supports FORCEnet, Sea Shield and Sea Strike pillars. This program element contains investments in the following FORCEnet, Sea Strike and Sea Shield enabling capabilities: Secure Collaboration; Advanced Communication for

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N
PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY

FORCEnet; GIG Compliant Networking; Dynamic Target Engagement and Enhanced Sensor Capability; Next Generation Command, Control and Decision Support Services; COCOM to Marine Combat ID; Combat ID Information Management of Coordinated Electronic Surveillance; Combat ID in the Maritime Domain to Reveal Contact Intent; Hostile Automated Control of Large Sensor Networks; and Hostile Fire Detection and Response Spiral 1.

In the context of the Naval Transformation Roadmap construct, this investment will achieve capabilities required by FORCEnet, “Persistent Intelligence, Surveillance, and Reconnaissance,” “Time Sensitive Strike,” “Sea Based Information Operations,” “Sea Strike” Ship-to-Objective Maneuver, and “Sea Shield” Theater Air and Missile Defense.

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: 0603235N
PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY

B. PROGRAM CHANGE SUMMARY:

	FY 2005	FY 2006	FY 2007
FY 2006 President's Budget Submission	83,062	60,589	53,471
Congressional Action	1,000	13,400	0
Congressional Undistributed Reductions/Rescissions	-64	-933	0
Execution Adjustments	981	0	0
FY 2005 SBIR	-1,615	0	0
Program Adjustments	1	0	0
Program Realignment	0	0	8,196
Rate Adjustments	0	0	58
FY 2007 President's Budget Submission	83,365	73,056	61,725

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:
Performance metrics are discussed within the project (R2a).

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 2919 PROJECT TITLE: COMMUNICATIONS SECURITY

COST: (Dollars in Thousands)

Project Number & Title	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
2919 COMMUNICATIONS SECURITY	78,153	59,656	61,725	42,739	42,971	47,424	52,282

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This Program Element (PE) addresses the advanced technology development, test and evaluation of a dynamic distributed common picture based on emergent technologies that will improve situational awareness across command echelons. The promise of net-centricity and potential for persistent and pervasive sensing create greater demand for automated fusion of large volumes of multi-sensor data, techniques to coordinate deployment of multiple diverse sensors and tailored dissemination of information to support. The focus for this PE is to refine technologies that exploit information and networking technology to ensure mission success in unpredictable warfighting environments, such as the Global War on Terrorism, urban operations, and asymmetric warfare. To ensure Maritime Domain Awareness, we must be able to collect, fuse, and disseminate enormous quantities of data drawn from US joint forces and government agencies, international coalition partners and forces, and commercial entities. To further network centric capability, this project demonstrates technologies that support seamless information services afloat and ashore; collaborative decision-making among geographically dispersed warfighters; a common, consistent view of the battlespace geared to user requirements; system interoperability with coalition forces; real-time information access with quality of service guarantees; and information assurance. Technologies of interest provide access to, and automated processing of, information necessary to make decisions that lead to rapid, accurate decision-making that lead to decisive, precise, and desired engagement outcomes. The payoff is access to tailored information in near real time with corresponding increases in speed of command, improved decision-making, and reduction in manpower. The Common Picture Program supports FORCEnet, Sea Shield and Sea Strike pillars. This program element contains investments in the following FORCEnet, Sea Strike and Sea Shield enabling capabilities: Secure Collaboration; Advanced Communication for FORCEnet; GIG Compliant Networking; Dynamic Target Engagement and Enhanced Sensor Capability; Next Generation Command, Control and Decision Support Services; COCOM to Marine Combat ID; Combat ID Information Management of Coordinated Electronic Surveillance; Combat ID in the Maritime Domain to Reveal Contact Intent; Hostile Automated Control of Large Sensor Networks; and Hostile Fire Detection and Response Spiral 1.

In the context of the Naval Transformation Roadmap construct, this investment will achieve capabilities

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 2919 PROJECT TITLE: COMMUNICATIONS SECURITY

required by FORCEnet, “Persistent Intelligence, Surveillance, and Reconnaissance,” “Time Sensitive Strike,” “Sea Based Information Operations,” “Sea Strike” Ship-to-Objective Maneuver, and “Sea Shield” Theater Air and Missile Defense.

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

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 2005	FY 2006	FY 2007
KNOWLEDGE SUPERIORITY AND ASSURANCE (KSA)	44,662	31,944	41,695

This activity is aligned with the FORCEnet pillar and explores fundamental technologies that enhance the Navy’s capability to exploit, manage and integrate complex, heterogeneous, multi-source information for the next generation common picture. Science and Technology (S&T) work is being focused on Navy and Marine Corps Warfighter Capability Gaps identified through analysis of operational and exercise lessons learned, as well as campaign analysis of capabilities required in the 2010-2015 time frame.

There are several FNC efforts that completed in FY 2005 and three efforts transitioning to other PEs in FY 2006. The funding profile from FY 2006 to FY 2007 reflects the reorganization of Future Naval Capabilities (FNC) Program investments into Enabling Capabilities (ECs). As a result of this reorganization, the funding for each EC has been aligned to a Budget Activity 2 and Budget Activity 3 PE as appropriate. Warfighter Capability Gaps are being addressed by Enabling Capabilities (EC). Each EC delivers capability-level products to acquisition in a three to five-year effort, and allocates a sufficient investment to ensure a capability is provided. ECs addressed include: Secure Collaboration; Advanced Communication for FORCEnet; GIG Compliant Networking; Dynamic Target Engagement and Enhanced Sensor Capability; Next Generation Command, Control and Decision Support Services; COCOM to Marine Combat ID; Combat ID Information Management of Coordinated Electronic Surveillance; Combat ID in the Maritime Domain to Reveal Contact Intent; and Automated Control of Large Sensor Networks.

FY 2005 Accomplishments:
• Completed work on Wireless Quality of Service (QoS) Based Routing for FORCEnet and transitioned to Automated Digital Network System (ADNS) (PMW 160).
• Completed work on K/Ka/Q-band phased array antennas for submarine, ship, and mobile ground vehicles.

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 2919 PROJECT TITLE: COMMUNICATIONS SECURITY

Transitioned to Program Executive Office (PEO) C4I & Space Program Management of Warfare (PMW) 770/Advanced High Data Rate Antenna.
• Completed Battle Force Composite Networking Block II. Transitioned to Joint Task Force (JTF WARNET) and Joint Tactical Radio System Joint Program Office (JTRS JPO). Alternated high data rate path for disadvantaged platforms for improved SIPRNET throughout, reliability, and redundancy with automated and network routing.
• Completed Sea Trial Experimentation on capability to access, update, and maintain the Common Operational and Tactical Picture (COTP) through an integrated and interoperable set of software applications.
• Completed Sea Trial Experimentation on the Multi-National Virtual Operations Capability (MNVOC) Battle Force Email High Frequency (HF) Local Area Network system to carry Internet Protocol (IP) data over HF (and other Line of Sight Systems) to complement satellite communications assets.
• Continued development of the Airborne Communication Package for the FIRESCOUT Unmanned Aerial Vehicle (UAV).
• Continued effort for Comprehensive, Analytic, Real-Time Execution in Joint Air Operations (CARTE).
• Continued development of Multi-National Virtual Operations Network, including Domino One-way Replication Services (DORS) and Unit Level Multi-level Thin Client Prototype, with transition to PMW-160. Significantly enhances network centric interoperability among allies and coalition partners by providing at-sea reliable, secure, and timely exchange of releasable tactical information through use of virtual private networks and secure web servers Concepts (PMA-263).

• Initiated effort for Reconfigurable Surveillance UAVs for Warfighter Protection. (Moves to PE 0603114N in FY 2006).
• Initiated Joint Coordinated Real-Time Engagement (JCRE) Advance Concepts Technology Demonstration (ACTD) to provide Global Information Grid (GIG)-compliant core enterprise Services and Community of Interest (COI) Services which ensured warfighting COIs access to information required from any source for rapid situation awareness assessment.
• Initiated effort for Decision Support for Dynamic Target Engagement.
• Initiated Information Assurance effort called Secure Distributed Collaboration.
• Initiated effort on Integrated Autonomous Network Management (IANM).
• Initiated an Ultra-High Frequency (UHF)/L-Band Phased Array Antenna for Naval aircraft carrier platforms. (Moves to PE 0603271N in FY 2006).

FY 2006 Plans:
• Continue all efforts of FY 2005, less those noted as completed above.
• Continue effort on Processing Tactical Signal Intelligence (SIGINT) (Sly Fox) (follow on to Tactical Processing and Analysis initiated in PE 0602235N). Automate back-end software that supports the Shipboard

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 2919 PROJECT TITLE: COMMUNICATIONS SECURITY

Information Warfare and Cryptologic System Acquisition Front-end, resulting in 75% reduction of operator effort associated with processing intercept reports, and a 50% decrease in operator errors and a 50% reduction in training hours.
• Complete Airborne Communications Package (ACP). Transition to FIRESCOUT program, Program Management Warfare (PMW) 760. Extends penetrating surveillance range to an area greater than 80 nautical miles. Transition to Program Executive Office (PEO) C4I, PMW-160 and NAVAIR 4.0x, Advanced Development Program for Airship.
• Complete effort for Comprehensive, Analytic, Real-Time Execution in Joint Air Operations (CARTE). Transition to Program Management (PM) Computer Aided Cost Estimate (CACE) MCSC/JSF. Automated Squadron-level coordinated Operations & Maintenance scheduling tools for AV8-Bs (reduce scheduling time from six hours to two minutes).
• Complete transition of Intra Battlegroup Wireless Networking to ADNS (PMW 160).
• Complete transition of Multi-National Virtual Operation Network, including Domino One-way Replication Services (DORS) and Unit Level Multi-level Thin Client Prototype, with transition to PMW-160. Significantly enhances network centric interoperability among allies and coalition partners by providing at-sea reliable, secure, and timely exchange of releasable tactical information through use of virtual private networks and secure web servers Concepts (PMA-263).
• Initiate and complete Sea Trial Experimentation of command decision-making and dynamically managed connectivity (e.g., Decision Support for Dynamic Target Engagement; Secure Distributed Collaboration; Processing Tactical SIGINT, Integrated Autonomous Network Management (IANM); as well as replanning and rehearsals of operational and tactical forces).
• Initiate Actionable Information from Multiple Intel Sources in a Global Information Grid Enterprise Services (GIG-ES) Environment. Automate integration of multi-INT surveillance & reconnaissance of red, white, and blue force locations for Combat ID by providing software integrated into Navy and Marine Corps Command Control & Combat Systems. Order of magnitude less false recognition. Identification of significant military entities consistent with sensor capabilities. Work continues under PE 0602235N in FY 2007.
• Initiate effort for Improved Maritime Common Operational Tactical Picture in a GIG-ES Environment. Provides software to perform level one fusion of intelligence sources and tactical organic sensors to provide knowledge about battlespace objects including location, track, and Combat Identification. Improve planning and resource management of ISR assets allocated to fill ISR coverage gaps, with 100X improvement over current performance. More effective allocation of assets to eliminate redundant coverage, with 100% more coverage or 50% reduction in planned sensor asset usage. (Moves to PE 0602235N in FY 2007)
• Initiate design of tools enabling mission-specific tactical sensor fields for at least two separate mission areas. (Moves to PE 0602235N in FY 2007)
• Initiate design of tactical distributed data analysis and automated indications and warnings for 50% of

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 2919 PROJECT TITLE: COMMUNICATIONS SECURITY

tactical data. (Moves to PE 0602235N in FY 2007)
• Initiate design of automated tactical platform and sensor planning and management sufficient for one operator to control of multiple sensors. (Moves to PE 0602235N in FY 2007)

FY 2007 Plans:
• Continue all efforts of FY 2006, less those noted as completed above.
• Complete effort on Processing Tactical Signal Intelligence (SIGINT) (Sly Fox).
• Complete development of Integrated Autonomous Network Management. Transition to (Item Serial Numbers/Automated Digital Network System) ISNS/ADNS PMW-160. Enables central monitoring of as many as 15 distributed network management systems, tactical shore and ship, in a 1500 nm area. Network automatically assesses the environment and recommends changes to optimize network performance in real time (10s of seconds). There will be manpower savings, fewer personnel required to manage computers, and communication networks for big-deck ships.
• Complete development of Secure, Distributed Collaboration effort. Transition to the PEO for C4I and Space, for the PMW 160 program. Combined Enterprise Regional Information Exchange System (CENTRIXS) for secure collaboration across multiple coalition boundaries and security levels in the maritime environment. Enhances real-time collaboration among coalition partners and own forces. Increase speed of decisions based on integrated and shared tactical picture. Enforces security policy providing increase in assurance level. Reduces administrative overhead by automating functions.
• Complete the High Altitude Airborne Relay and Router Package to deliver multi-beam relay/router in high altitude capability across UHF/VHF/L- and Ku-Bands (previously reported in PE 0603271N).
• Complete the Innovative Tactical Beyond Line of Sight (BLOS) Communications Relay (previously reported in PE 0603236N).
• Complete Ultra High Frequency (UHF)/L-Band phased array antennas for carriers (previously PE 0603271N).
• Initiate design of tools enabling mission-specific tactical sensor fields for at least two separate mission areas.
• Initiate smart algorithms for tactical sensors.

	FY 2005	FY 2006	FY 2007
USCG VESSEL TRACKING	9,996	4,459	4,830

Details are of a higher classification.

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 2919 PROJECT TITLE: COMMUNICATIONS SECURITY

	FY 2005	FY 2006	FY 2007
MULTI-SOURCE INTEGRATION (MSI) AND COMBAT IDENTIFICATION (CID)	8,587	8,796	7,410

This activity is aligned with the Sea Shield pillar. Multi-Source Integration (MSI), Advanced Sensor Netting Technology (ASNT), and Composite Combat Identification (CCID) technology address theater air and missile defense (TAMD) needs for data fusion, correlation of and reasoning over attributes leading to target Identification, and sensor fusion/management. The goal is to develop algorithms for use by air defense combat systems which will then be able to fuse, filter, and correlate on-board sensor and off-board battlespace information from all sources to achieve one common Combat Identification (CID) solution using Theater-wide information. This activity supports the Sea Shield Enabling Capability for Real Time Long Range Air Defense CID in Support of Early Engagements and related CID Science & Technology to be worked under FORCEnet.

FY 2005 Accomplishments:
• Continued development of advanced MSI algorithms to integrate radio frequency sensors, Identification Friend or Foe (IFF) data, Cooperative Engagement Capability (CEC), Joint Tactical Information Distribution System (JTIDS), and correlate Satellite Communications (SATCOM) data to integrated track files in the E-2C/D airborne early warning aircraft mission computer.
• Continued development of CCID algorithms designed to correlate and fuse real time track data with intelligence, surveillance and reconnaissance data in Ship Signal Exploitation Equipment (SSEE) equipped surface ships. Continued evolutionary development of a common reasoning algorithm for CID capability to rapidly build high confidence identification of air tracks using all available Identification attributes in theater.
• Completed development and demonstration of ASNT multiple hypothesis correlation algorithms in a laboratory environment. These algorithms were designed for integration of electronic warfare support data into CEC and transmission of track Identification attributes via CEC-like network.
• Completed coordination of MSI, ASNT, and CCID development with the Joint Single Integrated Air Picture (SIAP) Systems Engineering Organization (JSSEO) Integrated Architecture Behavior Model (IABM) for use in joint service open architecture combat system applications.

FY 2006 Plans:
• Continue all efforts of FY 2005, less those noted as completed above.

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 2919 PROJECT TITLE: COMMUNICATIONS SECURITY

FY 2007 Plans:
• Continue all efforts of FY 2006.
• Complete ASNT, CCID, and MSI development. MSI, ASNT, and CCID will transition to the E-2C/D Program Management Office (PMA-231), Intelligence, Surveillance, Reconnaissance, and Information Operations Program Office (PMW-180), and Program Executive Office-Integrated Warfare Systems (PEO-IWS).
System.

	FY 2005	FY 2006	FY 2007
PLATFORM PROTECTION/ELECTRONIC WARFARE SYSTEMS	7,189	7,215	0

This activity is aligned with the Sea Strike pillar and supports the development of Situational Awareness (SA) capabilities for small surface, ground-based and airborne platforms. Currently, these platforms have limited SA capability, which jeopardizes their battlefield effectiveness and combat survivability. This activity develops the Electronic Warfare Integrated System for Small Platforms (EWISSP), a compact small platform electronic warfare capability providing radio frequency (RF), electro-optic (EO), and infrared (IR) sensors for platforms such as smaller ships, expeditionary fighting vehicles (EFV), and surveillance aircraft. This activity integrates successful proof-of-concept hardware and software developed under PE 0602235N into systems suitable for capability demonstration under Naval environments and tactical conditions. Responding to customer reprioritization of requirements based upon threat capabilities, the initial focus of the EWISSP program will be toward the development of an EO/IR detection, warning, and countermeasures capability with future capabilities development in the RF technology area. This activity includes support to the Sea Strike Enabling Capability for Hostile Fire Detection and Response Spiral 1 (U/A OPS EC 1C).

The decrease in funding from FY 2006 to FY 2007 is due to the EWISSP program moving to PE 0603114N in FY 2007.

FY 2005 Accomplishments:
• Continued the development of advanced technology applications to increase the survivability of the Marine EFV.
• Continued development of the EO countermeasures subsystem.
• Continued testing prototype flexible masts for EO countermeasures sensors in parallel with compatibility testing with existing and/or planned basic physical and electrical designs and features of the EFV platform.
• Continued integration of the EWISSP with the EFV to address issues related to limited space and power available in the EFV as well as severe restrictions on modifications to the vehicle's exterior configuration.
• Initiated assembly and integration of the Situational Awareness (SA) (2.0-18.0 GHz) and Electronic Attack

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 2919 PROJECT TITLE: COMMUNICATIONS SECURITY

(EA) subsystems. Focus was on hardware and software integration at the subsystem level.
• Initiated incremental testing of the four categories of subsystems as they were assembled to ensure technical performance requirements are being met.
• Initiated implementation of design configuration management as part of the transition effort to track development and integration progress and identify technology insertion points with a maximum overall limitation of 10 percent of platform cost.

FY 2006 Plans:
• Continue all efforts of FY 2005.
• Complete fabrication and test of EWISSP subsystems. Integrate subsystems into EWISSP prototype systems for final demonstration and test.
• Initiate EWISSP IR Threat Warning System (IR TWS) Operational Demonstration. Show capability of the IR TWS to detect simulated missiles in a field environment, including evaluation of response time, azimuth and elevation accuracy, and false alarm rate as compared to the performance goals of 90 deg azimuth x 45 deg elevation with .5 deg resolution.
• Initiate field demo of integrated system on surrogate vehicle (High Mobility Multi-purpose Wheeled Vehicle (HMMWV)), to demonstrate EO/IR sensor detection and cueing of laser decoy, the 310 pound Multi-function Electro Optical System (MEOS) countermeasures, and optical augmentation for situational awareness and target detection and Identification.

FY 2007 Plans:
• The EWISSP program moves to PE 0603114N.

	FY 2005	FY 2006	FY 2007
GLOBAL POSITIONING SYSTEM (GPS) & NAVIGATION TECHNOLOGY	4,803	4,459	4,850

This activity enhances Global Positioning System anti-jam (GPS AJ) capabilities and develops other technologies to provide alternative navigation methods. In the GPS AJ area, Space-Time Adaptive Processing (STAP) is being pursued to remove the operational risks associated with enemy jamming of GPS functions. Also, the next generation GPS receiver will be programmed with M-code; therefore, both the next generation M-code and the existing C/Y-codes must be used at the same time frame. Office of Naval Research initiated a transitional receiver which will accommodate both the C/Y- and M-codes. The alternative navigation methods investigated include GPS receivers with a tightly coupled Inertial Navigation System (INS); organic Link-16 relative navigation; gravity gradiometer development, used in a terrain-following concept; and an electro-

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 2919 PROJECT TITLE: COMMUNICATIONS SECURITY

optic accelerometer developed as an improved element in INS. This activity also develops the atomic clock for inclusion in Naval Systems. The atomic clock efforts include small, low-cost Rubidium (Rb), and Coherent Population Trapping (CPT) atomic clock development. These areas will provide alternatives to GPS navigation and alternatives to the availability of precise GPS-provided time transfer.

FY 2005 Accomplishments:
• Continued the development and simulation of GPS M-code and C/Y-code input to refine specifications for multi-code Applications Specific Integrated Circuit (ASIC) development.
• Continued the development of a small, lightweight Micro-Electro-Mechanical Systems (MEMS) accelerometer for navigation systems; fabricated an Electro-optic Accelerometer.
• Continued the development of algorithms for distributed time scaling other supporting scaling; developed architectures necessary to establish a Navy Global Coordinated Time Scale; tested the algorithms via both simulation and using actual clock data provided by the U.S. Naval Observatory (USNO).
• Continued the development of a 10cc Rubidium (Rb) Coherent Population Trapping (CPT) atomic clock for tactical applications.
• Completed the integration of the Frequency Hopping (FH) M-code correlator, data recorder, and Field Programmable Gate Array (FPGA) GPS software receiver card. Also, conducted fast M-code acquisition tests.
• Completed the development of the Adaptive Bathymetric Estimator (ABE).
• Initiated the development of an Optical Ring Gyroscope Chip. Fabricated dual-arm, 2 cm diameter optical ring resonator in neodymium-doped substrates, and incorporated an electro-optics phase modulator into the ring.
• Initiated the demonstration project of nonlinearity-constrained adaptive beam forming for defeating BPSK jammers. Developed an algorithm to mitigate the loss of Signal-to-Noise Ratio (SNR) through a combination of adaptive space-time-frequency signal processing techniques.

FY 2006 Plans:
• Continue all efforts of FY 2005, less those noted as completed above.
• Complete the development of a 10cc Rb Coherent Population Trapping (CPT) atomic clock for tactical applications.
• Complete the fabrication of an ASIC chip for GPS M- and C/Y-code and test with GPS II and GPS III signals.
• Initiate the development of two gravity gradient devices. The first is an Octadecahedral Gravity Gradiometer in which the full-Gravity Gradient sensor is determined to separate translational and rotational effects from gravity effects. The second is a Ribbon Sensor Gravity Gradiometer whose vibrational modes in a gravitational field can be related to the gravity gradient tensor elements.

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 2919 PROJECT TITLE: COMMUNICATIONS SECURITY

• Initiate the development of magnetic map requirements for Magnetic Passive Navigation (MPN). Define top-level MPN performance requirements, establish MPN reset algorithm, develop system hardware requirements, investigate existing magnetic maps and models, develop map and modeling requirements, determine risk areas, evaluate performance projections, and prepare a final report.

FY 2007 Plans:
• Continue all efforts of FY 2006, less those noted as completed above.
• Initiate the 5-cc accelerometer with the Embedded GPS Inertial (EGI) System for aircraft avionics applications. Initiate the 5-cc accelerometer with the Embedded GPS Inertial (EGI) System for aircraft avionics applications.
• Initiate the Integrated Optically Transduced Gyro Assembly (IOTA) project.
• Initiate the Enhanced AJ GPS Receiver Technology (EAGRT) project.
• Initiate the Advanced Anti-Spoofing Detection and Isolation for GPS Acquisition project.
• Initiate the Scaleable Integrated Micro Optical Gyroscope (SIMOG) project.
• Initiate the Navigation Grade Microfabricated Integrated Optical Gyro (MIOG) project.
• Initiate the Navigation Grade Sub-Harmonic Lateral Mode Gyro (GSLMG) project.

	FY 2005	FY 2006	FY 2007
INFORMATION SECURITY RESEARCH	1,916	1,783	1,940

The goal of this activity is to protect the Navy and Joint information infrastructure from hostile exploitation and attack. This requires situational awareness of network assets and operations. This activity focuses, in part, on integrating successful proof-of-concept research prototypes developed under PE 0602235N. The goal is to develop tools, techniques and methodologies in order to: improve network resistance to denial of service attacks; improve indications and warnings of suspect activities; conduct traffic analysis; monitor and assess network status and health; identify new capabilities to analyze and network vulnerabilities and attacks; measure the effectiveness of Information Assurance (IA) protective measures; and improve the quality and level of certification of IA software.

FY 2005 Accomplishments:
• Continued the development and demonstration of correlated statistical analysis of pro-active monitoring of intrusive network behaviors, specifically addressing network misuse at the lowest/slowest event level (e.g., low bandwidth, high timeline events).
• Completed development, demonstration, and common criteria evaluation of the Naval Research Laboratory (NRL)

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 2919 PROJECT TITLE: COMMUNICATIONS SECURITY

Network Pump for its ability to transfer data securely from high to lower levels of classification across dissimilar networks while providing strong authentication and secure administration capabilities.
• Initiated development of a secure, survivable, and dynamic service-oriented enterprise architecture to support military missions, addressing grid computing, peer-to-peer computing, and the adaptation of security and survivability features to those technologies for military use.

FY 2006 Plans:
• Continue all efforts of FY 2005, less those noted as completed above.
• Complete the development and demonstrate correlated statistical analysis of pro-active monitoring of intrusive network behaviors, specifically addressing network misuse at the lowest/slowest event level (e.g., low bandwidth, high timeline events).
• Initiate development of the security management tool that provides a common picture of the networked environment with respect to information assurance and security, with emphasis on visualization capabilities to support active computer network defense.
• Initiate development of a tool for the development of agents that integrates unified modeling language (UML) and that provides a verifiable agent programming language, an inter-agent communication protocol, security agents for enforcing run-time properties, and property checkers.

FY 2007 Plans:
• Continue all efforts of FY 2006, less those noted as completed above.
• Complete the development of and demonstrate a secure, survivable, and dynamic service-oriented enterprise architecture to support military missions, addressing grid computing, peer-to-peer computing, and the adaptation of security and survivability features to those technologies for military use.
• Initiate development of integrated capabilities that support battle damage assessment and infrastructure and asset protection based on information provided by the common picture of the networked environment with respect to information assurance and security.

	FY 2005	FY 2006	FY 2007
MARINE MAMMALS	1,000	1,000	1,000

This initiative provides data and technology for making informed decisions regarding the interaction of naval activities with protected marine life and habitats to enable platform operation and force projection, and maximize use of Navy training ranges within environmental constraints. Ensure Navy compliance with national

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 2919 PROJECT TITLE: COMMUNICATIONS SECURITY

environmental laws, Executive Order 12114, and SECNAVINST 5090.1.b while still maintaining full operational and training exercise capabilities.

FY 2005 Accomplishments:
• Continued temporary threshold shift (TTS) data collection to determine time, energy trade-off and recovery rates for long duration sound exposures and multiple pings typical of Navy operations and training.
• Expanded Marine Mammal Monitoring (M3R) frequency bandwidth for tracking beaked whales. Develop classification software for identification of marine mammal species and populations. Continued Atlantic Undersea Test Evaluation Center (AUTEC) on-site analysis and Pacific Missile Range Facility (PMRF) data collection with visual surveys. Initiated Technology Readiness Level (TRL) assessment and transition plan.

FY 2006 Plans:
• Continue all efforts of FY 2005.
• Develop an Acoustic Safety Criteria Model for multiple sonar pings on dolphins and toothed whales.
• Complete TTS data collection for dolphins.
• Complete M3R TRL and transition plan; develop technology transition agreement (TTA) with CNO N45. Test M3R classification software for identification of species/populations and complete M3R Technology development at AUTEC.
• Initiate TTS data collection to develop cumulative sound exposure model for seals and sea lions.

FY 2007 Plans:
• Continue all efforts of FY 2006 less those noted as completed above.
• Complete TTS Acoustic Safety Criteria Model for multiple sonar pings on toothed whales.
• Initiate transition plan for demonstration and evaluation of M3R technology at other Navy ranges.
• Initiate sound exposure study at AUTEC to develop effective M3R mitigation methodology for Navy ranges.
• Initiate transition from behavioral to electrophysiological measurements of hearing/TTS in marine mammals.

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

PE 0601153N (Defense Research Sciences)
PE 0602114N (Power Projection Applied Research)
PE 0602123N (Force Protection Applied Research)
PE 0602131M (Marine Corps Landing Force Technology)

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 2919 PROJECT TITLE: COMMUNICATIONS SECURITY

PE 0602235N (Common Picture Applied Research)
PE 0602236N (Warfighter Sustainment Applied Research)
PE 0602271N (RF Systems Applied Research)
PE 0603114N (Power Projection Advanced Technology)
PE 0603123N (Force Protection Advanced Technology)
PE 0603236N (Warfighter Sustainment Advanced Technology)
PE 0603271N (RF Systems Advanced Technology)
PE 0603609N (Conventional Munitions)
PE 0603640M (USMC Advanced Technology Demonstrations)
PE 0603658N (Cooperative Engagement)
PE 0603727N (Joint Experimentation)
PE 0604307N (Surface Combatant Combat System Engineering)
PE 0604518N (Combat Information Center Conversion)
PE 0204152N (E-2 Squadrons)
PE 0205601N (HARM Improvement)
PE 0206313M (Marine Corps Communications Systems)
PE 0303140N (Information Systems Security Program)
PE 0308601N (Modeling and Simulation and Support)

NON-NAVY RELATED RDT&E:

PE 0603750D8Z (Advanced Concept Technology Demonstrations)

D. ACQUISITION STRATEGY:
Not applicable.

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 9999 PROJECT TITLE: Congressional Plus-Ups

CONGRESSIONAL PLUS-UPS:

	FY 2005	FY 2006
AUTONOMOUS SERVICE AGGREGATION FOR THE EXPEDITIONARY WARFARE TESTBED	0	1,000

This effort supports research into the autonomous service aggregation for the expeditionary warfare testbed.

	FY 2005	FY 2006
CIP ADVISOR FOR GLOBAL MARITIME AWARENESS	0	1,000

This effort supports Critical Infrastructure Protection (CIP) advisor for global maritime awareness research.

	FY 2005	FY 2006
CONSOLIDATED UNDERSEA SITUATIONAL AWARENESS SYSTEM (CUSAS)	3,278	2,900

FY 2005 - This effort continued development of the openly-architected agent-based decision support software for the Undersea Warfare Decision Support System and the Aircraft Carrier Tactical Support Center. The deliverable was an agent-based software module for the Anti-Submarine Warfare Combat, Command, and Control System.

FY 2006 - This effort supports CUSAS research.

	FY 2005	FY 2006
DYNAMIC BROKERING IN THE EXPEDITIONARY WARFARE TESTBED	964	0

This effort developed dynamic brokering capabilities in the expeditionary warfare tested for refining the discovery process of the service-based architecture to support faster performance, better communications throughout usage, and the underpinnings of multi-level security to support user requirements. The open service-based Expeditionary Warfare Testbed architecture supported the inclusion of new web services. Scalability and usability dictated minimizing redundancy while maintaining quality of service.

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 9999 PROJECT TITLE: Congressional Plus-Ups

	FY 2005	FY 2006
IMPROVED SHIPBOARD COMBAT INFORMATION	0	2,000

This effort supports improved shipboard combat information research.

	FY 2005	FY 2006
INTERNET PROTOCOL VERSION 6	970	1,000

FY 2005: This effort developed the Internet Protocol Version 6 (IPv6) testbed consisting of servers, clients and infrastructure, including external site partners. The project developed remote facilities required to model, simulate and test IPv6 in stressed mobile RF environments. Draft IPv6 protocols addressing Mobile Ad-Hoc Network (MANET), Load Balancing and Auto-Configuration of network participations were tested and evaluated. Current status shows that implementation of these concepts with IPv6 protocols will yield improved circuit connectivity, versatility and robustness over current practices.

FY 2006 - This effort supports internet protocol version 6 research.

	FY 2005	FY 2006
MARITIME DOMAIN IDENTIFICATION SYSTEM	0	1,000

This effort supports maritime domain identification system research.

	FY 2005	FY 2006
MIST AFFORDABLE HIGH RESOLUTION PHASED ARRAY RADAR	0	3,000

This effort supports MIST affordable high resolution phased array radar research.

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603235N PROGRAM ELEMENT TITLE: COMMON PICTURE ADVANCED TECHNOLOGY
PROJECT NUMBER: 9999 PROJECT TITLE: Congressional Plus-Ups

	FY 2005	FY 2006
SHIPBOARD AUTOMATED RECONSTRUCTION CAPABILITY	0	1,500

This effort supports shipboard automated reconstruction capability research.