FY 2003 RDT&E, N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2002

BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603235N
PROGRAM ELEMENT TITLE: Common Picture Advanced Technology

(U) COST: (Dollars in Thousands)

| PROJECT NUMBER & TITLE | FY 2001 ACTUAL | FY 2002 ESTIMATE | FY 2003 ESTIMATE | FY 2004 ESTIMATE | FY 2005 ESTIMATE | FY 2006 ESTIMATE | FY 2007 ESTIMATE | TO COMPLETE | TOTAL PROGRAM |
|---|---|---|---|---|---|---|---|---|---|
| R2919 | Communications Security | | | | | | | | |
| | ** | 48,122 | 37,753 | 44,022 | 63,556 | 64,066 | 61,295 | CONT. | CONT. |
| R9020 | National Cargo Tracking Program | | | | | | | | |
| | 1,685 | 0 | 0 | 0 | 0 | 0 | 0 | 1,685 | |
| TOTAL | ** | 49,807 | 37,753 | 44,022 | 63,556 | 64,066 | 61,295 | CONT. | CONT. |
| Defense Emergency Response Fund (DERF) | | 7,000 | 7,000 | 7,000 | 6,000 | 4,000 | CONT. | CONT. | |

**The Science and Technology (S&T) Program Elements (PEs) were restructured in FY 2002. FY 2001 efforts were funded in PEs 0603238N, 0603794N and 0603707N.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:

(U) This PE includes funds for the advanced technology development, test and evaluation of a dynamic distributed common picture based on leading edge technologies that will improve situational awareness across Command echelons from the Commander in Chief (CINC) to tactical units afloat and war-fighters ashore. This effort will demonstrate a capability for building and maintaining a seamless secure, common operational and tactical picture of the total battlespace, thereby providing Naval Forces a capability for self-synchronization, increased speed of command, and optimized resource allocations. The Common Picture Program supports the following Future Naval Capabilities (FNCs): Knowledge Superiority and Assurance (KSA); Missile Defense; Littoral Anti-Submarine Warfare (ASW); and Platform Protection. Advanced technologies to be developed, tested and demonstrated include: (1) communication protocols and networks for secure data link operation; (2) information networks for cooperative target tracking; (3) information and knowledge management tools; (4) exploitation, extraction and distribution tailored information; (5) communication security and information assurance technologies; (6) decision support tools for use in network-centric operations and collaborative environments; (7) multi-source integration for composite combat identification (ID) and target tracking; (8) small platform situational awareness and protection; and (9) cross-platform data fusion for formulating a common tactical/environmental picture in support of littoral ASW.

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

FY 2003 RDT&E, N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2002

BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603235N
PROGRAM ELEMENT TITLE: Common Picture Advanced Technology

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is budgeted within the ADVANCED TECHNOLOGY DEVELOPMENT Budget Activity because it encompasses design development, simulation, or experimental testing of prototype hardware to validate technological feasibility and concept of operations and reduce technological risk prior to initiation of a new acquisition program or transition to an ongoing acquisition program.

B. (U) PROGRAM CHANGE SUMMARY:

| | FY 2001 | FY 2002 | FY 2003 |
|---|---|---|---|
| (U) FY 2002 President's Budget | ** | 48,583 | |
| (U) Adjustments from FY 02 PRESBUDG: | | | |
| Section 8123 Management Reform Initiative Reduction | | -444 | |
| FFRDC Reduction | | -32 | |
| Congressional Plus up | | 1,700 | |
| (U) FY 2003 President's Budget Request: | ** | 49,807 | 37,753 |

**The Science and Technology PEs were restructured in FY 2002. FY 2001 efforts were funded in PEs 0603238N, 0603794N and 0603707N.

FY 2003 RDT&E, N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2002

BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603235N
PROGRAM ELEMENT TITLE: Common Picture Advanced Technology

(U) COST: (Dollars in Thousands)

| PROJECT NUMBER & TITLE | FY 2001 ACTUAL | FY 2002 ESTIMATE | FY 2003 ESTIMATE | FY 2004 ESTIMATE | FY 2005 ESTIMATE | FY 2006 ESTIMATE | FY 2007 ESTIMATE | TO COMPLETE | TOTAL PROGRAM |
|---|---|---|---|---|---|---|---|---|---|
| R2919 Communication Security | ** | 48,122 | 37,753 | 44,022 | 63,556 | 64,066 | 61,295 | CONT. | CONT. |

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B. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 2001 ACCOMPLISHMENTS:

- (U) ($3,300) DECISION SUPPORT SYSTEMS: Decision Support System supports the KSA FNC. The emphasis is on developing information and knowledge technologies in the area of computer assisted decision aids. This technology development is based on the Fleet's need to build and maintain a timely operational/tactical picture of the total battlespace across all Command echelons from the CINC to tactical units afloat as well as warfighters ashore. In FY 01, the Enterprise Workstation was delivered to United States Commander in Chief Pacific (USCINCPAC), United States Commander in Chief Strategic (USCINCSTRAT) Command and Defense Threat Reduction Agency (DTRA).

The Enterprise Workstation enables an operator to simultaneously operate on two separate local area networks with a single workstation. This capability improves an operator's ability to correlate information and reduces equipment and maintenance costs by 60 percent. Also, the Defense Collaboration Tool Suite (DCTS) was delivered to USCINCPAC. Along with this a six-panel large screen display was delivered to USCINCSTRAT with software that enables the Command and Control (C2) Concept Development laboratory at Strategic Command (STRATCOM) to develop tactics, techniques, and procedures for the effective display of summarized C2 information. Completed the formal assessment of the FY01 demonstration, establishing the potential military application of CINC21 developed integrated services. (FY 2001 accomplishments were funded in PE 0603707N.)

- (U) ($5,000) SURFACE/AEROSPACE SURVEILLANCE MULTI-SOURCE INTEGRATION AND COMBAT IDENTIFICATION: The Surface/Aerospace Surveillance Multi-source Integration and Combat Identification Advanced Technology program in FY 2001 conducted system studies to define overall system architectures in the E-2C Airborne Early Warning (AEW) aircraft and the Navy's EP-3 aircraft. The E-2C Multi-Source Integration (MSI) studies focused on the total sensor and avionics system architecture with emphasis on defining electrical and mechanical interfaces including signal levels and timing to enable the integration of multiple sensor data streams on-board the aircraft. This technology significantly reduces crew/operator workload and enhances the ability of the aircraft to rapidly determine combat threat identification for hand-off/cueing via the Cooperative Engagement Capability (CEC) network/tactical data links to other warfighting participants. Laboratory demonstrations were conducted in FY01, which validated system level input/output functionality and demonstrated fusion and correlation of Electronic Support Measures (ESM) and radar track algorithms were highly effective in reducing multiple redundant tracks. EP-3 system efforts focused on determining the mix and fidelity of available sensor parameters and their contribution to the determination of high confidence combat identification. The EP-3 studies also focused on development of system level interfaces to facilitate networking of Story Maker system combat identification products to other warfighting units. The program completed System studies to quantify the impact of distributing real time Composite Combat Identification (CCID) information to battle group and other theater users on available network and data link bandwidths. (FY 2001 accomplishments were funded in PE 0603238N.)

- (U) ($14,808) EXTENDING THE LITTORAL BATTLESPACE: Extending the Littoral Battlespace (ELB) is an Advanced Concept Technology Demonstration (ACTD) intended to extend high throughput wireless networking across a Naval Expeditionary Task Force including an embarked Marine Air-Ground Task Force (MAGTF), as part of a overall Joint Task Force. The ACTD demonstrated enhanced integrated command, control/fires, and targeting capability in support of joint dispersed units, enabling common situational awareness, enhanced access to joint fires, facilitating dynamic maneuver and reducing fratricide. In FY01 a partial ELB ACTD, equipment suite successfully completed an operational deployment with the USS TARAWA ARG/13th MEU to the Arabian Gulf. Additionally, the ACTD successfully completed Full Systems Test 3 followed by Major Systems Demonstration Two (MSD II) as part of Exercise Kernal Blitz (Experimental). A Military Utility Assessment (MUA) was completed as part of MSD II. The draft MUA strongly endorsed the capabilities demonstrated during MSD-II. USCINCPAC is

expected to be release the final draft of the MUA by late January 2002. (FY 2001 accomplishments were funded in PE 0603238N.)

- (U) (3,000) GLOBAL POSITIONING SYSTEM (GPS) & NAVIGATION TECHNOLOGY: GPS is essential for many modern naval and maritime systems, and generally speaking it is essential that GPS-derived navigation and timekeeping services be made available to platforms and weapons at the highest level of accuracy and with the highest possible confidence at reasonable cost. Unfortunately, the GPS signal is a low-power signal that is susceptible to interference. Therefore, there is a need for developing GPS anti-jam technology and non-GPS navigation devices and systems. The emphasis of this thrust is in the following three areas: Integration of the GPS and Inertial Navigation System (INS), relative navigation system using GPS and other existing position location systems such as Link 16/Joint Tactical Information Distribution System (JTIDS) and Enhanced Position Location Reporting System (EPLRS), and non-GPS navigation system (Atom Interferometer Gravity Gradiometer for submarines. The first effort deals with the development of integrated GPS and INS system, which draws upon the commercially available INS with GPS when the GPS is jammed. The second effort deals with the development of a relative navigation system with GPS and Link 16/JTIDS and EPLRS. A prototype system was developed for aircraft using a Kalman filter and a track integration system. The third effort deals with alternatives to GPS and to relative navigation. The cooled atom was used to detect the gravity gradient, thereby, developing a collision avoidance system for submarines. Another alternative effort was concerned with the development of a Rubidium (Rb) atomic clock using the coherent population trapping (CPT) technology. The technical objective of an Rb atomic clock is to eliminate a maser cavity, thereby, reducing the size of the clock. A small, accurate and affordable atomic clock can be used as a timekeeping device for various naval platforms when GPS-derived clock is denied by jamming. (In FY01, work was funded in PE 0603794N.)

2. (U) FY 2002 PLANS:

(U) ($12,884) KNOWLEDGE SUPERIORITY AND ASSURANCE (KSA) Combined FY01 Thrust entitled Decision Support Systems and Secure Networked Information System under the thrust title KSA. The KSA Future Naval Capability (FNC) enables warfighters to plan and execute operations that are coordinated across organizations and command echelon, including coalition partners. The KSA FNC addresses warfighter needs in four areas: a) Secure Networked Information Systems, b) 21st Century Command, c) Common Picture, and d) Time Sensitive Decision Making. Secure Networked Information Systems emphasize developing technologies supporting secure heterogeneous wireless communication networks for data (e.g. voice, multi-media) links and interconnecting air, ship, submarine and land platforms. In the area of the 21st Century Command, the objective is to develop a capability to correlate and present information from diverse sources such as news, messages, voice reports, and briefings in near real time. Common Picture addresses developing software tools as aid to the planning, monitoring, and re-planning cycle of combat operations. The last area, Time Sensitive Decision Making, addresses the real time and quality of information technology issues. Examples of Time Sensitive Decision Making technology area include: automatic image registration in support of geo-locating targets, course of

action simulation, projection, and assessment, and visualization of the planned battlespace. In FY02, the emphasis continues towards developing information and knowledge management technologies for use in building and maintaining a timely common operational and tactical picture of the total battlespace. Technology demonstrations include: (1) Knowledge based operations with intuitive visualization for Command Center operations; (2) multi-source integration; situational assessment decision aids that reduces operator workload and optimize resource allocation; (3) interactive distributed planning, monitoring and re-planning software; and (4) collaborative technologies to support distributed operations and time sensitive decision making.

- (U) ($4,600) INTEGRATED ASW: Integrated ASW (IASW) supports the Littoral Anti-Submarine Warfare (LASW) FNC. The emphasis is on developing a common ASW tactical and environmental picture to improve detecting, tracking, and classifying subsurface platforms. Technologies that will be developed and demonstrated include; cross platform data fusion, common sensor performance predictions across platforms, and capturing sensor performance uncertainty. In FY 2002 Integrated ASW builds on the efforts from the previous year (under PE 0603747N Cooperative ASW) and begins extending the technology previously developed for inter-platform fusion between surface combatant ships and Maritime Patrol Aircraft (MPA). In addition, the technology for fusion of data from MPA radar data and Extended Echo Ranging (EER) data will be initiated. In support of these algorithm developments, data collections and sea-tests will be performed. The algorithms will be assessed using recorded data and taken to sea on appropriate platforms. In FY 2002, IASW will also begin focusing on the Common Environmental Picture phase of the program. The new effort builds on the previous work in improved fusion to incorporate up-to-date environmental information into sensor performance prediction capability. It will leverage “through-the-sensor” in-situation measurements to enable tactically useful planning and performance prediction. The value-added of the improved sensor performance capability will be assessed using the previously developed capability.

- (U) ($7,500) SURFACE/AEROSPACE SURVEILLANCE MULTI-SOURCE INTEGRATION AND COMBAT IDENTIFICATION: Surface/Aerospace Surveillance Multi-Source Integration & Combat ID supports the Missile Defense FNC. The emphasis of this thrust is on development of advanced technologies for Multi-source Integration, Cooperative Target Tracking, Improving Combat Identification and extending Naval Capabilities to engage air targets near point of origin by using all source data to formulate a common operational and tactical picture of the total battle space. In FY 2002, the program initiated advanced development efforts to fabricate a field test model of the Affordable Ground Based Radar (AGBR). AGBR is being developed as a multimode/multi-mission radar specifically for US Marine Corps expeditionary warfare operations. AGBR technology developed in this Program Element (PE) is planned for insertion into the Marine Corps Multi-Role Radar System (MRRS) development in the Fiscal year 2004/2005 time frame. MRRS when fielded in the Fiscal year 2007/2008 time frame is intended to replace and perform the functions of three current battlefield radars (TPS-63, TPS-73, MPQ-62). (This project will move to PE 0603271N in FY 2003.) Following the successful initial laboratory demonstrations of the E-2C multi-source integration and data fusion technologies, development and assessment of algorithms to fuse and correlate off-board satellite communications information (SATCOM) with on-board ESM information will be

conducted. Fusion and correlation of on-board and off-board ESM information contributing to Composite Combat Identification (CCID) information will continue.

- (U) ($1,000) PLATFORM AWARENESS & PROTECTION/ELECTRONIC WARFARE SYSTEMS: Platform Awareness & Protection supports the Platform Protection FNC. Current small platforms (both surface and airborne) have little to no Situational Awareness (SA) capability that can significantly increase their battlefield effectiveness and combat survivability. The focus of this effort is on developing a compact, small platform SA capability that is particularly suited for smaller ships, amphibious assault vehicles, and surveillance aircraft. This PE integrates successful proof-of-concept hardware/software developed under PE0602235N, into systems suitable for capability demonstration under naval environments and tactical conditions. The SA system, a subset of the Electronic Warfare Integrated System for Small Platforms (EWISSP) program, addresses several small surface platform self protection system integration requirements and employs miniature millimeter-wave integrated circuit (MMIC) devices and a new antenna to form an extremely compact, low volume/light weight system that provides very accurate hemispheric direction finding and self-protection capability against threat missile systems. EWISSP is being executed in four phases. During Phase I (FY02-FY03) the EWISSP program will continue to review the candidate platforms' concept of employment (COE) and tradeoffs leading to the definition of performance requirements for an affordable Electronic Warfare (EW) system capable of providing substantially increased platform survivability will be conducted. Advanced prototypes of the Compact Small Platform SA projects within the EWISSP program are specifically addressed under this PE. Planned tasked under this PE include top-level investigations of approaches to integrate the EWISSP into defined platforms and development of demonstration plans.

- (U) ($15,000) COMMUNICATION SECURITY - Classified Program

- (U) ($1,000) INFORMATION SECURITY RESEARCH: The goal of the Navy Information Security Thrust is to ensure the continued protection of Navy and Joint information and information systems from hostile exploitation and attack. The rapid rate of change in the underlying commercial and government information infrastructures makes the provision of security an increasingly complex and dynamic problem. Information Assurance (IA) technologies and deployment strategies must evolve quickly to meet the rapidly evolving threats and vulnerabilities. No longer can information security be separate from the information infrastructure. The program develops frameworks, architectures, and products based on mission threats, information criticality, exploitation risks, common criteria, and integrated Joint information system efforts in close cooperation with Office of the Chief of Naval Operations and National Security Agency. The FY02 work includes: (1) Determination of vulnerabilities to information security resulting from legacy Naval information systems, their insertion into networked environments, their systems management, and their modernization; and (2) Development of IA tools and techniques to assist system administrators and software developers in the rapid and effective IA evaluation of IT products.

- (U) ($1,000) EXTENDING THE LITTORAL BATTLESPACE: Extending the Littoral Battlespace (ELB) is an Advanced Concept Technology Demonstration (ACTD) to extend high throughput wireless networking across a Joint Task Force. The ACTD will demonstrate enhanced integrated command, control/fires, and targeting capability in support of joint dispersed units, enabling common situational awareness, enhanced access to joint fires, facilitating dynamic maneuver and reducing fratricide. In FY02, the effort will focus on transition of proven technologies to multiple acquisition programs, and refinement/system tests of the ELB ACTD equipment and application suite in preparation for calendar year (CY) 2003 deployment with Joint Task Force elements including a Navy Carrier Battle Group, Amphibious Readiness Group, Marine Air-Ground Task Force, Army Brigade Combat Team and Air Force Air Operations Center.

- (U) (3,638) GLOBAL POSITIONING SYSTEM (GPS) & NAVIGATION TECHNOLOGY: Three approaches are being pursued under this effort: The development of tightly coupled GPS and INS, the development of the relative navigation concept using GPS and other existing organic navigation systems in the fleet, and non-GPS navigation technology such as the atom interferometer gravity gradiometer. The first effort is to develop an integrated GPS and INS system, which draws upon the capability presently available in a GPS receiver with a tightly coupled micro-electronic mechanical system (MEMS). The second effort is to develop relative navigation efforts, which draw upon the capabilities presently available in the fleet that use Link 16/JTIDS and EPLRS systems. This approach attempts to locate elements in the battle group through RF signal time-of-flight. Over all, the relative navigation approach draws upon a wide range of navigation and precision clock capabilities available in the navy battle group and extends their availability through available communications links. The third efforts are to develop an alternative navigation system (Atom Interferometer Gravity Gradiometer) for submarines and to develop a miniaturized Rubidium atomic clock. In FY01, a prototype Gravity Gradiometer was constructed with an optical laser device and an electronic control device to prove the principle of the concept. In FY02, this effort will be concerned with the miniaturization of the Gravity Gradiometer. Likewise, in FY01 a prototype Rb atomic clock was constructed with an optical laser device and an electronic control device to prove the principle of the concept. In FY02, this effort will be concerned with the miniaturization of the Rb atomic clock.

- (U) ($1,500). MARINE MAMMALS: This area of effort provides both data and models for decision making regarding interactions of naval activities with protected marine life and habitats (marine mammals, birds, turtles, fish, fish habitat, etc.). In keeping with Navy environmental stewardship policies laid out in National Environmental Policy Act (NEPA), Executive Order (E.O) 12114, SECNAVINST 5090.1.b. and related documents, these common tactical picture advanced technologies are needed to ensure Navy compliance with appropriate environmental laws while maintaining full operational and exercise capabilities. The program provides hardware and software solutions that are uniquely suited to the marine environment in which Navy operates, and which are uniquely compatible to existing tactical and METOC (meteorological and oceanographic) assets used by Navy. No other agency or service is capable of providing the unique combination of biological information for a marine environment, placed in the context of other common tactical picture assets unique to the Navy's mission and arena of operation. This area of effort is new to PE 0603235N in FY01. Prior-year Basic and Applied Research programs (PE 0601153N and PE 0602121N) demonstrated new hardware and software systems capable of demonstration

in this PE: the selected FY02 projects follow: 1) Marine Mammal Monitoring on Navy Instrumented Test Ranges (M3R), a project of the Naval Undersea Warfare Center in Newport RI, is demonstrating the capability of Navy instrumented test ranges to self-monitor for protected marine life. Test ranges can use existing tactical sensing and signal processing assets, and minimal additional hardware and software for picking out biological signals, localizing and tracking them in the same way a tactical target of interest would be monitored, thus making the information readily accessible to staff trained only for the tactical mission of the range (no additional specialized training for environmental compliance monitoring). The initial test is sited at the AUTEC test range, and an additional demonstration is being set up for FY02-03 at the Pacific Missile Range Facility (PMRF). 2) Prediction of Acoustic Safety Criteria for Marine Mammals, developed by the Space and Naval Warfare Center in San Diego, and the University of California at Santa Cruz, provides an empirical database and predictive model for safe sound exposure levels for marine life, comparable to National Institute of Occupational Safety and Health (NIOSH) hearing safety standards for humans in the workplace. The interim database and model is now used in all Navy environmental compliance documents, and a final version anticipated in 12-24 months.

3. (U) FY 2003 PLANS:

- (U) ($17,500) KNOWLEDGE SUPERIORITY AND ASSURANCE (KSA): KSA Future Naval Capability (FNC) enables warfighters to plan and execute operations that are coordinated across organizations and command echelon, including coalition partners. The KSA FNC addresses warfighter needs in four areas: a) Secure Networked Information Systems, b) 21st Century Command, c) Common Picture, and d) Time Sensitive Decision Making. Secure Networked Information Systems emphasize developing technologies supporting secure heterogeneous wireless communication networks for data (e.g. voice, multi-media) links and interconnecting air, ship, submarine and land platforms. In the area of the 21st Century Command, the objective is to develop a capability to correlate and present information from diverse sources such as news, messages, voice reports, and briefings in near real time. Common Picture addresses developing software tools as aid to the planning, monitoring, and re-planning cycle of combat operations. The last area, Time Sensitive Decision Making, addresses the real time and quality of information technology issues. Examples of Time Sensitive Decision Making technology area include: automatic image registration in support of geo-locating targets, course of action simulation, projection, and assessment, visualization of the planned battlespace. In FY03, the emphasis continues towards developing information and knowledge management technologies for use in building and maintaining a timely common operational and tactical picture of the total battlespace. Specific projects include: (1) sea combat commanders' module for embarked staff; (2) common undersea picture architecture; (3) course of action analysis tool for identifying mobile time sensitive targets; and (4) comprehensive, analytic, real-time execution in joint air operations.

- (U) ($4,600) INTEGRATED Anti-Submarine Warfare: Integrated ASW supports the Littoral Anti-Submarine Warfare (ASW) FNC. The emphasis is on developing a common ASW tactical and environmental picture to improve detecting, tracking, and classifying subsurface platforms. Technologies that will be developed and demonstrated include; cross platform data fusion, common sensor performance predictions across platforms, and capturing sensor

performance uncertainty. In FY 2003, Integrated ASW concludes the development and assessment of the advanced fusion engines and documents the results of the assessments and sea tests. A final sea test will be completed early in FY03. The Common Environmental Picture phase of the program will concentrate on data collection events and the initial architecture for sharing environmental data within a tactical timeline. Critical areas for improvement in sensor performance prediction will be identified and tasks initiated or accelerated.

- (U) ($3,300) SURFACE/AEROSPACE SURVEILLANCE MULTI-SOURCE INTEGRATION AND COMBAT IDENTIFICATION: Surface/Aerospace Surveillance Multi Source Integration & Combat ID supports the Missile Defense FNC. The emphasis of this thrust continues to be on development of advanced technologies for Multi-Source Integration, Cooperative Target Tracking, Improving Combat Identification and extending Naval Capabilities to engage air targets near point of origin by using all source data to formulate a common operational and tactical picture of the total battle space. The Affordable Ground Based (AGBR) was moved to PE 0603271N in FY 2003. In FY 2003, the program of platform (E-2C) Multi-Source Integration (MSI) project, that is developing advanced technology to improve combat system efficiencies and to reduce operator workload, will continue in the development and optimization of information fusion and correlation techniques including optimization of algorithms to fuse and correlate off-board satellite communication information with on-board Electronic Support Measures (ESM) information. The project will initiate the development of interfaces and fusion algorithms to enable the integration and fusion of E-2C Infrared Search and Track sensor information with information from the on-board radar, Identification Friend or Foe (IFF) and the Electronic Support sensor. Complete development and laboratory/hardware in the loop evaluation of on-board/off-board ESM Composite Combat Identification algorithms.

- (U)($3,800) PLATFORM AWARENESS & PROTECTION/ELECTRONIC WARFARE SYSTEMS: Platform Awareness & Protection supports the Platform Protection FNC. Current small platforms (both surface and airborne) have little to no SA capability that can significantly increase their battlefield effectiveness and combat survivability. The focus of this effort will be to develop a compact, small platform SA capability that is particularly suited for smaller ships, amphibious assault vehicles, and surveillance aircraft. The SA system, a subset of the EWISSP program, will address several small surface platform requirements and will employ MMIC devices, a new antenna to form an extremely compact, low volume and light weight system that can provide very accurate hemispheric direction finding and a self-protection capability against threat missile systems. During Phase I (FY02-03) the threat to small Navy and Marine combat platforms will be defined, individual vehicle integration and installation requirements/limitations will be determined, and measurements of the platform signature (RF/Milli-Meter Wave (MMW)/IR) will be conducted. The platforms' Concept of Employment (COE) are reviewed and trade-offs leading to the definition of performance requirements for an affordable EW system capable of providing substantially increased platform survivability will be conducted. Following this, top-level system requirements and the system and subsystem designs will be developed. In FY03, EWISSP EO/IR efforts previously funded in PE 0603123N will migrate into this PE to facilitate the consolidation of EW related efforts. In Phase II (FY03-05) detailed EWISSP subsystem designs will be developed and the various component modules fabricated and integrated within the system. Interfaces between the various subsystems (both hardware (HW) and software) will also be defined and developed. Subsystem hardware and software performance will be successfully demonstrated to defined levels in a

laboratory/field environment at the end of this phase. In addition, they will be compatible with existing and/or planned basic physical and electrical designs and features of host platforms. For the EO/IR Self-Protection for Small Surface Vehicle project, work will continue on the fabrication of the off-axis laser detection system that provides wide area threat detection capability against laser-designated missiles and munitions. Fabrication and integration of the decoy subsystem will also continue using a lightguide capable of transmitting radiation from 0.4 um to 12 um from a mast height ranging from 3.5 to 8 meters.

- (U) ($1,553) INFORMATION SECURITY RESEARCH: The goal of the Navy Information Security Thrust is to ensure the continued protection of Navy and Joint information and information systems from hostile exploitation and attack. The rapid rate of change in the underlying commercial and government information infrastructures makes the provision of security an increasingly complex and dynamic problem. Information Assurance (IA) technologies and deployment strategies must evolve quickly to meet the rapidly evolving threats and vulnerabilities. No longer can information security be separate from the information infrastructure. The program develops frameworks, architectures, and products based on mission threats, information criticality, exploitation risks, the common criteria, and integrated Joint information system efforts in close cooperation with OPNAV and NSA. The FY03 work includes: (1) continuing the determination of vulnerabilities to information security resulting from legacy Naval information systems, their insertion into networked environments, their systems management, and their modernization; and (2) continuing the development of IA tools and techniques to assist system administrators and software developers in the rapid and effective IA evaluation of IT products.

- (U) ($1,000) EXTENDING THE LITTORAL BATTLESPACE: Extending the Littoral Battlespace (ELB) is an Advanced Concept Technology Demonstration (ACTD) to extend high throughput wireless networking across a Joint Task Force. The ACTD will demonstrate enhanced integrated command, control/fires, and targeting capability in support of joint dispersed units, enabling common situational awareness, enhanced access to joint fires, facilitating dynamic maneuver and reducing fratricide. In FY03, the effort will focus on transition of proven technologies to multiple acquisition programs, and system tests of the ELB ACTD equipment and application suite in preparation for CY03 workup, exercise and deployment with Joint Task Force elements including a Navy Carrier Battle Group, Amphibious Readiness Group, Marine Air-Ground Task Force, Army Brigade Combat Team and Air Force Air Operations Center.

- (U) (4,500) GLOBAL POSITIONING SYSTEM (GPS) & NAVIGATION TECHNOLOGY: Three approaches will be pursued under this effort: The development of tightly coupled GPS and Inertial Navigation System (INS), a relative navigation concept using GPS and other existing organic navigation assets in the fleet and non-GPS navigation technology such as the Atom Interferometer Gravity Gradiometer for submarines. The first effort is to develop an integrated GPS and INS system. This effort will replace the existing GPS receiver, a Costas loop filter, with a new Kalman filter tracking system. This will increase the anti-jamming (AJ) mitigation capabilities of the system. The second effort is to develop the relative navigation system by improving the precision time transfer with a more accurate clock, thereby, reducing the accuracy margin of the JTIDS. This will improve the relative navigation accuracy from 100 meters to about 30 meters. The third effort is to develop alternatives to GPS navigation. This category

draws upon wide-ranging physical principles and phenomena. One aspect is concerned with the development of an atom gravity gradiometer, which will be transportable on aircraft such as P3-C. The other aspect is also concerned with the development of field test unit (FTU) Rubidium atomic clocks. The current Rubidium atomic clock is housed in a 19-inch rack. The FTU clock will be compact (about the size of a beer can).

- (U) ($1,500) MARINE MAMMALS: This area of effort provides both data and models for decision-making regarding interactions of naval activities with protected marine life and habitats (marine mammals, birds, turtles, fish, fish habitat, etc.). In keeping with Navy environmental stewardship policies laid out in NEPA, E.O. 12114, SECNAVINST 5090.1.b. and related documents, these common tactical picture advanced technologies are needed to ensure Navy compliance with appropriate environmental laws while maintaining full operational and exercise capabilities. The program provides hardware and software solutions that are uniquely suited to the marine environment in which Navy operates, and which are uniquely compatible to existing tactical and METOC (meteorological and oceanographic) assets used by Navy. No other agency or service is capable of providing the unique combination of biological information for a marine environment, placed in the context of other common tactical picture assets unique to the Navy's mission and arena of operation. This area of effort is new to PE 0603235N in FY01. Prior-year Basic and Applied Research programs (PE 0601153N and PE 0602121N) demonstrated new hardware and software systems capable of demonstration in this PE. In FY03 M3R will complete testing of automated signal processing algorithms that will enable the automatic collection of marine mammal data during usage of Navy test ranges, thus providing an integral, non-interfering self-monitoring capability for environmentally compliant test range operations. In addition, M3R data will be ground-truth against visual and other, standardized acoustic monitoring assets, in order to calibrate M3R data with estimated numbers of marine mammals on the range. This ability to convert range detection rates to a numerical estimate of total animals present is required for environmental compliance documentation under NEPA and EO12114. Prediction of Acoustic Safety Criteria will prepare for demonstration a synthesized model that will be able to predict safety thresholds for any Navy sound source operated under any specified set of conditions. The result will be a set of consistent, standardized impact assessment criteria for all naval activities emitting underwater sound. An additional planned FY03 project would extend M3R capabilities to deployable sensing technologies for field application outside Navy instrumented test ranges, anywhere in the world, e.g. sonabuoys, or easily deployed towed or 'pop-up' instruments. The sensors and M3R-like processing would be rendered compatible with existing ship and helicopter-deployed tactical sensors used for ASW or similar missions, rendering the environmental compliance aspect of any operation or exercise transparent to existing operational and exercise hardware and protocols, resulting in environmental compliance capability with little or no impact on the tactical mission.

C. (U) PROGRAM CHANGE SUMMARY EXPLANATION:

(U) Schedule: Not Applicable.
(U) Technical: Not Applicable.

D. (U) OTHER PROGRAM FUNDING SUMMARY:

FY 2003 RDT&E, N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2002

BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603235N PROJECT NUMBER: R2919
PROGRAM ELEMENT TITLE: Common Picture Advanced Technology PROJECT TITLE: Communications Security

(U) RELATED RDT&E: The Navy's 6.1 program contributes to this effort.

(U) NAVY RELATED RDT&E:

(U) PE 0601153N (Defense Research Sciences)
(U) PE 0602114N (Power Projection Applied Research)
(U) PE 0602123N (Force Protection Applied Research)
(U) PE 0602131M (Marine Corps Landing Force Technology
(U) PE 0602235N (Common Picture Applied Research)
(U) PE 0602271N (RF Systems Applied Research)
(U) PE 0204152N (E-2 Squadrons)
(U) PE 0205601N (HARM Improvement)
(U) PE 0206313M (Marine Corps Communications Systems)
(U) PE 0603123N (Force Protection Advanced Technology)
(U) PE 0603271N (RF Systems Advanced Technology)
(U) PE 0603609N (Conventional Munitions)
(U) PE 0603640M (Marine Corps Advanced Technology Demonstrations
(U) PE 0603658N (Cooperative Engagement)
(U) PE 0604307N (Surface Combatant Combat System Engineering)
(U) PE 0604518N (Combat Information Center Conversion)

(U) NON NAVY RELATED RDT&E: Not Applicable

E. (U) SCHEDULE PROFILE: Not Applicable.

BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603235N
PROGRAM ELEMENT TITLE: Common Picture Advanced Technology

**CONGRESSIONAL PLUS-UPS**

This section describes the following Congressional Plus-Ups appropriated in FY 2001 or FY 2002 whose efforts fall within the scope of this Common Picture Advanced Technology program, or were appropriated in this program element;

Dominate Battlespace Command Initiative
National Cargo Tracking Program
National Technology Alliance

1. (U) FY 2001 Congressional Plus-ups:

- (U) ($5,795) DOMINATE BATTLESPACE COMMAND INITATIVE: The Dominant Battlespace Command project established a state-of-the-art battlespace visualization environment to advance Joint Vision 2020 objectives and the United States Navy's "Forward from the Sea" strategy. Dominant Battlespace Command integrates commercial technologies with emerging Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) capabilities, specifically to support situation awareness and planning for Navy and Marine Corps battlefield commanders and their staffs. In the absence of proven data correlation and information fusion algorithms, Dominant Battlespace Command visually represented the positions and tracks of ships, aircraft, and ground-based units, along with threat envelopes in a whole earth, scalable, multi-resolution virtual display linked to intelligence and operational databases. Therefore, Dominant Battlespace Command presented the commander with the battlespace that closely approximates what one sees in their "mind's eye." This realization of the mind's eye view is expected to result in intuitive actions that transform the 2-D battlespace into a 4-D battlespace so that the warfighter can view events in near-real time and fold in operational aspects associated with time - the $4^{th}$ dimension. In 2001, this capability was demonstrated using a Naval Fires context during Fleet Battle Experiment India and Global Wargame 2001 in order to collect user feedback on the utility of viewing battlefield information in this way. (Appropriated in PE 0603794N.)

- (U) ($9,659) NATIONAL TECHNOLOGY ALLIANCE (NTA): The NTA has successfully demonstrated the automatic registration of tactical video (10 frames per second) of national imagery for supporting Time Critical Targeting. They have also successfully integrated Moving Target Indication technologies with this capability. In addition, they have produced several enhancements to current capabilities to include registration and display of meteorological data, ocean bathymetric data, surface temperature data, wind speed and direction, and wave action data. Additional enhancements include the ability to access meta data on various sites, targets, weapons, and sensors. All of this capability is being integrated in a testbed at the Naval Coastal Systems Station, Panama City, FL to provide continued development, integration, and evaluation of hardware, software, and communications systems in support of littoral warfare, disadvantaged tactical users, as well as future C4ISR architectural studies. (Appropriated in PE 0603794N.)

FY 2003 RDT&E, N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2002

BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603235N
PROGRAM ELEMENT TITLE: Common Picture Advanced Technology

2. (U) FY 2002 Congressional Plus-ups:

- (U) ($1,685) NATIONAL CARGO TRACKING PROGRAM: The National Cargo Tracking Program will enable the Navy to track containerized cargo in support of Homeland Defense. The program will allow the Navy to merge disparate data sources into a central database, allowing for the expeditious analysis of cargo related data. Work would include data warehouse development; integration of advanced analytical tools; and deployment of analytical tools for use by analysts to track cargo.