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SSC San Diego Command History Calendar Year 1999

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SSC San Diego
San Diego, CA 92152-5001

Preface

The Space and Naval Warfare Systems Center, San Diego (SSC San Diego) Command History for calendar year (CY) 1999 is submitted in conformance with OPNAVINST 5750.12E. The history provides a permanent record of CY 1999 activities at SSC San Diego. Although the history covers one calendar year, much of the information was only available on a fiscal year (FY) basis and is so noted in the text.

Organization of Document

The history is divided into three main sections. The first section is a general introduction to SSC San Diego. The second section describes administrative developments. The third section documents technical highlights in 1999.

To conform to OPNAVINST 5750.12E guidelines and to facilitate review and approval of the information, technical accomplishments are grouped by SSC San Diego major departments. Readers familiar with the SSC San Diego organizational structure can access information by consulting the department section of interest. Cross-references are given in the text when possible to find related or expanded discussions.

C4ISR Programs. As discussed in the introductory section, SSC San Diego technical programs focus largely on C4ISR, corresponding roughly to the Center's organizational structure (e.g., most command and control programs are included in section for the Command and Control Department).

Interdepartmental Programs. Many programs are interdepartmental efforts. Interdepartmental program efforts are included in the department section corresponding to the major responsible code. For example, the Extending the Littoral Battlespace (ELB) Advanced Concept Technology Demonstration (ACTD) program was an interdepartmental effort. The team was led by the Command and Control Department; therefore the discussion is found in the Command and Control section.

Complementary Programs. Programs and research outside of the C4ISR focus (see the discussion in the general introduction to SSC San Diego) are also included in the major department sections.

A Note on Programs

Because the results of scientific work often develop out of many years' effort, programs are not always documented annually. Previous command histories provide extensive background articles on many major programs. When possible, background articles are prepared for new or previously untreated programs. By consulting command histories written over a period of several years, a reader can follow the broad thrusts of SSC San Diego's research and development.

Sources

Numerous sources were used to prepare this history. Retrievable sources are included in section References/Notes. General points of contact are given when possible; further points of contact may be found in the referenced sources or by contacting the SSC San Diego Public Affairs Office.

Appendices

Appendices to this document provide supplementary SSC San Diego information. Appendix A lists achievement awards given in CY 1999. Appendix B lists patents awarded in CY 1999. Appendices C and D provide lists of distinguished visitors hosted by SSC San Diego and major conferences and meetings at SSC San Diego, respectively. Appendix E defines acronyms used in this document.

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Introduction

Introduction to SSC San Diego

The Space and Naval Warfare Systems Center, San Diego (SSC San Diego) * is a full-spectrum research, development, test and evaluation (RDT&E), engineering and fleet support center serving the Navy, Marine Corps, and other Department of Defense (DoD) and national sponsors within its mission, leadership assignments, and prescribed functions. SSC San Diego reports directly to the Commander, Space and Naval Warfare Systems Command (SPAWAR).

Mission

SSC San Diego's formal mission is "To be the Navy's full-spectrum research, development, test and evaluation, engineering and fleet support center for command, control and communication systems and ocean surveillance and the integration of those systems which overarch multiplatforms."

Leadership and Technology Areas

Consistent with our mission, eight leadership areas are formally assigned to SSC San Diego. These leadership areas clearly represent SSC San Diego's command, control, communication, computers, intelligence, surveillance, and reconnaissance (C^4ISR) charter as well as leadership areas outside that scope—ocean engineering and marine mammals. Beyond these, SSC San Diego has demonstrated national- and international-level expertise in a broad range of technology areas.

Assigned Leadership Areas

- Command, control, and communication (C^3) systems
- Command, control, and communication systems countermeasures
- Ocean surveillance systems
- Command, control, and communication modeling and analysis
- Ocean engineering
- Navigation systems and techniques
- Marine mammals
- Integration of space communication and surveillance systems

Technology Areas

- Ocean and littoral surveillance
- Microelectronics
- Communications and networking

* Note: SSC San Diego is also referred to as "the Center" throughout this document.

- Topside design/antennas
- Command systems
- Computer technology
- Navigation and aircraft C^3
- Intelligence/surveillance/reconnaissance sensors
- Atmospheric effects assessment
- Marine mammals
- Environmental quality technology/assessment

Vision

SSC San Diego's vision is: "To be the nation's pre-eminent provider of integrated C^4ISR solutions for warrior information dominance." SSC San Diego's vision guides the Center's efforts in defining, developing, integrating, installing, and sustaining C4ISR systems.

Programs

SSC San Diego conducts a broad range of programs that focus on integrated C4ISR. The Center also conducts several unique programs outside of our primary C4ISR focus: Environmental Quality Technology/Assessment, Marine Resources, Marine Mammals, Ocean Engineering, and Robotics and Physical Security. Innovative new research is encouraged through our In-House Laboratory Independent Research Program (ILIR).

Organization

SSC San Diego's major staff and technical departments include Science, Technology, and Engineering; Navigation and Applied Sciences; Command and Control; Fleet Engineering; Intelligence, Surveillance, and Reconnaissance; Communication and Information Systems; and SPAWAR Systems Activity, Pacific. Major organizational changes in 1999 are described in Administrative Developments. Figure 1 shows SSC San Diego's organization as of October 1999.

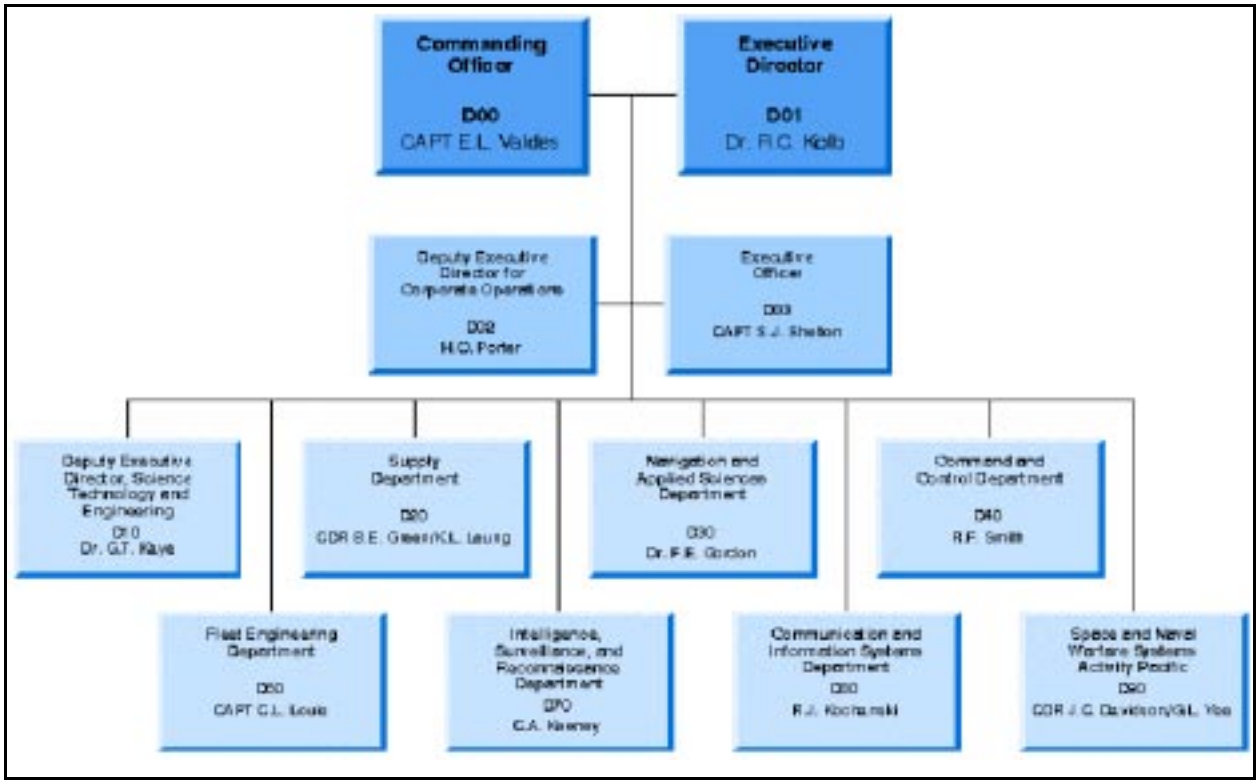

Figure 1. SSC San Diego Organization.

Administrative Developments

Financial Developments

Funding[1]

Total funding (see Figure 2) for SSC San Diego for the year was over $1 billion. Funding for research, development, test, and evaluation grew in CY 1999. SPAWAR funding has increased over the past several years (see Figure 3). Funding from the Defense Advanced Research Projects Agency (DARPA) has also increased and provides the second largest source of funding. Funds also come from the Air Force, Army, Marines, and other Department of Defense agencies. Direct funding was up again for the fifth year in a row.

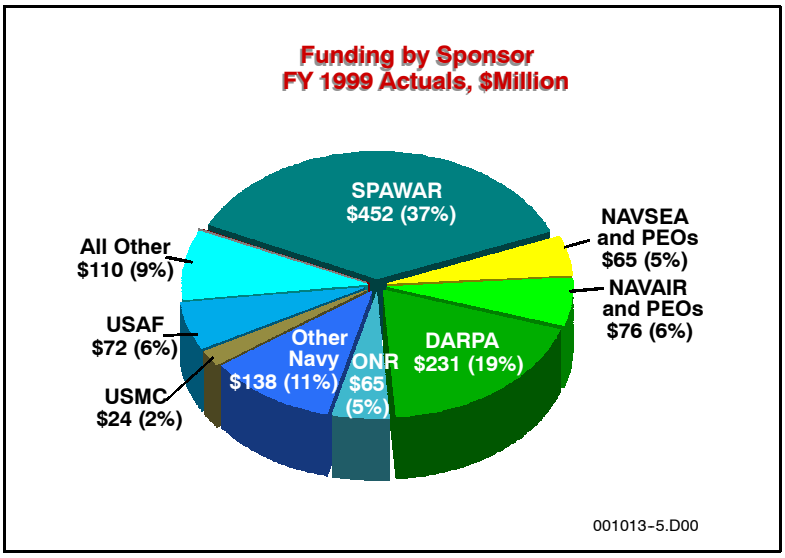

Figure 2. Funding by sponsor, FY 1999.

Enterprise Resource Planning (ERP)[2]

ERP is a Navy initiative led by Vice Adm. John Lockard, Commander, Naval Air Systems Command, to examine commercial software processes for use in the Navy. There are six pilot programs, and the Center was invited to participate as the Warfare Center Financial Management Pilot Program.

The Center will reengineer business processes to match commercial-off-the-shelf (COTS) software. SSC San Diego's business processes include program management, workflow, and human resources.

ERP implementation was scheduled to begin in March 2000.

Supply and Contracts

In FY 1999, the Supply and Contracts Department (D20) placed $774 million on contracts, $200 million on DARPA projects, and $574 million on non-DARPA

programs and projects. These dollar values represented increases of 22.5 percent and 11 percent, respectively, over FY 1998. SSC San Diego had a 13 percent increase in purchases made by a Navy purchase card. There are 54,500 inbound receipts, which represent a 7-percent decrease over FY 1998. A 75-percent increase in hazardous material items crossing the loading docks was noted as well as a 15.5-percent increase in classified material.

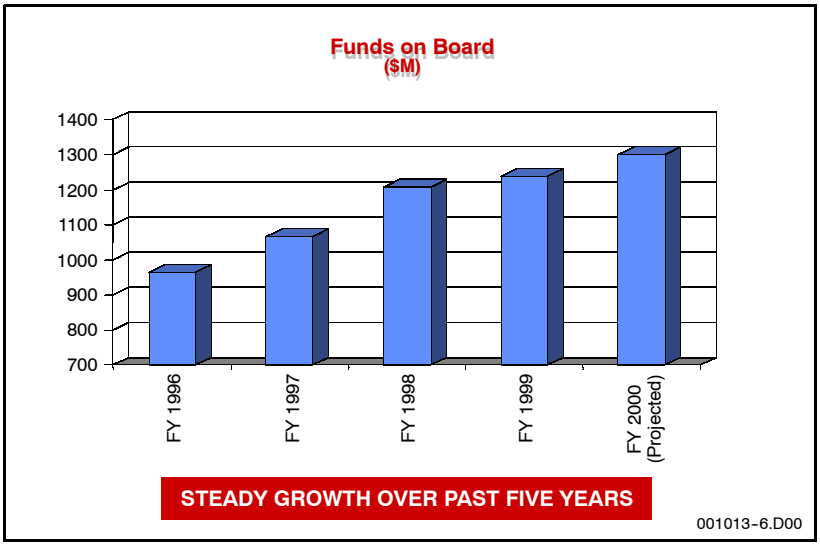

Figure 3. Funds onboard, FY 1996–2000.

Technical Board 99-1[3]

Office of Secretary of Defense (OSD) decisions calling for significant overhead cost reductions by FY 05, a negative budget wedge in outyear costs, and a growth in the workyear rate signaled the need for SSC San Diego to adopt a new financial strategy. The Center formed Technical Board 99-1 to look at alternatives.

Composed of more than 80 people from the technical and support codes, Technical Board 99-1 was formed into eight teams to consider issues and develop recommended actions. The teams recommended actions to reduce general and administrative (G&A) and production overhead expenses. They evaluated alternative overhead expense recovery strategies and evaluated alternative overhead generation strategies.

Finance QMB[4]

The Finance Quality Management Board (QMB) endeavors to address topics brought to their attention by Center personnel experiencing difficulty with existing financial processes. Historically, corporate finance defined most financial management processes and policies at SSC San Diego. The Finance QMB was chartered in 1991 as a forum to allow the technical codes to bring forward issues pertaining to the improvement of the financial management process from their perspective.

The Finance QMB's goal is to improve the financial process from receipt of funds through project management, sponsor billing, and payment; foster the under-

standing, development and improvement of financial management processes; and focus on customer (SSC San Diego sponsors and project managers) concerns.

After an initial evaluation, business process reviews are conducted and reengineering teams or process action teams (PATs) are established to further evaluate the problem and propose solutions. Dedicated efforts are made to assemble as much expertise and technical code participation as possible to address any problem area. CY 1999 developments included the following.

A-11 Reengineering PAT

The Finance QMB sponsored the A-11 Reengineering PAT that reviewed the process for developing the A-11 Budget. The PAT identified overall improvements in the process by streamlining and including more productive front-end planning with a better perspective of mission critical areas. They also recommended training for personnel who participate in the A-11 Budget preparation process and conducted an annual survey to measure process improvement.

Financial Management Overview

The Finance QMB spearheaded the revival of the Financial Management Overview course, conducted in April 1997, for administrative personnel. The purpose was to educate administrative personnel and standardize Center-wide financial procedures. With the implementation of the Defense Industrial Financial Management System (DIFMS), accounting procedures changed so drastically that course revision is needed. The course is tentatively targeted to be offered in FY 2000.

CON/JON PATs

Also with the emergence of the DIFMS accounting system, the Center gained new flexibility for the structure of customer order numbers (CONs) and job order numbers (JONs). The Finance QMB established two process action teams (PATs): One to evaluate the direct CON/JON structure and the other to evaluate the indirect CON/JON structure. The outcome of the indirect CON/JON PAT was to leave indirect (overhead) CONs and JONs as they are. The recommendation of the direct CON/JON PAT was to allow flexibility, as determined by each department, in the structure.

STARS

The apparent delay in obligation/expenditure information to sponsors in the Standard Accounting and Reporting System (STARS) has been an area of concern on the part of SSC San Diego technical managers for some time. The Finance QMB conducted several business process reviews to determine the cause of this delay. Resulting changes were to:

- Extend STARS access to technical departments by providing STARS query training and connectivity.
- Improve the process for passing obligation data from contracts to accounting, resulting in more timely obligation in accounting system.

- Make SSC San Diego the payment office on all "C" contracts and the majority of "D" contracts to improve the timeliness of contract obligations and reduce the burden of reconciliation of variances.
- Develop the STARS/DIFMS Financial Interface (SDFI), a user-friendly application currently in final development. SDFI will be available to Center personnel in the near future. This application will provide the ability to track financial information such as commitments, obligations, and billings in STARS and compare it to financial status in DIFMS, which will aid in identifying variances.

DWQR

For the past 2 years, major attention has been given to the emergence of DIFMS. The Finance QMB closely tracked the transition into DIFMS and assured that management and the workforce were advised of the impact and how to prepare for the "dark period." They requested establishment of the DIFMS Data Warehouse Query and Reporting (DWQR) team to provide central information and help desk capability for the workforce.

The DWQR held its first meeting in July 1998. This group provides direct access for the technical codes to the Management Information Data Warehouse (MIDW) and query and reporting (Q&R) maintenance effort. The team is composed of one or more members from each technical department and one member from both the D021 and Information Technology Division (D029). It has been responsible in large part for the cleanup of DWQR data problems. As a result, MIDW and DIFMS are very close to matching. The team has developed over 40 validation Brio Queries that have been invaluable in this effort. Over 220 issues have been raised, resulting in 180 software changes in MIDW and Q&R, including over 20 database changes. Currently, the user team serves as primary points of contact for their department's query and reporting help. The group meets at least monthly to discuss, review and prioritize new DWQR issues, problems, and software change requests.

Bankcard Reengineering

To address concerns expressed by both the technical codes and corporate budget and accounting, a Bankcard Reengineering team was chartered to review and improve the bank card process. Each department has a representative on this team. The Bankcard Reengineering Team announced a process improvement[5] targeted at correcting several problems. The team found that the bankcard purchasing process is complex and extremely resource intensive both front and back-end. It was determined in the process review that excessive paperwork and copying on the part of the cardholders is required. Center overhead costs are increasing unacceptably due to an inability to properly match many purchases to the appropriate job order numbers. The recording of bankcard purchase costs is neither timely nor accurate.

The new process provides an automated Business Data Input (BDI) application for inputting, tracking, and reconciling purchases. The improved process reduces work load and eliminates redundant processes required on the part of the cardholder while improving the timeliness and accuracy of costs recorded against job

orders. It eliminates tracking and reconciling purchases in the Defense Industrial Financial Management System (DIFMS) and Queries and Reporting. It reduces excessive paperwork required for post-audit reviews and reduces the potential loss resulting from unmatched purchases. The new process applies only to SSC San Diego cardholders and approving officials at this time.

The Bankcard Reengineering Team was chartered by the Finance QMB to recommend improvements to the current bankcard purchasing process. The team was composed of representatives from every department as well as cardholders, approving officials, finance, and administrative personnel.

A General Overview brief and a Detailed Process Overview brief of the reengineered process have been provided for all cardholders, approving officials, administrative personnel and program managers. Overviews will also be scheduled for employees located in Hawaii and Philadelphia, Pennsylvania.

Long-Term Financial Strategy

The Finance QMB identified the need to develop a long-term financial strategy for the Center, and brought the requirement to the attention of the Executive Board. Tech Board 99-1 (February 1999) addressed these issues and resulted in several business changes that were presented to the project managers in May. One of the priorities is to improve the dissemination of information to the workforce concerning financial issues or changes that have an impact on them.

Industry Partnerships

CRADAs

SSC San Diego entered into eight Cooperative Research and Development Agreements (CRADAs) with industry in FY 1999. The eight organizations and topics included:

FUGRO Geosciences, Inc.	Research and develop methods for environmental subsurface geophysical investigations
Oceaneering International, Inc.	Research and develop ultralight, underwater autonomous surveillance systems
Ocean Sensors, Inc.	Develop low-cost system of shallow water sensors
Santa Barbara Infrared, Inc.	Develop algorithm measuring minimum resolvable temperature differences of thermal images
Scientific Environmental Research Foundation (SERF)	Investigate alternate uses of de-activated U.S. Navy Sound Surveillance System (SOSUS) stations
SDL, Inc.	Manufacture and integrate Polarization Independent Narrow Channel (PINC) Wavelength Division Multiplexing (WDM) couplers
Sun Microsystems	Demonstrate feasibility of Network-Centric Re-engineering for enterprise-level information technology (IT)
UnderSea Sensor Systems, Inc.	Research and develop autonomous off-board surveillance sensor systems

DD 21 (Lockheed)

SSC San Diego entered a new relationship and cooperative culture with industry to transition technology to the fleet. Lockheed Martin, the systems integrator for one of the industry teams recently placed under contract by Naval Sea Systems Command to build the Navy's DD 21 next-generation destroyer, contracted with SSC San Diego to participate in this effort. Under a newly developed Sale of Articles or Services Agreement negotiated with Lockheed Martin, SSC San Diego is now receiving DD 21 tasking and funding from industry.

Major Organizational Changes

SSC San Diego Change of Command[6]

Capt. Ernest L. Valdes, USN, assumed command of SSC San Diego from Capt. Harold A. Williams, USN, at the retirement/change of command ceremony on 16 June 1999.

Capt. Williams was Commanding Officer of Space and Naval Warfare Systems Center, San Diego beginning in June 1996. Capt. Williams retired from the Navy with 30 years of active duty.

Capt. Valdes reported as Commanding Officer of Space and Naval Warfare Systems Center, San Diego. Capt. Valdes, an engineering duty officer and acquisition professional, reported from his previous assignment as Deputy Commander for Engineering (chief engineer) at the Port Hueneme Division of the Naval Surface Warfare Center, Port Hueneme, California.

SPAWAR Systems Activity (D90) Change of Leadership[7]

SPAWAR Systems Activity Pacific (SSA PAC) (D90) held its Change of Charge on 4 February 1999. Cmdr. Sherman Metcalf was relieved as officer-in- charge by incoming Cmdr. John Davidson.

Cmdr. Metcalf received a new assignment with Naval Sea Systems Command as group director for the Integrated Information Systems Engineering Group (NAVSEA 03J).

Cmdr. John Davidson reported to SSA PAC from a previous assignment as the Arleigh Burke class guided missile destroyer (DDG 51) new construction platform manager in the Office of the Chief Engineer, SPAWAR. He was responsible for the acquisition, integration, and installation of all SPAWAR sponsored systems on DDG 51 class destroyers.

Glenn Yee became the new technical director of D90. Beginning in 1987, Yee served as the head of C4I Shipboard Engineering Division, which provides engineering and installation support to the Pacific fleet. Yee has also been responsible for managing personnel to provide support for engineering, planning, and installation of shipboard C4I systems.

Other Organizational Changes

NCTC Merger[8]

In September 1998, COMSPAWARSYSCOM approved the recommendations of the SPAWAR and NCTC Business Strategy Study Group setting forth organi-

zational, business, and financial strategies for the merger of the Space and Naval Warfare Systems Command and the Naval Computers and Telecommunications Command (NCTC). All Navy Working Capital Fund (NWCF) funded activities, programs, functions, personnel and material assets in Norfolk, Washington, Jacksonville, and Pensacola were scheduled to transfer into SPAWAR Systems Center Charleston; Naval Computer and Telecommunications Area Master Station Pacific (NCTAMSPAC) Pearl Harbor, and Naval Computer and Telecommunications (NCTS) San Diego were scheduled to transfer into SPAWAR Systems Center, San Diego.

NCTS San Diego and NCTAMS PAC changes affecting SSC San Diego included two organizational moves. Pearl Harbor divisions were moved as intact units into SSC San Diego's existing organization (InTech San Diego Support Division (D86) and Information Technology Sector (D916)). Organizational changes to the Communication and Information Systems Department (D80) were approved 29 September 1999. Organizational changes to the Space and Naval Warfare Systems Activity Pacific, Pearl Harbor, Hawaii (D90), were approved 15 October 1999.

Personnel

Personnel Onboard

Total personnel onboard as of 30 September 1999 was 3685 (see Figure 4).

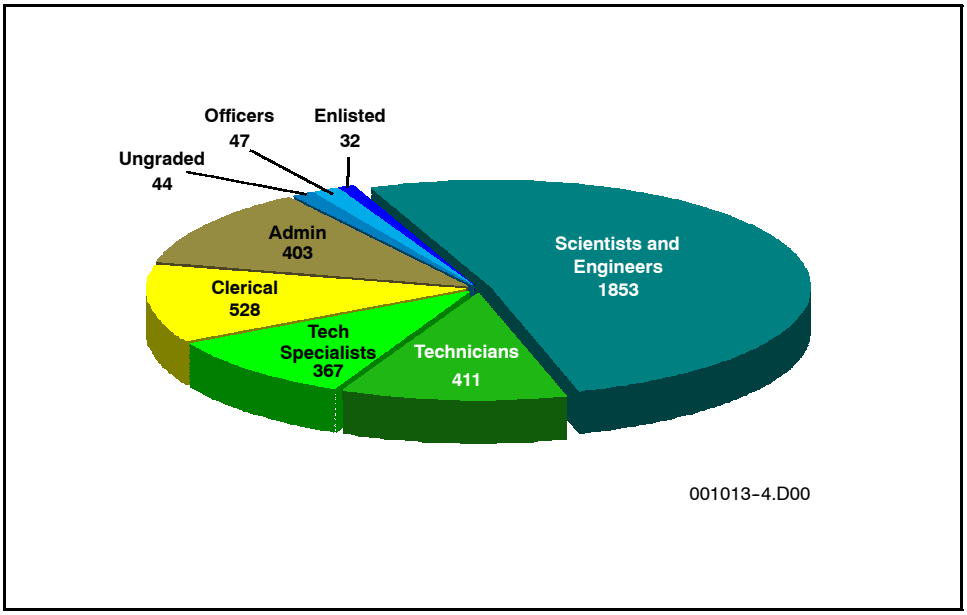

Figure 4. Personnel onboard, September 1999.

CA Study[9]

SSC San Diego was included in a Navy-wide review of job functions to compare performance costs by government employees with projected performance costs by contractors. The Commercial Activities (CA) study is established by OMB 29 Circular A-76 and OPNAVINST 4860.7C. Over 80,000 positions are under study within the Navy as potential commercial activities. The Navy's premise is that competition enhances quality, economy, and productivity. All positions at SSC San Diego are coded to determine whether they are inherently government positions. CA studies are ongoing reviews of civil service job functions that are not inherently government positions and might be performed by a contractor. The cost comparison study will determine if it is more cost effective to retain these functions in-house or contract them out.

A review of the retail supply, receiving, warehousing, and transportation functions was directed by CNO Message 151504Z JAN 98. This study involved the Physical Distribution Division (D24). It began in January 1999, scheduled to conclude in April 2000. In May 1999, SSC San Diego was directed by CNO message[10] to study nine additional functions, to be combined into six studies: four multifunctional studies scheduled for completion within 36 months and two abbreviated cost comparisons to be completed within 6 months. The multifunction studies are the Technical Information Division, including the Presentations,

Multimedia, and Photography Branch; the Publications Branch; the Library Branch; the Mail Center; Travel Services; Contracting Support; and Financial Support. Abbreviated cost comparisons will be made of Message Center and photography functions.

Community Involvement

Examples of SSC San Diego's community involvement in 1999 included strong participation in the 1999 Combined Federal Campaign (see below) and service to the community, including rehabilitating a home as part of the Greater San Diego Christmas in April Program[11] and voluntary work with Cabrillo National Monument.[12]

1999 Combined Federal Campaign[13]

The 1999 Combined Federal Campaign officially ended on 15 December 1999. The final tally computed over the holidays indicates a record contribution to charitable agencies by the Center. SSC San Diego recorded contributions totaling $285,750.00 for the 1999 campaign, a record amount for the Center. This total is an 11 percent increase over 1998 and resulted from 1116 Center employees each contributing an average $256.00 to the charities of their choice. The Center pledged the most among all 110 activities in the Shore Group, and was second among all 647 activities eligible to participate in the county.

Student Programs

Examples of SSC San Diego student outreach in 1999 included the Engineering and Science Residential Program (ESRP) (see below), participation in the FIRST Lego League California 1999,[14] hosting Science and Humanities Symposium[15] students, and presentations to students.[16]

Engineering and Science Residential Program (ESRP)[17]

The Engineering and Science Residential Program (ESRP) is sponsored by the Department of Navy in partnership with SSC San Diego and San Diego State University (SDSU). This intensive 6-week research-based program includes academic course work and work experience at the Center. The ESRP is one means for increasing and diversifying the pool of future scientists and engineers.

Twenty highly talented students from various high schools throughout San Diego were selected for the program based on their academic interest, grade point average, a 250-word essay, and recommendations from two of their teachers. The students stay in residence halls during their week at SDSU. They attend a morning C++ programming lecture for which they receive 3 units of college credit. In the afternoon, the students are paired with SSC San Diego scientists and engineers who serve as mentors and provide hands-on laboratory experience. Each mentor is assigned at least two students to help conceptualize, design, and complete a proposed project. The program ran from 5 July through 12 August. At the end of the 6-week period, the students presented their completed projects at an award ceremony.

Technical Highlights

Deputy Executive Director, Science, Technology and Engineering (D10)

IOCOF[18]

The Information Operations Center of the Future (IOCOF) achieved initial operational capability on 19 January 1999.

The facility is located in Lab 260 of Building 600 in the Seaside portion of the Point Loma campus. Lab 260 is part of a sensitive compartmented information facility.

The IOCOF began as an idea to develop an area within SSC San Diego that could help coordinate work in the rapidly developing field of information operations. While providing a common ground for integrating systems developed by the various technical codes at SSC San Diego, it will also facilitate looking into the future to help guide and shape the ability of the nation to meet the very real threats and challenges of the information age. Visitors to the IOCOF to date represent a variety of Department of Defense (DoD) agencies involved in information operations. There is significant interest in using this new facility in a number of roles to support development of critical information operations technologies and processes.

The initial IOCOF kickoff meeting was in early April 1998. Construction in Lab 260 followed beginning in late summer. Not only does the IOCOF represent support from across the SSC San Diego technical codes, but also a highly productive teaming with industry. Specialists in Information Operations from Booz-Allen & Hamilton Inc. have worked with government civilian and military personnel to create the facility.

IOCOF Technical Highlight: Brazen Tsunami 99-1[19]

IOCOF personnel designed and executed successful war game, Brazen Tsunami 99-1. The Commander in Chief, U.S. Pacific Command (USCINCPAC J2) commissioned SSC San Diego to design and present this war game focused on intelligence support to information operations (IO).The IOCOF team of government and contractor personnel developed and facilitated this war game in Hawaii for members of the Joint Intelligence Center Pacific (JICPAC) 8-11 March 1999.

The two goals of the game were to exercise the JICPAC analytical response in an IO intensive environment and to hone JICPAC skills to provide intelligence support to information operations. The game's objectives included refining theater intelligence support in an IO environment, exercising existing IO policies and procedures, and evaluating relationships with other organizations from the IO perspective.

The game began with a half-day training session for watchstanders and joint exercise control group (JECG) personnel. Then, over a 3-day period, JICPAC analysts were treated to a "crawl, walk, run" approach to the indications and

warning process as it relates to IO. Each of the five game segments ended with a session that captured valuable lessons learned. Additionally, the USCINCPAC J2 received a briefing by the two watch teams at the end of each day adding significantly to the intensity and realism of the game.

The JICPAC analysts used their existing workstations and servers during the game, which was conducted on the JICPAC operations watch floor. The game design was such that analysts could not differentiate the 300 game messages from the 5000 real world messages they received during the game play. In a few instances realism was evident when events depicted in the game-injected messages, written weeks before, actually occurred during the game.

Brazen Tsunami 99–1 was unique, much more akin to a flight simulator for intelligence analysts than a traditional war game. JICPAC analysts praised the game because it helped "open their eyes" and provided them with a clearer understanding of IO. At the conclusion, the IOCOF team also provided an "emerging results" briefing to Rear Adm. (sel.) Rick Porterfield, the USCINCPAC J2 designate, and to Col. Mike Ennis, JICPAC commander.

All war game goals and objectives were met and numerous lessons learned were included in an after-action report. Additionally, USCINCPAC issued a formal message to the joint DoD and non-DoD IO community praising the results of the game and acknowledging the valuable contributions of the IOCOF team.

In-House Laboratory Independent Research (ILIR)[20]

New and innovative ideas proposed by the scientists and engineers of SSC San Diego are supported and encouraged through the In-house Laboratory Independent Research (ILIR) program, which is administered by the Office of Naval Research (ONR). The ILIR program is implemented at SSC San Diego under the authority of the Deputy Executive Director for Science, Technology and Engineering and is managed by the Science and Technology Office. This program supports basic scientific research in several areas of interest to the Navy, including command and control, communications, surveillance, and navigation.

The selection process began with the 25 March 1998 call for proposals in four ILIR Thrust Areas. These areas are Command and Control (C^2); Communications (COMM); Intelligence, Surveillance and Reconnaissance (ISR); and Other Research. Scientists and engineers responded with 79 written proposals, which were screened for scientific merit and Navy relevance and then evaluated by panels of experts.[21] Based on evaluations by the panels and an administrative review, 29 projects were selected.

ONR allocated $2,544,688 to SSC San Diego for FY 1999. In December 1998, ONR placed a hold on $1M pending possible reallocation of funds to projects relating to stochastic resonance. The funding hold was eventually reduced to $500K, and final resolution of FY 1999 funding occurred in August 1999. The final allocations included $200K redirected to stochastic resonance projects, $300K carried over from FY 1999 to the FY 2000 ILIR program, and other FY 1999 projects funded at approximately 84% of their original recommended

amounts. Thus, the amount invested in ILIR projects during FY 1999 was approximately $2,240K. Funding delays and reductions caused significant adverse impacts on almost all FY 1999 projects.

Program Changes for FY 2000 and FY 2001

The ILIR program at SSC San Diego is being restructured to increase the impact of limited ILIR resources. This restructuring will be accomplished by increasing the size of selected projects to better focus ILIR on areas identified in our corporate technical vision as most critical to the SSC San Diego mission. Between two and six large team projects will be selected. Each will be funded at approximately $300K per year or more and will generally last for 2 to 3 years. The rest of the program will comprise smaller projects, each funded in the range $100K to $150K per year. The intent is to fund the most mission-critical projects at high levels to enable exceptional impacts and to fund all projects at adequate levels to generate useful results. Because of these changes, a smaller number of projects overall will be funded in FY 2001 than in previous years. For example, if the FY 2001 ILIR program receives approximately $2.7M, it may comprise four projects with an average funding of $300K, and 12 smaller projects with an average funding of $125K.

Two large team projects were initiated in FY 2000, *Knowledge Mining for Command and Control Systems* and *Robust Waveform Design for Tactical Communication Channels.* These projects are expected to continue for 2 to 3 years, and additional team projects will be selected in FY 2001 and subsequent years.

Navigation and Applied Sciences Department (D30)

MATCALS SW-CMM Level 2 Rating[22]

The Marine Air Traffic Control and Landing System (MATCALS) project underwent a Software Capability Evaluation (SCE) 22–28 January 1999. The evaluation resulted in the MATCALS project receiving a Software Capability Maturity Model (SW–CMM) rating Level 2. The MATCALS project also satisfied several of the key process areas for Level 3. MATCALS provides continuous, all-weather air traffic control services for expeditionary airfields and remote area landing sites.

This is the second project at SSC San Diego to achieve SW–CMM Level 2. The Communications and Information Security (INFOSEC) Systems Support and Integration Division (D87) Embeddable INFOSEC Product (EIP) project received its rating in September 1998.

AN/FRN–42 TACAN On-Site Restoration[23]

An SSC San Diego-led team accomplished an on-site restoration of the AN/FRN–42 Tactical Air Navigation (TACAN) system at McMurdo Station and the South Pole. Additionally, the team assembled a third AN/FRN–42.

The sheltered AN/FRN–42 system houses two transponders and monitoring equipment with an antenna mounted atop the shelter. The TACAN systems are a primary navigational aid for landing aircraft in the Antarctic.

In 1997, the Navy's Naval Support Forces officially pulled out of the Antarctic. The National Science Foundation (NSF) took over the facilities with communication equipment, radar, weather, and navigation systems. Operation, repair, and restoration of that equipment is now funded by NSF through support of SSC Charleston.

McMurdo Station is their hub for air traffic into Antarctica and those working for NSF disperse their projects from there. Transportation to the South Pole is from McMurdo Station and is by C–130 aircraft provided by the Air National Guard out of New York.

The work was accomplished under the TACAN Service Life Extension Program (SLEP). SSC San Diego is the designated in-service engineering agent (ISEA) for TACAN and, with SLEP efforts, supports Naval Air Systems Command for all naval air stations. A similar program is also run for ships equipped with TACAN.

NAVSSI BLOCK 3 FOT&E[24]

Navigation Sensor System Interface (NAVSSI) Block 3 underwent successful follow-on operational test and evaluation (FOT&E) in June 1999 on USS *Porter*

(DDG 78) and was approved for fleet release by Commander, Operational Test Force. The FOT&E for the second and final stage of the NAVSSI Block 3 were scheduled for June 2000. As of November 1999, 169 ships were scheduled to receive NAVSSI, 122 existing and 47 new construction. Of these, 59 have Block 2 and 110 have or will receive Block 3. The platforms on which the NAVSSI have been or will be installed include carriers, cruisers, destroyers, and amphibious vessels.

The NAVSSI AN/SSN-6 (V) is a system that provides this mix through real time collection, processing, and distribution of accurate and reliable positioning, navigation, and training (PNT) data from various sources to shipboard weapons, combat support, and information systems. In accordance with the U.S. Navy command, control, communication, computers, intelligence, surveillance and reconnaissance (C4ISR) implementation plans, NAVSSI is designed as a Defense Information Infrastructure Common Operating Environment (DII COE) mission application. This application allows straightforward integration of the U.S. Coast Guard-developed Command, Control and Display-Integrated Navigation (COMDAC-INS) software package. The integration of NAVSSI, COMDAC-INS, and a shipboard radar system provides a fully integrated automated navigation and collision avoidance capability.

The NAVSSI has three major subsystems: the Real Time Subsystem (RTS), the Display Control Subsystem (DCS), and the Bridge Workstation Subsystem (BWS). The RTS analyzes navigation sensor data from a variety of sources and integrates it into an optimal solution. These data are distributed to various ship user systems by using a combination of point-to-point and local area network (LAN) connections.

The DCS is a dedicated workstation that automates navigation and piloting functions traditionally performed manually. The DCS provides a real-time display where own-ship data are overlaid on a digital nautical chart (DNC). The BWS is a remote workstation located on the bridge that enables the ship's navigator or quartermaster to perform all the functions of the DCS from the bridge. The DCS and BWS both act as human computer interfaces to the RTS, shipboard sensors, COMDAC-INS, and the U.S. Naval Observatory (USNO) based celestial navigation program STELLA (System to Estimate Latitude and Longitude Astronomically).

The NAVSSI is designed to minimize the cost and impact of accommodating future upgrades. It takes advantage of an evolutionary acquisition philosophy and an open-systems architecture using commercial-off-the-shelf (COTS) and government-off-the-shelf (GOTS) hardware and software to the greatest extent possible.

Following the evolutionary acquisition philosophy, each new NAVSSI phase or upgrade is called a "block." New user requirements serve as the primary driver for each new block. The first, or "core system," was NAVSSI Block 0. It provided for the integration and data exchange of Tomahawk Weapons System, Inertial Navigation, Gyrocompass, Joint Operational Tactical System, Global Positioning System (GPS), Electro Magnetic Log, and Outboard system data.

NAVSSI Blocks 1 and 2 added the basic carrier and amphibious capabilities. These upgrades to Block 0 added capabilities to interface with the Advanced

Combat Direction System, Tactical Aircraft Mission Planning/Standard Land Attack Missile, MK86 Gun Fire Control System, Fathometer, Joint Maritime Command Information System, LAN, and dual RTS capabilities. All Block 0 systems have been upgraded to the Block 2 configuration. Block 2 is DII COE Level 6 compliant, year 2000 certified, and is currently installed on 59 surface combatants.

The current version or upgrade being developed and fielded is Block 3, which is primarily driven by Aegis guided missile destroyer and new electronic navigation user requirements. Block 3, designed to be DII Level 7 compliant, adds a number of new capabilities such as the integration of COMDAC-INS and STELLA. Other new capabilities include integration of the Carrier Air Traffic Control System (TPX-42), Battle Force Tactical Trainer, Shipboard Data-Multiplexing System, Ship Self Defense System (SSDS MK 2), GPS expansion ports, LAN/wide area network, chart serving navigation operational reports, and Redundant GPS/GPS Versa Module Eurocard Receiver Card. Also included are a Doppler sonar velocity log, Tactical Environmental Support System, tides and currents, navigation radar overlay, AN/SPS-73 radar interface, ring laser gyro, cooperative engagement capability, SQS-53D, Aegis LAN interface, integrated communications and advanced network, wind, and bathymetric data.

To meet an aggressive ship installation schedule, NAVSSI Block 3 is being introduced to the fleet in two stages with an independent FOT&E. In accordance with the NAVSSI Block 3 test and evaluation master plan, NAVSSI Block 3 underwent test and evaluation at numerous land-based test (LBT) facilities prior to shipboard FOT&E. These LBT facilities included the Aegis Combat Systems Center (ACSC), Anaheim, California; ACSC, Wallops Island, Virginia; Combat Systems Engineering Development Site, Moorestown, New Jersey; Tomahawk Weapons Laboratory, Naval Surface Warfare Center, Dahlgren, Virginia; and Integrated Combat Systems Test Facility, San Diego, California. The formal qualification test and system qualification tests were completed at SSC San Diego.

Future NAVSSI enhancements will expand on the initial design concept to add National Imagery and Mapping Agency, chart serving, Integrated Bridge System, and ship-wide display capabilities. In response to the need for integrated navigation systems aboard platforms not scheduled to receive a full-scale NAVSSI system, SSC San Diego has ported the NAVSSI software to smaller, less expensive suites of hardware. Such downsized systems are capable of providing completely scalable solutions that can be tailored to the specific needs of a particular vessel. A wide range of such systems can be built. The applications of these downsized systems are many and may have appeal to foreign navies and commercial users.

EPLRS[25]

The first phase of Year 2000 (Y2K) compliant deliveries of the Army's Enhanced Position Locating Reporting System (EPLRS) ended with an on-site delivery, test, and training journey to the 1st Cavalry Division deployed in Bosnia. SSC San Diego is responsible for life-cycle support of Position Locating and Report-

ing System (PLRS) and EPLRS systems, which are used by the Army, Navy, Marines, and Air National Guard.

EPLRS is an integrated network of radio transceivers with embedded computer processors controlled by a central net control station (NCS). The NCS generates an accurate track base and associated display of all EPLRS equipped units in a community. There may be up to eight adjacent networks with NCSs that interchange tactical data with one another, thereby extending the effective area of operations several fold. Additionally, EPLRS provides a high-data-rate, robust, and secure digital communications network to enable commanders to send and receive tactical information throughout the battlefield. EPLRS also provides navigation aids automatically through computer generated alerts and guidance to operational units. Thus, EPLRS is a total command, control, and communication tactical support system for ground warfare.

In FY 1998, SSC San Diego upgraded and tested all configurations of PLRS and EPLRS to Y2K compliant versions of tactical and support operating systems. Primary focus was transitioning the real-time software to the Y2K compliant Hewlett Packard Unix Operating System (HP-UX 10.2). The final task was to deliver the compliant versions to the Army field sites before January 1999. Originally scheduled for January 1999, delivery was postponed several times due to hostilities in the combat area served by EPLRS. Deliveries got underway 8 March and were completed 18 March 1999.

The primary mission in Bosnia was to install the Y2K compliant EPLRS software in the 1st Cavalry Division's two Net Control Stations (NCSs). This involved formatting the system computer's hard drives, installing the software, and providing checkout of the system with EPLRS radios.

A secondary mission resulted from a request to investigate problems reported with the operation of EPLRS in Bosnia and provide whatever assistance possible. Problems the 1st Cavalry Division had been experiencing included:

- All Situation Awareness (SA) terminals used for displaying EPLRS tracks and other data were locking up approximately every 1 1/2 hours.
- Inability to use the Over The Air Re-Keying (OTAR) feature that allows communications security (COMSEC) keys to be distributed electronically. Not being able to use OTAR slows the process of doing COMSEC changeover.
- Inability to get two adjacent NCSs to talk to each other.
- Other problems related to operational training deficiencies and network coordination.

All immediate problems were resolved and an active dialog was established between the field users and the field support contingent at SSC San Diego to provide continuity of support emanating from this very significant opportunity.

SIR for Soil Sample Core System[26]

In March 1999, SSC San Diego received Statutory Invention Registration (SIR) H1780 for the Soil Sample Core System. The Soil Sampler Core System is a

mechanical device that allows easy extraction of soil samples. The Soil Sampler Core System keeps the sample intact when sampling loose soil or fluid sands. It is used on the Mostap soil sampler.

Instrument Landing System[27]

SSC San Diego installed the Navy's first end-fire configured instrument landing system. The instrument landing system (ILS) is a precision approach landing system widely used by military and commercial aviation worldwide. As the in-service engineering agent, SSC San Diego has installed nine systems at various Navy/Marine Corps stations.

The landing system is installed adjacent to the runway and provides approach and landing information to arriving aircraft during poor weather conditions. Avionics equipment aboard the aircraft receive azimuth (directional) and glide slope (angle of descent) guidance that enables the pilot or autopilot computer to fly the aircraft along a precision final approach path for landing.

Typical ILS systems require a tightly uniformly flat area at least 1200 feet in front of the antenna to serve as a ground plane. However, at Naval Air Station (NAS) Corpus Christi, this was cost prohibitive due to extensive fill dirt requirements to form the reflection plane and to the existence of wetlands on the northeast side of the runway. The cost estimate for fill requirements was in excess of $700,000.

Working closely with the station's environmental group to examine various options, alternative antenna technologies were researched. One new technology under development by the Watt Antenna Company for the Federal Aviation Administration (FAA) was the end-fire antenna. This radical approach to antenna design enables the antenna to be much smaller and forms a virtual ground plan without requiring large amounts of land. A simulation analysis was performed and it was determined that an end-fire antenna could work at NAS Corpus Christi.

SSC San Diego determined that procurement and installation of an end-fire antenna would save the Navy in excess of $500,000 in site preparation costs, minimize environmental impact, and greatly reduce obstacle risks to landing aircraft. The sponsor, Naval Air Systems Command Air Traffic Control and Landing System Program Office (PMA-213), granted approval for the end-fire installation design. Due to its unusual design, special military installation modifications were required, including a unique antenna support pedestal to handle blasts generated from C-5A type aircraft. In the only installation of its kind in the United States, the antenna support pedestal heights were tapered outward from the Center to provide a low profile to the expected air movement.

On 14 and 15 October 1998, an FAA flight inspection found the facility fully met all the accuracy requirements for Category I operations. The FAA commented that the signal quality was so high that the system was capable of meeting much stricter landing accuracy requirements.

This is the first Navy end fire configured ILS. The use at NAS Corpus Christi is for training of Navy pilots and ancillary support for U.S. Border Patrol agents.

Two more systems were installed in January/February 1999 at NAS Meridian and NAS Whidbey Island. Combined, all three end-fire configured systems will have saved the Navy over $2 million in site preparation and environmental mitigation costs.

Marine Mammal Vet Lab Accreditation[28]

SSC San Diego's Marine Mammal Veterinary Laboratory (Vet Lab) received accreditation renewal by the Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC) International. The Vet Lab, located at SSC San Diego Bayside, is part of the U.S. Navy's Marine Mammal Program.

AAALAC is a nonprofit non-regulatory organization formed in 1965 by scientific and biomedical organizations. It promotes high standards of animal care and use, improves laboratory animal well being, and enhances life sciences research through accreditation. Currently, 600 animal programs from academia, government, hospitals, commercial firms, nonprofit organizations and pharmaceutical organizations participate. AAALAC assessment includes a triennial on-site inspection and a comprehensive review of all procedures and performance for the care and handling of the animals. An annual written report is required to update a facilities status or to detail changes made during the year. The accreditation is a significant accomplishment the Vet Lab first achieved in 1995. All Department of Defense (DoD) animal use facilities are directed to seek and maintain AAALAC accreditation. The recent triennial review and inspection upheld the previously attained accreditation and resulted in commendation regarding SSC San Diego programs for staff and animals interactions, Institutional Animal Care and Use Committee oversight and monitoring, husbandry practices, veterinary care, and record keeping.

SSC San Diego is the only DoD non-biomedical animal use facility with accreditation. The accreditation is widely accepted by the scientific community and demonstrates that the animal care at SSC San Diego has achieved a high level of excellence and provides a humane animal care and use approach.

Dolphin Launch and Recovery System[29]

The marine mammal systems developed by SSC San Diego and operated by the Explosive Ordnance Disposal Mobile Unit Three (EODMUTHREE) developed the capability of operating from ships deployed at sea. These dolphin systems can now be temporarily housed aboard amphibious ships, launched, and recovered from the stern gate and transported to operational areas. An important part of these operations is the launch and recovery of the boats with the dolphins, handlers, and equipment on board to and from the amphibious ships in varying sea states.

Special trailers were developed for both hard-hulled craft consisting of 22-foot and 25-foot Boston whalers, and rigid-hulled inflatable boats (RHIBs). A RHIB recovery system was developed and tested during RIMPAC (Rim of the Pacific) 98 fleet exercises conducted off the Hawaiian Islands.

The recovery system was developed by an SSC San Diego cross-departmental team. The work was conducted under the Shipboard Forward Deployment Enhancement program sponsored by Naval Sea Systems Command Program Manager and Explosive Ordnance Disposal. The recovery system had to effectively and safely allow for easy launch and recovery from the stern gate of an amphibious assault ship. The system has a modified 24-foot RHIB boat trailer and a catch-and-release device used to launch and recover the boat at precisely the right moment. The trailer was reinforced and outfitted with high goal posts covered with PVC tubing sections to guide the boat onto the trailer. The trailer and posts were designed to withstand the dynamic forces that would be present, yet not damage the inflatable boat after repeated use.

The catch-and-release device operates with a special spring-loaded hook that releases the guide line when the boat is launched yet also snaps onto the hook when the boat lands. This is somewhat like the arresting hook on an airplane when landing on an aircraft carrier.

This prototype system will be applied to boat recovery operations for the fleet marine mammal systems and ensures the continued success of shipboard deployments.

Command and Control Department (D40)

DLTTs Gateway System[30]

The Data Link Test Tools (DLTTs) Gateway system, developed by SSC San Diego's Tactical Systems Integration and Interoperability Division (D45) and contractor Digital Wizards, Incorporated, was instrumental in the success of an international test demonstration conducted 19–23 April 1999. The project team of the Standard Interface for Multiple Platform Link Evaluation (SIMPLE) Demonstration included representatives from the United Kingdom, Germany, France, Italy, the North Atlantic Treaty Organization (NATO) Anti-Early Warning (NAEW) Force Command – the Netherlands, and the United States.

The stated objective was to demonstrate, validate, and assess the capabilities of the SIMPLE standard to permit the transfer of data between remote sites to support interoperability testing of Tactical Data Link (TADIL) implementations in the differing platforms of NATO nations and organizations. This type of testing supports the users' ability to successfully exchange data in tactical operations and to identify Link-16 interoperability problems.

The SIMPLE standard, as specified in Standard NATO Guidelines (STANAG) 5602, was developed by the Interoperability Subcommittee Working Group on NATO Interoperability Environment Testing. It lays out requirements for data transfer between remote sites. It defines a method for interconnecting NATO test facilities with different platforms in different locations so that multiple-platform, multi TADIL interoperability testing can be carried out in simulated environments.

Adherence to the SIMPLE standard will ensure that equipment procured by a NATO test facility can be interconnected with equipment procured by other NATO facilities for Tactical Digital Information Link (TADIL) message exchange. The SIMPLE standard includes several elements: the communications bearer, such as telephone lines and digital wide area networks; the encryption methods to be used to protect the secure information SIMPLE demonstration transmitted between sites; the protocols or data formats for the data transfer process; and additional aspects, such as time coordination.

Planning for the April demonstration began in 1997. SSC San Diego was the Data Link Gateway representative for the SIMPLE effort and was instrumental in coordinating the international installations of the Data Link Gateway systems. Despite the international connectivity challenges involving hardware, software, and encrypted communications, there was instant connectivity as the tests began and smooth sailing thereafter.

Two weeks were set aside for the testing, but due to extensive preliminary checkouts and coordination, the demonstration was completed in 1 week.

The Data Link Gateway system served as the Link-16 data terminal and monitoring system at six of the eight testing lab sites. The SSC San Diego Systems

Integration Facility (SIF) served as the data hub during the SIMPLE demonstration. The SIF was critical to the operations because all data link messages came over encrypted telephone lines through the SIF and forwarded to the other connected SIMPLE nodes.[31]

In addition to the systems in the SIF and NCTSI, Data Link Gateway systems were installed at the NATO Air Base in Geilenkirchen, Germany, the British Royal Air Force base in Waddington, U.K., the German Navy base in Wilhelmshaven, Germany, and the NAEW Force Command Branch at The Hague in the Netherlands. Another Link-16 simulator, called the Tornado ADV, was used at the Italian Air Force base in L'Aquila. The Defence Evaluation and Research Agency (DERA) in Malvern, United Kingdom monitored with its own system. The Hague was the hub for voice communication exchange.

SSC San Diego hosted more than 25 European representatives involved in the SIMPLE demonstration 29 June–1 July for a formal review and evaluation of the test results. The SIMPLE NATO Analysis Panel Executive (SNAPE) meeting was chaired by United Kingdom Navy Lt. Cmdr. Owen McDermott of the Management and Commercial Policy Branch of the Defense Procurement Agency, Ministry of Defense.

The administrators, analysts, and technicians attending the SNAPE agreed that the SIMPLE Demonstration accomplished its goals and paved the way for future testing. Because of the success of these tests, it is planned to do interoperability testing twice a year, in April and September, and to involve other countries and U.S. military services. The next test will be held in April 2000.

The Data Link Gateway systems were specifically chosen for this testing demonstration. Data Link Test tools are now being used in more than 80 military sites worldwide to simulate a variety of airborne and surface elements in support of interoperability testing and training.

ELB ACTD[32]

Spearheaded by SSC San Diego, the Extending the Littoral Battlespace (ELB) Advanced Concept Technology Demonstration (ACTD) completed its first major system demonstration. The team was a government and industry partnership. With Marines and Soldiers on the ground hundreds of miles from their command post at sea, the littoral (coastal) battlespace extended over 200 miles. All forces were able to maintain continuous contact using a complex set of COTS (commercial off-the-shelf) and GOTS (government off-the-shelf) communication equipment based in a series of airborne, non-tactical satellite relays.

The AN/VRC–99(A) GOTS radio made by Marconi Hazeltine provided the long-haul communication backbone to major platforms while WaveLAN, a commercial Lucent Technologies product, provided the link to individual Marines in the field.

The ELB ACTD was the outgrowth of the 1996 Defense Science Board study to respond to the challenges of "Operational Maneuver from the Sea" and "Ship to Objective Maneuver." Flattened web-based C2 supported by sensors and intelli-

gence were enabled by a high capacity tactical wide area network over hundreds of miles. Integrated fire and targeting solutions were the cornerstones of the program.

ELB ACTD Group Award[33]

The ELB ACTD team received a group award for their role in ELB ACTD. The ELB team provided technical support, management, and leadership to the program and spearheaded the communications and networking efforts. They planned and engineered the command and control variants, coordinated the sensors participation, installed the shipboard systems and subsystems, provided a series of video reports, and wrote technical documentation. The team used talent and expertise from across the Center.

Distributed Engineering Plant[34]

SSC San Diego is playing important roles in a comprehensive new program designed to improve fleet readiness by identifying and resolving interoperability issues before deployments. The Distributed Engineering Plant (DEP) is a battle group testing system that connects, in real-time, land-based combat and battle management systems located in a variety of Navy testing facilities across the U.S. The DEP shifts battle group testing ashore by using cutting-edge technology and innovative application methods to provide an environment that can simulate actual battle group operating conditions anywhere in the world.

The DEP expands combat systems integration testing outside the lifelines of a platform to include all battle group participants in the testing process. It also allows software support activities to participate in the testing process in real time.

In January and February 1999, after months of planning and pretesting exercises, the first certifying interoperability test using the DEP was conducted for the *John F. Kennedy* (JFK) Battle Group (CV67). Called the Battle Group Interoperability Test (BGIT), the program proved that the DEP concept works.

The BGIT was designed to provide a disciplined method to characterize battle group interoperability prior to at-sea operations; identify combat system and Tactical Digital Information Link (TADIL) anomalies for future correction; support Naval Sea Systems Command's (NAVSEA) 05 interoperability certification decisions; and validate documented battle group capabilities and limitations. The JFK test events were designed to address several critical operational issues: coherent tactical picture establishment and maintenance; battle group management effectiveness; Year 2000 data format change impacts; and the effects of operational performance enhancements and computer system upgrades.

The NAVSEA Public Affairs Office reported that the JFK BGIT successfully proved that complex engineering problems that challenge interoperability in deployed legacy systems and rapidly developing naval systems can be resolved.

Development of the DEP began following the formation of NAVSEA's Task Force on Combat Systems Interoperability in 1998. An alliance of NAVSEA, SPAWAR, and Naval Air Systems Command (NAVAIR) field activities began

working on a prototype DEP in September 1999. This effort was under the leadership of the Navy's Battle Force Systems Engineer (SEA 05) and was headed by the Naval Surface Warfare Center, Dahlgren Division (NSWCDD).

Included in the DEP network are SSC San Diego's SIF and E2C Laboratory; the Naval Surface Warfare Center, Port Hueneme Division's (NSWC PHD) Integrated Combat Systems Test Facility (ICSTF); and the Navy Center for Tactical Systems Interoperability (NCTSI). Other DEP facilities include SSC Charleston, SC; NSWC PHD, Dam Neck, VA; Aegis Combat Systems Center, Wallops Island, VA; Aegis Training and Readiness Center (ATRC) and Aegis Computer Center (ACC), Dahlgren, VA; and the Naval Air Warfare Center Aircraft Division, Patuxtent River, MD. More facilities will become part of the DEP in the future.

Test facilities are equipped with actual host combat and battle management hardware in the loop and software systems. These include aircraft, aircraft carriers, guided missile cruisers and destroyers, amphibious assault ships, command and control ships, and submarines.

Information is exchanged among battle groups via tactical data link networks (Link-16 and Link-11). Link-16 message exchange capability in the DEP is provided by SSC San Diego's Data Link Gateway Terminal Emulators (GTEs) located at each Link-16 host site (in the SIF; at the F-14 laboratory, Point Mugu; NSWCDD, Wallops Island; SSC Charleston; and ICSTF).

The GTEs emulate the Joint Tactical Information Distribution System (JTIDS) terminals that would be found on actual hosts for Link-16 message exchange. The ACC, ATRC, and NSWC PHD sites utilize NSWC Dahlgren Division's Aegis Broadcast Network-16 (ABN-16) to exchange Link-16 messages. The GTEs and the ABN-16 network are bridged together using the JTIDS terminal interface control document specification.

Future connectivity between ABN-16 and GTEs will utilize the NATO Standard Interface for Multiple Platform Link Evaluation (SIMPLE) Standardization Agreement for TADIL message exchange. The sites are interconnected by means of high-speed asynchronous transfer mode (ATM) network technology that aggregates all tactical data link, common environment, and voice/video teleconferencing communications into a single network. This creates a realistic tactical communications environment for system testing and/or certification.

BGSIT Y2K Readiness[35]

SSC San Diego were directly involved in coordinating Battle Group Systems Integration Testing (BGSIT) Year 2000 (Y2K) operational validations. BGSIT is a Commander in Chief, U.S. Pacific Fleet (CINCPACFLT)/Commander in Chief, U.S. Atlantic Fleet (CINCLANTFLT) program chartered to identify integration and interoperability issues in U.S. Naval forces and provide direct fleet support.

A headline news report from the Chief of Naval Information stated: "The Navy completed its Y2K work by using BGSIT during the spring and summer. These

tests involved rolling ships' system clocks ahead to January 2000 and to leap year dates of 29 February and 1 March 2000. These BGSITs exercised all ships' systems, from weapons and fire control to logistics and quality of life. Similar tests ashore were conducted to test the continuation of services at Navy bases and in pay, personnel, and logistics systems readiness. The tests confirmed that the Navy's ships will be well prepared as the new year dawns around the globe."

To combat the concerns with respect to the Navy's Y2K readiness, in June of 1998 the Chief of Naval Operations (CNO) established a Y2K Program Office to investigate potential problems within U.S. Naval forces' operational capabilities and ensure corrections were provided prior to the "roll over." Mohlenbrok explained that the most daunting task for the CNO Y2K Program Office was a timely determination of which of all of the Navy's thousands of combat and C4ISR systems were Y2K vulnerable. This means that the system processed a date and may potentially be affected by a date transition from 1999 to 2000. Once the list of Y2K vulnerable systems was determined, each system was subjected to a three stage testing strategy designed to identify any Y2K deficiencies. Corrections to deficiencies were to be fielded well before 31 December 1999. Three levels of testing were designed as part of the Navy's Y2K Readiness Plan.

Level 1 - Individual System Certification

Y2K vulnerable systems were tested individually by each system owner. Each system was lab-tested for 27 critical Y2K related dates including the two most visible dates 1 January 2000 and 29 February 2000. Each system's program manager was required to certify the system's compliance for the Y2K dates and ensure that all Memorandums of Agreement for system interfaces existed.

Level 2 - Functional Mission Area and Integrated Systems Testing

"Strings" of Y2K vulnerable systems were tested together to ensure compliance of system interfaces. SPAWAR, NAVSEA, and NAVAIR linked various lab facilities together to test C4ISR and combat systems for Y2K compliance by simulating ship functional configurations and again testing all 27 critical Y2K related dates.

Level 3 - Validation of a Task Force in the Operational Environment

CINCPACFLT and CINCLANTFLT created a team using SSC San Diego support to validate Y2K compliance in an at-sea operationally stressed environment. This validation was to confirm that the warfighter could continue to perform the critical mission areas while in a simulated Y2K situation.

CNO, CINCPACFLT, and CINCLANTFLT selected five battle groups (BGs) and amphibious ready groups (ARGs) to participate in the Y2K Level 3 operational validation (OV) events. These groups of ships are the ones most likely to be operationally deployed before, during, and after the date transition of 31 December 1999 to 1 January 2000, and the other Y2K critical dates. OV events were conducted in January 1999 on the *Constellation* BG, *Peleliu* ARG, Pacific Middle Eastern Force (PACMEF) 99-2, and the USS *Coronado* (AGF11); in May 1999 on the *John F. Kennedy* BG; in June 1999 on the *Bataan* ARG; in August 1999 on the *John C. Stennis* BG, *Bon Homme Richard* ARG, PACMEF

99-3, and *Coronado*; in September 1999 on the Forward Deployed Naval Forces in Japan; in October on the *Eisenhower* BG; and finally, the *Wasp* ARG which is ongoing (May 1999).

Y2K OVs were structured to evaluate system performance in an artificially induced Y2K environment while a Naval task force conducted a strenuous at-sea training event. The Commander in Chiefs' BGSIT teams were charged with expanding the standard interoperability testing processes into a vehicle used to monitor a task force's ability to perform its mission in the next century. Comprehensive BGSIT final integration test (FIT) procedures were produced and executed in a 1999 environment to identify any interoperability or integration issues in real-time. Once the task force performance baseline had been determined, system experts and ships' force personnel prepared each system for advancement into the Y2K (backed up databases, etc.) and then advanced the Y2K vulnerable systems into 2000 using precise procedures conducted in sequence. Systems were observed for proper operation, and the FIT steps were re-executed to look for system performance differences between 1999 and 2000. Once validation requirements were satisfied, the systems were restored to the real 1999 date and proper operations were again confirmed.

Results

In all of the OVs combined, there were less than 20 Y2K issues identified. Most were "display" issues that did not impact performance of that system. During the simulated Y2K environment, there were no system degradations that impacted any task force's mission readiness. The Sailors and Marines on these task force units were able to perform their warfighting duties in the 2000 environment as if they were still in 1999.

CTAPS Awards[36]

On 7 September 1999, SPAWAR Deputy Program Manager, Navy Command and Control Systems (PMW-157) Mike Spencer presented the SPAWAR Lightning Bolt "Team Excellence" Award to the Contingency Theater Automated Planning System (CTAPS) Y2K (Year 2000) team. The award letter stated that the team displayed "keen foresight, superior software engineering expertise, and a relentless work schedule that resulted in providing the joint community a Y2K compliant version of CTAPS, designated version (5.2.3)."

The Lightning Bolt Award is normally given to SPAWAR Systems Command personnel only. In this case, SPAWAR PMW-157 wanted it presented to SSC San Diego's Command and Intelligence Systems Division (D42) CTAPS team.

CTAPS is an operationally critical force-level aircraft mission planning and execution software system. It is used daily in support of Operation Southern Watch (OSW) to coordinate all aircraft assets enforcing no-fly zones in southern Iraq. CTAPS 5.2.3 will allow the seamless planning and execution of OSW missions and any other joint air operations as U.S. armed forces transition to the new millennium.

The CTAPS team includes civilian, military, and contractor personnel from SSC San Diego and SSC Charleston. CTAPS was scheduled to be replaced by Theater

Battle Management Core Systems (TBMCS) in the spring of 1999 but exhibited numerous deficiencies during its preliminary testing cycle. Even before TBMCS was experiencing problems, SSC San Diego submitted a proposal to the U.S. Air Force Electronic Systems Command to provide a Y2K compliant version of CTAPS as a backup in case proposed TBMCS testing and fielding dates were delayed.

SSC San Diego started development and was subsequently awarded the contract to complete development of the Y2K-compliant version of CTAPS. Because of the extremely short time frame, the CTAPS team worked overtime to methodically review approximately four million lines of code for date and time dependencies that could lead to a Y2K failure. Once these dependencies were identified, they were systematically analyzed for Y2K errors. Code segments that needed fixing were reprogrammed, tested, and validated. Both systems centers were then heavily engaged in planning and executing joint acceptance tests (JAT) at Navy and Air Force sites.

Based on successful results of the JAT, the Joint Standard Air Operations Software Configuration Control Board ruled on 15 July that CTAPS 5.2.3 would be the Y2K program of record. The award letter stated that the team's foresight, technical aptitude, and relentless perseverance ultimately resulted in the decision to field CTAPS 5.2.3 to the joint operational community.

The Commander, Operational Test and Evaluation Force (COM OPTEVFOR) released results of the joint acceptance test/follow-on operational test and evaluation of the CTAPS 5.2.3. COMOPTEVFOR found it operationally effective and operationally suitable. The Navy Center for Tactical Systems Interoperability certified CTAPS 5.2.3 interoperable for use in Navy operations on July 23. The Joint Interoperability Test Command certified CTAPS 5.2.3 conformant in the generation and validation of the Air Tasking Order Confirmation and Airspace Control order and U.S. Message Text Formatting messages. On 23 June, Chief of Naval Operations, Director Space Information Warfare, Command and Control (N6) Rear Adm. Robert Natter and Rear Adm. Richard Mayo (N6B) recognized this major accomplishment in an e-mail stating: "Great news on CTAPS and your Y2K efforts based on the preliminary successful joint acceptance test for CTAPS 5.2.3. Please pass my thanks on to all our great techs for their good work."

The Joint Standard Air Operations Software Configuration Control Board voted unanimously to make CTAPS 5.2.3 the system of record for joint air operations. This allowed Air Force fielding schedules and cut-over plans to be finalized with a nominal cut over date of 15 November. On 20 July, SSC San Diego received a letter of appreciation from Rear Adm. Natter. In the letter Rear Adm. Natter stated: "I would like to thank you for your role in the successful remediation of CTAPS. Your efforts over the last several months will allow all U.S. military aviation operations to transition through into the Year 2000 safely and with minimum disruption. The development of a Y2K compliant CTAPS by the U.S. Navy has significantly improved the level of cooperation with the U.S. Air Force in the area of aviation command and control. Congratulations on a job well done."

SSC San Diego spearheaded the engineering efforts to remediate CTAPS. The software development, independent test and evaluation, and Y2K Level 3b- self-

certification were conducted in the lab from November 1998 through June 1999. In July and August, SSC San Diego supported the Air Force Y2K testing at Shaw Air Force Base, South Carolina and Hanscom Air Force Base, Massachusetts. SSC San Diego also supported the U.S. Navy installation of CTAPS 5.2.3 on the USS *John C. Stennis* (CVN-74), USS *Bon Homme Richard* (LHD-6), and *USS Coronado* (AGF-11).

Fleet Engineering Department (D60)

Fleet Battle Experiment-Echo (D60)[37]

"Network-centric warfare in the littoral-asymmetric maritime dominance" was the predominant theme defining the hypothesis and concept of operations for Fleet Battle Experiment - Echo (FBE-E). FBE-E was the fifth Chief of Naval Operations (CNO)-sponsored FBE examining the operational and tactical level of war in the year 2005-2010 timeframe.

The Command and Control (C2) Fleet Engineering Division (SSC San Diego D64) provided integration and command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) in response to tasking from SPAWAR's Advanced Concepts and Technologies (PD-13) and the Maritime Battle Center. D64 provided engineering support to implement over 30 emerging technologies on board USS *Coronado* (AGF-11) and other Pacific Fleet vessels selected as candidates to participate in FBE-E. To limit the impact on shipboard assets, the D64 team designed C4ISR architecture to overlay the existing infrastructure. In doing so, they capitalized on available assets and extended their utility to the FBE forces across all platforms without significantly impacting available bandwidth.

Commander Third Fleet's Sea Based Battle Lab (SBBL), hosted on *Coronado*, was integral in facilitating the many diverse technologies used during this synergistic experiment. The collaborative effort between government and contractor personnel was declared an overwhelming success by First Marine Expeditionary Force Commanding General Lt. Gen. Knutson and Commander Third Fleet Vice Adm. McGinn in Naval message 292300Z APR 99.

The unique characteristics of many of the technologies required in-depth configuration and integration analysis. These included such concepts as Land Attack Warfare System (LAWS), which provides alerts for new calls for fire and automation to support operator validation and declaration of targets during naval gunfire scenarios. Portable Surface Terminal delivered high-resolution imagery, electro-optic video, secure voice and file transfer, and high frequency SURENET, an automatic adaptive communications protocol that uses existing transmission equipment to ensure 100-percent error-free data transmission. Many of these technologies also interfaced with tactical information and data systems such as Global Command and Control System–Maritime (GCCS–M) and Tactical Data Link (Link-16/11). These enabled FBE forces to generate and distribute a fused land, air, surface, and subsurface picture in a secure environment.

The future of naval warfare is being shaped in the Fleet Battle Experiments. While the concepts and technologies supporting the experiments have numerous origins, the overriding purpose is to test innovations in real-time battle scenarios leading to improved warfighting capabilities in the fleet. FBE-E sought to leverage Navy/Marine Corps efforts to extend maritime dominance to an urban environment. In particular, FBE-E explored maritime dominance enabled by a common operational picture. This includes the undersea picture, force protection

from air and missile attack, as well as asymmetric threats and precision engagement in an urban warfare setting.

Forward presence and precision engagement are themes from Joint Vision 2010, which is supported by the Navy and Marine concepts: "Forward...From the Sea," "Navy Operational Concept" and "Operational Maneuver from the Sea."

A common thread of these concepts is the clear requirement to maneuver naval forces from the sea to dominate the littorals while conducting full-scale operations. The overwhelming majority of international population centers, trade, and resource-based markets are in areas contiguous to the sea. The collapse of the Soviet Union significantly reduced the threat of blue water opposition to naval operations and drove a shift in strategic emphasis from blue water operations to a focus on the littorals.

The U.S. Navy is improving its ability to meet the new threats emerging in this vital area of national interest. FBEs provide a vehicle for translating joint and service specific vision into functional tactics, technologies, and procedures. The Maritime Battle Center is the Navy's agent for conducting fleet battle experiments. The mission is to "operationally examine innovative concepts and emerging technologies to identify advanced warfighting capabilities for further development and rapid transition to the fleet." The process of experimentation is incremental, building conceptually and in complexity throughout the FBE series. Network centric warfare is the over-arching concept explored in the FBE series and integrates the tenets of fires, deconfliction, logistics, maneuvers and force protection.

FBE-E focused on the pillars of "Asymmetric Threat and Precision Engagement in an Urban Environment and Submarine Warfare." Supporting those pillars are the precepts of information superiority, theater air and missile defense (TAMD), and casualty management. FBE-E was conducted in conjunction with Urban Warrior/Kernel Blitz employing a diverse and full-spectrum littoral battlespace extending from a dense urban environment to a broad landscape ideally suited for amphibious operations.

FBE-E continued the "sensor-to-shooter" concept explored and developed during previous FBEs including exploration with the introduction of live sensors, investigating questions of command and control, sensor management, tracking, and targeting. The FBE-E forces examined new processes and incorporated additional technology to deter, detect, sort, target and engage asymmetric threats to naval forces operating in the urban littoral environment. Specific threats addressed were combat swimmers, small high-speed watercraft, low – slow flyers, and truck-mounted missiles. The goal is to extend the effective protection umbrella for naval forces operating from the sea, from the point of debarkation to offshore anchorages and operating areas. Specific objectives are to build a integrated surveillance and engagement capability against asymmetric threats, develop C2 to efficiently manage surveillance and engagement of asymmetric threats and to conduct required C2 from a dedicated naval force protection platform.

MLO Training[38]

Link-16 In-Service Engineering Support Agent (ISEA) and Fleet Combat Training Center Pacific (FCTCPAC) personnel teamed up to provide Multi-Link Operations (MLO) training to crew members and staff of the forward deployed *Kitty Hawk* Battle Group (CV 63).

In response to a request from Commander Seventh Fleet (C7F), a team was tasked to provide tailored and responsive Multi-Tactical Digital Information Link (TADIL) classroom and onboard/hands-on training to ships in port and at sea. In an effort to go beyond the basic systems operational training, the team prepared a training package that addressed Link-16 architecture specific to the *Kitty Hawk* Battle Group's theatre of operations. TADIL architectures are complex and develop rapidly. Architectures for theatre operations utilize various data links, TADIL A/B/C/J, and numerous command, control, communications, computers, and intelligence systems. Readiness in these areas is critical.

The purpose of the Korean Theatre of Operations (KTO) Multi-TADIL training conducted for the *Kitty Hawk* Battle Group was to enhance Multi-TADIL readiness and efficiency. It also implemented the training strategy of Commander Task Force 70 (CTF-70) staff Link Quality Management Board (LQMB).

The Multi-TADIL training took place from 8-18 February 1999 and was well received and attended by all of the ships within the battle group. Topics covered by the instructors included:

- An executive review of the Operations Plan 5027.
- Descriptions of theatre specific warfare/mission areas supported by established TADILs, including Theatre Missile Defense, Air Warfare Defense, Under Sea Warfare, and Counter Special Operation Forces.
- KTO command joint structure.
- Introduction to KTO Multi-TADIL architecture, including primary TADIL participants, their locations and the TADILs used.
- An overview of Joint Multi-TADIL capabilities and limitations.
- A description of all theatre-specific Navy and Joint TADIL platform configurations and their capabilities and limitations.
- An overview of TADIL-A, including descriptions of equipment, characteristics, Multi Frequency Link, TADIL-A, modes of operation, and management duties and responsibilities.
- An overview of TADIL-J including descriptions of equipment, characteristics, functions, capabilities and limitations; Model 4 and 5 differences; the Command/Control Processor (C2P); data forwarding JTIDS unit; Joint Network Library/theatre specific networks utilized.
- A review of gridlock that included a discussion of the capabilities and limitations of the Shipboard Gridlock System and the Shipboard Gridlock System with Auto Correlation.
- Operation Task Link development and format.

- KTO identification authority and Aegis/aircraft carrier auto-identification deconfliction/integration.

As part of training, students were instructed on how to develop Multi-TADIL architectures based on given configurations of TADIL platforms and display plans. Students were provided handouts of all current Joint Multi-TADIL platforms in the KTO. Five KTO Multi-TADIL configurations were introduced to the students, and, at the conclusion of the lesson, instructors provided one-on-one analysis of the student-proposed architectures.

As stated in the Commander, Carrier Group Five message, Date Time Group 021331Z Mar 99, "The high caliber of the SPAWAR/FCTCPAC instructors and the quality tailored training they provided were superb. They are examples of the types of personnel needed to provide quality JTIDS/Multi-TADIL training. This training has been recommended to be available in the Seventh Fleet to support all forward-deployed Naval and joint forces."

BG/ARG[39]

The Navy Award of Merit for Group Achievement was presented by SSC San Diego Executive Officer Capt. Sharon Shelton to the *John C. Stennis* Battle Group (BG)/*Bon Homme Richard* Amphibious Readiness Group (ARG) team. The letter stated that the team's "initiative, enthusiasm, and dedication to duty over the past year ensured that the BG and ARG will deploy at the highest level of readiness."

Team members served as onboard coordinators for all command, control, communications, computers, intelligence, surveillance, and reconnaissance installations. They coordinated all in-briefs, installations, site operational validation tests, training, and out-briefs. They acted as liaisons between ship's force and SSC San Diego as the single point of contact aboard ship. They supervised the daily activities of the install teams and briefed the ship's points of contact daily. If the ship was in a Chief of Naval Operations availability, they acted as liaison with the Naval Support Activity (NSA) and attended weekly production meetings. In addition, the team ensured that the NSA was included in clearance messages and correspondence, and that alteration installation teams complied with Naval Sea Systems Command Technical Specification 9090–310B.

Intelligence, Surveillance, and Reconnaissance Department (D70)

HPC Computing Systems Upgraded[40]

In July 1999, SSC San Diego successfully upgraded its current high-performance computing (HPC) systems with two Hewlett-Packard (HP) V2500 scalable parallel systems, one at the classified secret level and the other at the unclassified level.

Each of the two identical HP V2500 scalable parallel systems has 16 PA-RISC processors operating at 440 MHz, and each is configured with 16 GB of memory, 500 GB of disk space, and 6500 GB of robotic tape storage. The disk space and tape storage subsystems are linked to the HP V2500 systems via fiber channel storage area networks and feature hierarchical storage management software that will automatically handle all data archival and backup demands. A dual cluster of HP Lxr8000 Netservers running Windows NT is also available for local use. Systems share disk space and tape storage with the unclassified HP V2500 system.

All HPC systems connect directly to the campus asynchronous transfer mode (ATM) optical network backbones that provide links to all major sites and facilities at SSC San Diego as well as to the nationwide Defense Research and Engineering Network (DREN).

These state-of-the-art computing systems and high-speed networks provide SSC San Diego scientists and engineers access not only to the local HPC capabilities but also to all the computational resources available at other DoD High Performance Computing Modernization Program (HPCMP) centers.

USS *Dolphin*[41]

The research submarine USS *Dolphin* (AGSS-555) reached a 30th anniversary recently while dry docked at the 32nd Street Naval Station. The *Dolphin* program began in 1961 but was interrupted for 2 years after the loss of the submarine *Thresher*. *Dolphin* was finally launched at the Portsmouth Naval Shipyard 8 June 1968, at a total cost of $37 million. *Dolphin* has since operated as a unit of the Submarine Force of the U.S. Pacific Fleet under Commander, Submarine Development Squadron Five. The *Dolphin* is a tenant of SSC San Diego and operates from Pier 160 Bayside.

For 30 years, *Dolphin* has demonstrated and tested state-of-the-art capabilities for the Navy. In the first decade as a deep diving research submarine, *Dolphin* explored the deep ocean in the Gulf of Alaska and off the coast of Southern California. *Dolphin* collected low-frequency acoustic propagation loss data that helped define the submarine fleet of today. In the second decade, *Dolphin* tested complex weapon and sensor systems and was singularly responsible for

introducing new sonar technology that is still benefiting the submarine and undersea warfare communities. In the third decade, *Dolphin* demonstrated such advanced technologies as optical communications between a submarine and an unmanned undersea vehicle (UUV), acoustic control of a UUV from a submarine, and submarine-to-aircraft laser communications.

GISRS (FBE-E)[42]

SSC San Diego showcased a newly developed and highly evolved warfighting tool during Fleet Battle Experiment-Echo (FBE-E). Installed aboard the USS *Coronado* (AGF-11) early in 1999, the Global Intelligence Surveillance and Reconnaissance System–Maritime (GISRS–M) became an integral part of planning and execution of precision engagement operations conducted during FBE-E.

GISRS-M is a SPAWAR Intelligence, Surveillance, and Reconnaissance Systems Directorate (PD-18) sponsored effort consisting of the Tactical Advanced Situation Display (TASID) and the Common Operating Framework (COF). TASID is an Office of Naval Research initiative developed under sponsorship of Advanced Technologies and Prototypes (PMW-133). COF was developed under sponsorship of multiple agencies. The design, implementation, and integration of TASID and COF were accomplished by SSC San Diego's Joint and National Systems Division (D73).

The technical objective for the incorporation of GISRS-M/TASID into FBE-E was to create an automated interface between GISRS–M/TASID, the Precision Targeting Workstation (PTW), the Joint Targeting Workstation (JTW), and the Land Attack Warfare System (LAWS) to exchange target cueing, identification, and geo-location information. The automated interface design also met the operational objective of TASID to perform real-time multisource screening to identify and track targets for rapid exploitation and precision geo-location functions to support joint strike operations.

To achieve a tactically useful presentation, the TASID segment of GISRS–M was designed to be capable of accepting information from a variety of sources. These include reconnaissance information from unmanned aerial vehicles (UAVs) such as Predator and Global Hawk. TASID can also accept electronic intelligence (ELINT) information from the TRAP (Tactical Receive Equipment-Related Applications Report) Data Dissemination System (TDDS), tactical tracks from Link-16, theater and national imagery, order of battle (OOB) data from the Integrated Data Base (IDB), and Global Positioning Satellite (GPS) geo-location coordinates.

Although TASID displays the UAV video in a real-time video window, TASID also plots the location of the Predator UAV and its sensor footprint (target) on the map every 3 seconds, allowing the operator to see the geographical origin of the video stream. Operationally, this allows the TASID operator to track moving targets captured by the video sensor against a National Imagery and Mapping Agency (NIMA) map background and provides the information needed to support engagement of mobile land targets. The real-time positioning data needed

to provide this capability are decoded out of the closed caption band of the video signal. All features of TASID comply with Level 5 of the Defense Information Infrastructure (DII) Common Operating Environment (COE).

During FBE-E, one of the software application programs of COF termed "C2TLink" was installed as an information source for TASID. COF is a software framework that provides surveillance data streams and mission planning routes. COF utilizes the Common Object Request Broker Architecture (CORBA) as a mechanism to achieve inter-application network connectivity. In the specific COF implementation aboard *Coronado*, C2TLink accepted geographic and data type control directives from TASID and responded by supplying data streams and routes responsive to those directives. COF added value to the intelligence, surveillance, and reconnaissance (ISR) process by significantly expanding the types of data available to TASID.

During FBE-E Phase I, one of the most important roles played by GISRS–M was processing live reconnaissance video from Predator airborne sensors flown on board the Pelican, which is a Predator surrogate. The video imagery was received and injected onto the *Coronado* secret video local area network. Displaying the Pelican position and sensor footprint on the map, combined with ELINT and other information arriving via the Secure Internet Protocol Router Network (SIPRNET), provided an overall and comprehensive tactical picture for the targeting officers in the Joint Strike and Joint Air Operations Cells.

The TASID segment of GISRS–M was located in the Joint Strike Cell and during the initial days of FBE-E was manned by government personnel. The COF segment of GISRS–M was co-located with TASID and was manned by SSC San Diego D73 contractor personnel. The system was relied upon as the key operational tool for both real-time targeting and battle damage assessment. Targets in the incoming TASID video stream were easily detected by the operators. Snapshots of the target and surrounding geographic location, along with positional information, were forwarded to the JTW, the PTW, and the LAWS. At the JTW national imagery was fused with the TASID output to form target "folders" which were used for tracking, targeting, and killing the target.

An impressive capability demonstrated by the TASID support team was the ability to respond to configuration change requirements in near real time. During Phase II of FBE-E, the Pelican UAV was replaced with a P–3 Orion aircraft equipped with the Pioneer UAV sensor suite. It was discovered that the P–3 video data did not provide the sensor footprint. After noting the problem, the TASID shipboard team sent a software modification request, via SIPRNET, to the TASID Development Lab (TDL) at Point Loma. At the TDL, changes were made that displayed the sensor line-of-bearing on the map. The modified software modules were then transmitted (again via SIPRNET) back to the TASID workstation aboard the *Coronado*. The TASID support team rebuilt the software on-site in order to provide the needed capability. This method of providing rapid software changes necessary to accommodate a dynamic operational environment was used numerous times during the course of FBE-E.

During FBE-E Phase II, the TASID team provided on-the-job training to naval personnel manning the Joint Strike Cell (JSC). After a short period of indoctrination, the TASID segment of GISRS–M was operated solely by the ship's crew.

The crew successfully accomplished target acquisition and post-strike battle damage assessment (BDA) using TASID for a Standoff Land Attack Missile–Expanded Response (SLAM-ER). The integrated systems in the JSC (GISRS–M/TASID, JTW, and LAWS) provided a sensor to exploiter to weapon information flow that identified targets, created target folders, and conducted post-strike BDA. All operations went smoothly and without incident.

Originally expected to be de-installed after Phase II, TASID was retained for Phase III; it had been expected to have TASID operated with SSC San Diego developers present. Operational experience with the system provided the *Coronado*'s crew with the confidence needed to conduct autonomous operations during the third at-sea phase of the experiment.

The system was briefed at the flag level and was included in a Cable News Network (CNN) briefing during Joint Strike Cell activities. A number of Commander, Third Fleet Maritime Battle Center, and visiting dignitaries provided very favorable comments on the important role played by TASID in tracking and targeting mobile targets throughout the experiment.

ADS Fleet Exercise Test—Milestone II[43]

SSC San Diego supported the Advanced Deployable System (ADS) Program Office by successfully conducting a major fleet exercise test (FET). This exercise provided justification to continue the program into the engineering and manufacturing development (EMD) phase upon the Milestone II decision. ADS is a passive acoustic undersea surveillance system designed to detect, classify, localize, track, and report surface ships and submarines in the littoral battlespace in real time.

The ADS program is sponsored by SPAWAR Advanced Deployable Systems (PMW-183). Concentrated planning for FET began in December 1997. The FET site was finalized and approved as Southern California (SOCAL), the test and evaluation master plan test objectives were approved, and a rough schedule of events were proposed to several fleet organizations.

During the next several months of liaison with Commander, Third Fleet (COMTHIRDFLT), a 60 day window of time was selected. It was centered around three highly visible fleet operations/exercises scheduled in the SOCAL area. Once committed to the fleet for this test window, efforts by many individuals and organizations ensured that the hardware production and planning schedules stayed on track to meet the 1 April 1999 commencement date of FET. This achievement occurred despite many fleet schedule changes, delays in wet-end hardware deliveries, software build changes for the processing and analysis suites, and even last minute changes in the schedule of the installation platform.

An important evolution was required prior to the start of FET to ensure a smooth start of the exercise. First, in mid-January 1999, a multi-organization team led by SSC San Diego personnel installed the shore termination system. This system has a wet-end junction box installed in approximately 100 feet of water containing six acoustically activated pop-up buoys. These would be used to connect each

of the small-diameter fiber-optic cable connections from the field to shore. One armored shore cable (six individual fibers in the center) was connected from the J-box to shore, through the surf zone, to a bluff on station U.S. Marine Corps Camp Pendleton, Oceanside, where the processing and analysis system was located. Secondly, the multi-node test required the successful deployment and operation of a four-node leg of the FET by the prime contractor, Lockheed Martin Federal Systems, and its team of Raytheon Systems Company and GTE (formally Bolt, Beranek, and Newman, Incorporated). This was accomplished during February as a precursor test for FET.

FET officially began with the installation of three more four-node strings creating a 16-node field in which test targets and projectors would assist in the evaluation of the acoustic performance of the field. Using the M/V *Independence* as the deployment platform, the ADS field was deployed just prior to a mine-laying evolution that would require the use of several ADS nodes to detect these activities. The *Independence*, along with another platform, was used extensively to conduct repair operations with the remotely operated vehicle (ROV). They deployed additional nodes and internode cables, and conducted projector tows in a variety of patterns around each of the operating nodes throughout the 2-month FET test.

The critical element of FET was the successful interaction with the fleet during a number of tests/exercises. After a start-up learning curve, the fleet exercise with the USS *Constellation* Battle Group (CV64) proved highly successful. Operators passed real-time localization information on the test target, USS *Dolphin* (AGSS-555), which resulted in four successful prosecutions by carrier battle group response forces. This scenario vividly demonstrated the primary function of the ADS System.

As the at-sea operations were being conducted, activities were directed from the processing and analysis segment (PAS) site at Camp Pendleton. This complex consisted of two ADS isovans linked together to provide the processing and analysis. A Commander, Naval Telecommunications Command communications van provided a wide variety of connectivity to the fleet, including satellite communications, Officer in Tactical Command Information Exchange System, Voice, Naval Modular Automated-Communications System II, and Secure Internet Protocol Router Network.

SSC San Diego personnel arranged for the communications van, supporting equipment, and the acquisition of reservists to man the system as well as coordinated set up of the PAS site to accommodate the vans and equipment. Within the ADS PAS site, military operators from Commander, Undersea Surveillance provided 7/24 operational analysis. They provided the foundation for the direct information passed to the fleet via the communications van during real-time operations.

A high rate of cable repair was anticipated due to the placement of the fiber-optic J-box in the middle of sport fishing grounds. Operationally hazardous environments could not be avoided for this test and required a repair team that could rapidly respond to cable breaks as they occurred. SSC San Diego provided repair and splice team personnel. This dedicated team spent many long hours at-sea under

arduous circumstances to retrieve the cable, complete the splice around the break, and return the repaired cable to the seafloor.

Over the course of 4 months, the dive locker conducted 21 dives to greater than 100 feet of depth in the open ocean off of Camp Pendelton.

WIRE System[44]

The Advanced Deployable System (ADS) is a passive acoustic undersea surveillance system designed to detect, classify, localize, track, and report surface ships and submarines in the littoral battlespace. It provides the joint task force commander a complete acoustic view of the maritime picture.

Unlike previous systems, which take months or even years to deploy and operate primarily in deep water, ADS can be deployed within days in response to quickly evolving political and military situations along coastal areas of interest. Because of its flexible design, ADS hardware can be configured as dense or sparse fields, or as a trip-wire or barrier. Its sensors are battery-powered disposable arrays of hydrophones that can be installed from a ship of opportunity. A fiber-optic cable connects the strings of arrays to the processing system ashore or afloat.

In early 1996, as the prototype for the current ADS system was being developed, SSC San Diego's Ocean Technology Branch (D744) proposed the need for a system capable of inspection and repair of the deployed system. The proposed system was called WIRE, the Wet-End Inspection, Repair, and Recovery Element. SPAWAR PMW-183 leads the ADS program.

During the summer of 1996 the ADS design team developed the tools to be used by a remotely operated vehicle (ROV) to grab, cut, and attach recovery lines to the ADS fiber-optic cable, as well as the deck winch used to haul in the recovery line and ADS cable.

An important test for the complete system came in March 1998. The ADS Integrated Article Test (IAT) was just underway in Puget Sound when a critical failure occurred that stopped the entire test. It was determined that a section of ADS internode cable was damaged during installation preventing any acoustic signals from reaching the signal processing van on shore. The WIRE system was nearby in preparation for a scheduled demonstration. WIRE was called into emergency action and was able to mobilize the necessary equipment, localize the failure, find and retrieve the bad cable, and splice in a section of new cable, all within 24 hours, allowing the IAT to continue. The remainder of the test went flawlessly followed by a highly successful WIRE operation to recover the entire wet-end hardware subsystem.

In more recent at-sea ADS field testing, WIRE and its companion splicing system have been used to recover cables after testing, make planned cable splices at an offshore underwater junction box, and conduct ADS cable repairs. The repair operations have resulted in great savings to the ADS program when compared to the costs of replacement and other more conventional repair methods.

Communication and Information Systems Department (D80)

Prototype Vest Antenna[45]

A significant challenge in the digitization of the battlespace is to bring the distribution of information down to the foot-mobile warfighter. Although networked high capacity radios with a very large frequency range are currently under development, a new approach is needed to design the antennas to support this evolution. The prototype vest antenna has been fabricated to test new techniques to be used in the integrated ultra wideband antenna system. This antenna system will be incorporated into the combat wear of Marines and Soldiers in the field.

The development of an antenna system for the Man-Portable Joint Tactical Radio is a science and technology project funded by Marine Corps research and development (R&D) 6.2 money for command, control, communications, computers and intelligence projects. The project began in May 1999. The project is being done in cooperation with the Naval Postgraduate School (NPS).

The prototype is a vest-integrated antenna that will be the centerpiece in a user-friendly combat wear integrated (COMWIN) system. It will operate with legacy radios as well as with the Joint Tactical Radio System of the future. The complete system will operate over an extraordinarily wide range from two to above 2000 megahertz. The 1000:1 ratio of highest to lowest frequency is more than any existing system can do today. The vest antenna itself will operate in the 30–500 megahertz frequency range. This range covers the core of Marine communications in the field, the Single Channel Ground and Airborne Radio System (SINCGARS), and the systems used for locating and communicating with ships or airplanes.

The vest liner prototype is made of a commercial fabric of copper interwoven with polyester. It is breathable, light, and highly conductive. The deviation of the material from a perfect conductor is very small. Since the fabric, originally made to protect electronic devices from radiation, melts easily, copper tape was sewed to the fabric to make soldering possible.

Radiation hazards are the next challenge for the team to address. As with a cellular phone next to the ear, radiation emanates from the antenna vest. The research team will investigate, assess, and determine ways to mitigate any dangers from the radiation.

In addition to improving the vest design and investigating radiation hazards, the NPS team is performing research on fractal-based antennas that can be integrated into a helmet. Simulations run at NPS indicate that a frequency coverage from 400 to above 2000 megahertz is possible. SSC San Diego will fabricate a prototype and assess this design. Additional challenges include integrating the antennas into one system and investigating the robustness of wearable antenna systems in harsh environments.

The mother project to the antenna effort is the development of the Joint Tactical Radio System (JTRS). SSC San Diego is providing the simulation, modeling, and requirements analysis for the Marines on this project. In addition, the JTRS provides the transition path for the COMWIN antenna system. Eventually the R&D team envisions providing every foot-mobile warfighter with an antenna lined vest that would make the radio operator completely inconspicuous.

SPOT Geolocation Technology[46]

A VIP demonstration of geolocation technology tasked under the Defense Advanced Research Projects Agency (DARPA) Small Unit Operations (SUO) program was presented at the McKenna Military Operations in Urban Terrain (MOUT) Facility, Fort Benning, Georgia. The program called Soldier Position Orientation and Tracking (SPOT) was developed to demonstrate lightweight, portable geolocation technology for use by SUO personnel working in a variety of environments including urban, forest, and canyon. In addition, an in-building personnel tracking system was developed and demonstrated.

SSC San Diego was the designated technical agent for the SPOT project. The DARPA Tactical Technology Office, under the direction the U.S. Air Force, initiated the SPOT program to demonstrate an integrated geolocation device, the Specialized Navigation for Indoor Personnel (SNIPER) unit. This unit incorporates the Global Positioning System (GPS), differential GPS, long-range navigation (LORAN), and inertial measurement unit (IMU) for use in a variety of environments where GPS may not always be available.

Geolocation provides military force commanders with location information as to where their people and assets are in a variety of circumstances. For example, a squad level small unit operation might be required to go into a third world country to rescue hostages or evacuate an embassy. Potentially, soldiers could be outfitted with SPOT to identify their individual whereabouts.

For the demonstration, SPOT provided 1-second position updates to the command center over a very high frequency radio link. The program goal is to have a device that provides location accuracy to about 10 meters in urban terrain areas, 5 meters in heavily forested areas, and 3 meters inside buildings. The purpose of the VIP demonstration was to actually demonstrate these capabilities.

In 1997, contracts were awarded to develop components for the SPOT system under a broad agency announcement. QTECH developed a low-power, high-accuracy clock called MCXO that provides a common-time reference for all components of SPOT. Rockwell was the system integrator and developed the low-power GPS receiver. The receiver uses massively parallel correlators for rapid acquisition and only uses 2 joules of energy per position fix. The commander's mapping system displays the position of the SPOT receiver in real time. DARPA funded the Coast Guard Academy to develop a low-power LORAN receiver with a magnetic loop-based antenna. An in-building time difference of arrival system (TDOA) was also developed by the Coast Guard Academy. The TDOA can transmit from inside a building to receivers outside and determine a three-dimensional location fix within a 3-meter distance.

The McKenna MOUT facility was chosen because it offers a representative setup of a small third-world village, has a centralized command center, and is fully instrumented to provide observation by VIP personnel. The VIP demonstration was conducted much like a play and was organized with two acts with three scenes each. Act I Scene 1 demonstrated tracking of a mobile command post. The SNIPER portable unit was placed in a moving van and transmitted its location back to the McKenna command center where observers could monitor its position on a moving map display. In Act I Scene 2, the SNIPER unit was operated in the LORAN mode and the SNIPER unit simulated the operation as a covert tagging device. The SNIPER unit transmitted its position back to the command center and observers again watched on a moving map display. In addition, outdoor cameras installed at the McKenna MOUT facility provided live video of the movement. In Act I Scene 3, the SNIPER unit was again used in the van, retraced the path taken in the previous scene, and simulated a friendly force gathering intelligence.

In Act II Scene 1, a squad of soldiers (one carrying the SNIPER unit on his back) walked through a wooded area, encountered a hostile mortar team, had a firefight, and secured the area. The soldier with the SNIPER unit was tracked and his location identified. In Act II Scene 2, the squad was tracked as they cleared a church and prepared for an assault on a building containing terrorists. A wireless video camera was set up and observers could watch the live action video. In Act II Scene 3, a small unit of soldiers (one carrying a TDOA transmitter) entered a building containing terrorists, had a firefight, and captured the terrorists. The building was instrumented with video, sound, and acoustical tracking devices. The TDOA system was able to track the soldier inside the building, and his location was transmitted back to the command center. Observers were able to view live action video, sound, and the TDOA location on a moving map display.

The SUO geolocation VIP demonstration successfully presented a live action demonstration to an audience of approximately 25 people from several organizations.

Real-Time Intelligence Imagery Support to Kernal Blitz[47]

Under tasking from the High Altitude/Endurance Unmanned Aerial Vehicle (HAE UAV) Joint Program Office, SSC San Diego fulfilled a critical role in getting real-time reconnaissance information to tactical users in the field. The USS *Coronado* (AGF–11) was provided near real-time intelligence imagery in support of their role in the Kernal Blitz exercise during April 1999. The success was the result of a cross-department effort by a team of government and contractor personnel.

Using Synthetic Aperture Radar (SAR) and wide area search sensor packages developed for the Global Hawk UAV, an A-3 aircraft was employed as a reconnaissance platform during the exercise in support of Navy personnel. The information transmitted to *Coronado* was used as a key input for tactical decision making. This included strike planning and the allocation of platform and weapon resources.

Using in-place assets from the Defense Information Systems Agency (DISA) and the Defense Advanced Research Projects Agency (DARPA), SSC San Diego developed a global high-speed communications architecture at extremely low cost or, in some cases, at no cost at all. Elements of the Defense Information Systems Network, Leading Edge Services (DISN-LES), the Defense Research Engineering Network (DREN), and phases one and two of the Global Broadcast Service (GBS) were fused into an economic, secure, and highly robust information superhighway which served intelligence exploitation systems aboard *Coronado*. Tactical units at Nellis Air Force Base and Fallon Naval Air Station were also included in the exercise, but were prevented from participating due to technical problems unrelated to the imagery dissemination phase of the combat operations.

SSC San Diego designed an architecture that made use of a combination of copper and fiber-optic land lines, radio frequency microwave links, and satellite broadcast resources, employing state-of-the-art asynchronous transfer mode (ATM) networking technology. The imagery originating from the reconnaissance airframe sensor set was received and processed directly at the Global Hawk Mission Control Element (MCE) positioned at the Teledyne Ryan facility in San Diego. From Teledyne Ryan, the data were passed to SSC San Diego via a commercial wide-band land line where it was injected onto the unclassified ATM networking systems. Using an innovative Omnicast procedure, the imagery was then bridged onto SSC San Diego secure classified networks at the Precision Engagement Center of the Future (PECOF), with less than a few seconds delay. The classified ATM networks provided a secure high-speed path for information transport to GBS phase one and two ground stations in Suffolk, and at Wahiawa, Hawaii. Satellite broadcast then relayed the image files on to users aboard *Coronado*. The image files were available to users at Nellis and Fallon had they been able to participate.

Teledyne Ryan Aeronautical, builder of the Global Hawk, created tailored image files to more precisely support Kernal Blitz. Image analysts at Teledyne created smaller and specialized chips of larger files for transmission by reviewing the received imagery and selecting only those areas of interest to the tactical users. Both SAR and wide area search imagery chips were transferred to the GBS and uplinked to the users during the exercise. This resulted in a lower communications bandwidth use and reduced the end-user workload at the field site.

Fifteen SAR spot image chips averaging 18.3 megabytes (Mbytes) and 15 SAR wide area search image chips averaging 8 Mbytes were broadcast over a 2-hour period. A total of 395 Mbytes of imagery were broadcast during the exercise, resulting in a total transmission of 1.4 gigabytes including retransmissions.

Although the primary purpose of the imagery dissemination was to demonstrate the utility of Global Hawk information to the warfighter, the exercise showcased the capabilities and effectiveness of operational and experimental Department of Defense (DoD) communications resources. The UAV imagery dissemination exercises clearly showed that the current DoD connectivities and bandwidth availability can serve widely dispersed fighting units engaged in simultaneous, independent combat actions with virtual transparency to the end users. They can do so with a minimal of required communications technical support.

Concurrent with the imagery dissemination effort, SSC San Diego is also developing an Image Product Library (IPL) capability in the PECOF located Topside, Building A35. Based on the National Imagery and Mapping Agency (NIMA) standard, the IPL will contain a large database of Global Hawk and National image files. It will have interfaces with several wide-band and secure networks allowing remote users smart pull access to industrial security regulation (ISR) data. The IPL will provide the Navy a means to explore effective methods to integrate unmanned aerial reconnaissance sensor information into tactical warfighting tasks. Special emphasis will be focused on the utility of UAV data in the prosecution of littoral warfare scenarios.

A first effort of the IPL will be to determine methods of image partitioning for large files. This will enable field users with reduced communications capability (such as shipboard intelligence exploitation systems) to receive data in a time frame that is commensurate with the time line of the battle. Typically, Global Hawk generates images from 40 to 150 Mbytes in length. The bandwidth of a common T-1 communications channel is only 1.544 Mbytes per second, resulting in a worst-case transmission time of about 20 minutes. The IPL will investigate smart pull techniques that tailor the content of the image to the need of the user, effectively reducing transmission time.

SABER Team Certificate of Excellence[48]

A Certificate of Excellence for Acquisition Reform was awarded to the Situational Awareness Beacon with Reply (SABER) team. The award is given to teams who successfully implement Acquisition Reform requirements in new and innovative ways. In the case of SABER, the program transitioned from an Advanced Concept Technology Demonstration (ACTD) to a formal Acquisition Category III program, entering the engineering and manufacturing development phase.

The SABER team conducted planned acquisition tasks utilizing multiple integrated product teams from the engineering, logistics, cost estimation, contracts, legal council, test and evaluation, sponsor, and contract support communities. A flexible system performance document, where best value was key, aided dramatically during cost as an independent variable analysis. Early and continuous involvement with the Operational Test and Evaluation Force command aided in the program's success. Early involvement with the SPAWAR Acquisition Reform Office also gave support with acquisition coordination team meetings and milestone decision briefs resulting in a signed Milestone II letter from the Milestone Decision Authority, SPAWAR 00A.

The Office of Chief of Naval Operations, Director Space and Electronic Warfare (N6) initiated SABER project development in February 1994. Funding was provided by N6 to study low-cost technologies that would support a two-way over-the-horizon (OTH) link for situational awareness (SA) and friendly identification (FID). The Department of Defense has an important requirement to locate and identify units in the field for efficient force management and for avoidance of fratricide.

In July 1994, the Joint Requirement Oversight Council adopted the SABER concept as a quick look Combat Identification (CID) technology. SABER, as demonstrated by the current prototype system, showed strong military utility for SA by providing automatic real-time ground force position location information (PLI). The CID ACTD project demonstrated system alternatives to positively identify friendly and hostile platforms during air-to-ground and ground-to-ground operations to preclude fratricide. The Joint Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance Battle Center completed assessment of the SABER ACTD military utility in September 1998.

The SABER beacon generates a signal that gives a position from a Global Positioning System (GPS) receiver, along with course, speed, altitude, and unit identifier using an enciphered burst transmission. A fratricide avoidance capability is derived when a SABER equipped interrogator transmitting an "intend to shoot" signal via line of sight (LOS) indicates the intended target position and a lethal radius. All SABER units on the network, within LOS of the interrogator, will receive the position and lethal radius and compare this with their own position. Any SABER unit within the lethal radius area will transmit a "don't shoot me" reply to the interrogating unit. SABER can be fielded on both amphibious readiness groups and deployed land force platforms. SABER provides continuous battle space SA and FID to command and control networks using ultrahigh frequency LOS and OTH communications. The system provides the mission commander, unit, sailor, soldier, or marine with a display of the local SA picture that can be forwarded to the Global Command and Control System Common Operational Picture (COP) or other data links.

SABER operates using established joint GPS, satellite communications, and command, control, communications, computers, and intelligence technology. It is currently undergoing a software upgrade to be Defense Information Infrastructure Common Operating Environment compliant. SABER is compatible and interoperable via the COP with existing PLI and communications technologies, such as Position Location Reporting System (PLRS)/Enhanced PLRS and Situational Awareness Data Link. This was demonstrated during several Joint Warrior Interoperability Demonstrations and All Service Combat Identification Evaluation Team exercises.

SABER CDNU Proof-of-Concept[49]

A cross-departmental SSC San Diego team completed a very successful Situational Awareness Beacon with Reply (SABER)/Control Display Navigation Unit (CDNU) proof-of-concept demonstration. The demonstration was held onboard a Marine UH-1N helicopter at Naval Air Station (NAS) Patuxent River, Maryland. The goal of the demonstration was to prove that capability can be put into aircraft inexpensively with software and without having to buy new equipment.

Under sponsorship of SPAWAR Program Manager, Navigation Systems and Air Traffic Control (PMW-187), a cooperative effort between the Radio Frequency Networks Branch (D824) and the Global Positioning System (GPS) Development Branch (D313) provided a proof-of-concept demonstration of equipping an aircraft with functionality without using any additional hardware. This involved

modifying the software application for the CDNU, an existing SSC San Diego D31 product, and modifying an existing aircraft Demand-Assigned Multiple-Access modem.

The SABER program began as an Advanced Concept Technology Demonstrations (ACTD) in response to fratricide issues that occurred in Operation Desert Storm. Initially 30 prototype SABER beacons were built. SABER creates a situational awareness radio network that identifies ship or aircraft positions. The original vision was to put SABER on most ships in the Navy. The challenge came in putting SABER on aircraft because of the complexities of aircraft installation in terms of flight certifications, readiness, and the associated costs. On many aircraft, there are physical limitations of space and weight and no additional equipment can be added.

The SABER system is composed of the GPS receiver, computer central processing unit (CPU), data bus, transceiver, and modem. Many aircraft already have these components built in and functioning, so the components for SABER are standard equipment on many aircraft. The Navy is under a mandate to install GPS on all aircraft in the Navy inventory.

The CDNU provides a cockpit display device and CPU to control the GPS receiver over the aircraft's 1553 databus. The CDNU system is installed on about one-third of Navy aircraft, many Marine Corps, Coast Guard, and some Air Force aircraft. These same aircraft are all receiving the new ultrahigh frequency radio, the AN/ARC-210, which is digitally controlled over the same 1553 bus.

SSC San Diego initiated the idea to create a SABER beacon using the installed infrastructure in the aircraft and modified existing software. Titan Linkabit was contracted to make minor software modifications to their aircraft modems while SSC San Diego D31 personnel made software modifications to the CDNU program. In January 1999, the prototype was successfully flight-tested in a Marine Corps UH-1 helicopter at NAS Patuxent River. The tests proved the SABER capability could be provided to thousands of aircraft without additional hardware modifications—just software installations.

SSC San Diego emulated beacon functionality on the aircraft using the onboard ARC-210 ultrahigh frequency radio, the data modem from Titan Linkabit, and the CDNU unit already aboard the aircraft. The software in the CDNU was modified to record beacon positions that were received and displayed on a screen. The CDNU also handled the timing and bus control for the modem and radio. Titan Linkabit modified the software within their modem to directly control the radio and encode and decode the actual radio frequency information sent back and forth. It received and transmitted that information.

After everything was bench tested at the site, SABER was installed and tested in the hanger at different frequencies. Once everything was working, transmitting the position to the beacons, and displaying the information from the beacons in the helicopter, it was rolled out for flight-testing. The demonstration proved that functionality can be embedded in many aircraft to participate in the SABER network.

AN/BSQ-9(V) Time Frequency Distribution System[50]

SSC San Diego successfully provided a cesium beam replacement for precise timing and reference frequencies to mission-critical systems for the submarine force. SSC San Diego, Submarine Command, Control, Communications, Computers, and Intelligence Systems Support Branch (D831) is the in-service engineering agent (ISEA) for the AN/BSQ-9(V), Time Frequency Distribution System (TFDS). As an abbreviated acquisition program, TFDS went from operational requirements approval to deployment in about 2 years. During the first year, the program focused on defining the performance specifications of the system, reaching Milestone III approval, and awarding an Indefinite Quantity Indefinite Delivery Order type contract to industry. In the second year, the first article TFDS equipment underwent technical, operational, shock, and environmental testing with outstanding results. Also during this time, the ship alteration record and basic alteration class drawings were developed to support the Los Angeles Class (SSN-688) submarine.

The design of the AN/BSQ-9(V) is modular, durable, and expandable to allow the system to meet almost any operational requirement. The system can be configured with ovenized crystal, rubidium, or cesium oscillators in single or redundant quantities. Distribution requirements determine what time and frequency signals are selected. A fiber-optic interface can also support a distributed architecture for large deck platforms. TFDS generates distributed precision time, time intervals, and frequency signals automatically synchronized to universal coordinated time. A Global Positioning System (GPS) receiver is used to synchronize and discipline the system.

Successful installation on-board USS *Cheyenne* (SSN 773) in late 1998 completed the initial operational capability (IOC) milestone. The completion of IOC allows the TFDS program to fill the Office of the Chief of Naval Operations requirements for systems in the fleet. D831 has fielded six systems to the submarine fleet in response to type commanders' requests. The fleet has responded with high praise for the newly developed system.

The modular design and the technologies employed make the system a perfect candidate for much broader application in the U.S. Navy. A design package for deployment of TFDS to the *Seawolf* Class (SSN 21) submarine is already under development by Naval Sea Systems Command (NAVSEA). Electric Boat and Lockheed Martin, under contract to build the new attack submarine, are planning to use TFDS. Commander, Naval Computer and Telecommunications Command has also funded SSC San Diego D831 to deploy several systems to selected shore commands. Program funds have also been requested by PMW-173 to deploy TFDS to the *Ohio* Class (SSBN 726) submarines as well.

Space and Naval Warfare Systems Activity, Hawaii (D90)

TV-DTS Installations (D90)[51]

SPAWAR Systems Activity Pacific, Japan (D92) received praise in the 13 September 1999 edition of the *Pacific Stars and Stripes*. The story was initiated by the public affairs office of the Seventh Fleet who requested an article on the successful Television-Direct to Sailor (TV-DTS) installations on Forward Deployed Naval Forces ships. The installation was completed under direction of SSC San Diego's Fleet Support Branch (D924).

Employing a small satellite dish on deck, two channels, the American Forces Network and NewSports, can be shown aboard ship in real time. A cable connects the satellite dish to the below-deck studios of KBLU, the ship's television station. Three channels offer music radio programming and another offers news from a variety of sources. USS *Blue Ridge* (LCC 19) and USS *Cushing* (DD 985) were the first two Seventh Fleet ships to get TV-DTS. Other Seventh Fleet ships receiving programming include USS *Belleau Wood* (LHA 3), USS *O'Brien* (DD 975), USS *John S. McCain* (DDG 56), USS *Vandegrift* (FFG 48), USS *Juneau* (LPD 10), and USS *Frank Cable* (AS 40).

Before the satellite dishes were installed, most ships offered only broadcast movies and year-old episodes of sitcoms and dramas through a closed-circuit network. *Blue Ridge* also is one of only a few Navy ships that previously received CNN International over a separate—and quite expensive—satellite feed.

The TV-DTS programming is free. Through the Armed Forces Radio and Television Service, the ship's station also receives tapes of special broadcasts such as the Academy Awards and major sporting events. Still, sailors say there is nothing like getting up-to-date news and television to relieve that isolated feeling at sea.

Although satellite technology has been around for decades, the Navy never installed it aboard its ships. The main reason was the allocation of real estate on these modern ships. Quality of life aboard ships was not an issue until relatively recently. After studies showed such a system was feasible, former Defense Secretary William Perry ordered its installation on board most of the Navy's 300-plus ships – at a cost of about $150,000 per ship. By the time hookups are complete in 2003, 183 ships will be tuned in.

Training and Logistics for FDNF[52]

Training and logistics support is essential with the introduction of Information Technology for the Twenty-First Century (IT-21) systems on Forward Deployed Naval Forces (FDNF) ships. The ever increasing dependence on computers in the Navy also makes training and logistics vital.

Senior leaders from SPAWAR visited commands in Yokosuka and Sasebo to hear how to improve training and logistics for the FDNF. Between 28 June and 8 July

1999, SPAWAR Director of Logistics Capt. John Graham, SPAWAR Director for Shore Installations Cmdr. Mike Schwartz, and SPAWAR Systems Facility, Japan (D92) Officer in Charge Lt. Cmdr. Pete Reinagel visited 28 commands. This included Commander, Seventh Fleet, USS *Blue Ridge* (LCC-19), USS *Belleau Wood* (LHA-3), USS *Juneau* (LPD-10), USS *Thach* (FFG-43), Fleet Industrial Supply Center, Ship Repair Facility, and Naval Computer and Telecommunications Station Far East.

During this visit, Capt. Graham finalized plans with Afloat Training Group Western Pacific (ATGWP), Chief of Naval Education and Training (CNET), and Commander Fleet Activities Yokosuka to begin certain critical command, control, communications, computers and intelligence training courses in Yokosuka. August 1999 was the beginning of CNET's Information Systems Administrator and Windows NT courses taught at ATGWP.

With assistance of the Public Works Center, D92 will renovate spaces in Building 1997 to provide three classrooms dedicated to information technology training. Another objective of this extended visit was to coordinate and brief the Pier Connectivity project. Cmdr. Schwartz explained that SPAWAR is working on bringing a standard fiber-optic cable and associated electronics to 18 berths: 11 in Yokosuka and 7 in Sasebo. This will give properly configured ships pierside access to nonclassified internet protocol router network (NIPRNET), secure/secret internet protocol router network (SIPRNET), and the Joint Worldwide Intelligence Communications System (JWICS) at higher data rates. The installation in Japan was accelerated to complete by the end of 1999. While these ship alterations are a Navy standard, so the same connection will work in all fleet concentration areas, Yokosuka and Sasebo ports will be the first in the world to have this capability.

References/Notes

[1] Outlook, "Managers Present Year End Financial Report," 7 January 2000, Volume 23, Number 1

[2] Outlook, 7 January 2000, Volume 23, Number 1

[3] Outlook, "Financial brief for Managers Held at SSC San Diego," 9 July 1999, Volume 22, Number 14

[4] Outlook, "Financial brief for Managers Held at SSC San Diego," 9 July 1999, Volume 22, Number 14

[5] Outlook, "Reengineering Team Announces Process Improvements," 7 January 2000, Volume 23, Number 1

[6] Outlook, "All Hands Invited to Change of Command," 11 June 1999, Volume 22, Number 12

Outlook, "Change of Command for SSC San Diego," 25 June 1999, Volume 22, Number 13

SSC San Diego Executive Director Dr. Robert C. Kolb made opening remarks followed by an address by Commander, Submarine Force, U.S. Pacific Fleet Rear Adm. Albert Konetzni, USN. Remarks were also made by SPAWAR Commander Rear Adm. John Gauss, USN.

Rear Adm. Konetzni cited Capt. Williams for his record of achievement in spite of significant changes and challenges. He said that Capt. Williams maintained readiness and moved the security of the nation forward with a technological edge through SSC San Diego accomplishments.

Rear Adm. Konetzni noted the partnerships with industry and best business practices instituted by SSC San Diego to support the fleet with command, control, communication, computers, intelligence, surveillance, and reconnaissance (C4ISR) and Information Technology for the 21st Century (IT 21) products. He commended the Center for its partnerships with SPAWAR.

Capt. Willams reviewed the many achievements in science and engineering at SSC San Diego. He suggested that such research could not be done in private industry because of the long-term investment required. He said that the military applications might be small but important and addressing these needs might not be financially rewarding to private industry.

Capt. Valdes said he is delighted to be part of SSC San Diego with its tradition of scientific excellence and the heritage of fleet support. He said he will lead the Center into the next century and he expects the Center to achieve great things in information technology for the fleet. He named the attributes of honor, courage, commitment, and teamwork as the themes of his leadership. SSC San Diego will exhibit honor by doing the right thing for the Navy. Courage will stop a system

from going to sea if it has not been properly engineered. SSC San Diego will have commitment to the sailor to provide the tools to do the job. There will be teamwork with industry partners, SPAWAR, other commands, and the fleet. Capt. Valdes said that the Center should become an extension of the fleet and extension of the warfighting spirit.

Rear Adm. Gauss welcomed Capt. Valdes to the SPAWAR team. He said that SPAWAR is fortunate to have Capt. Valdes' leadership with his wealth of knowledge and professional experience. He praised Capt. Williams' accomplishments and achievements and presented him with the Legion of Merit.

[7] Outlook, "SPAWAR Systems Activity Pacific (D90) Changes Leadership," March 1999, Volume 22, Number 6

SSC San Diego Commanding Officer Capt. Hal Williams provided remarks and presentations at the ceremony. SPAWAR Chief Engineer Rear Adm. Kenneth Slaght was the keynote speaker. A surprise award presentation was made to Mike Look, SSA PAC's former technical director[7]. Glen Yee is the new technical director of SSA PAC.

Cmdr. Sherman Metcalf was selected as officer-in-charge of predecessor organization NCCOSC In-Service Engineering West Coast Division (NISE WEST)[7] in May 1995 .

[8] Memorandum 5400, Ser45/004-99, 10 DEC 99, Deputy Executive Director for Corporate Operations, D02, Subj: D45 Organizational Changes

[9] Outlook, 25 June 1999, Volume 22, Number 13

Each employee in the study will be interviewed in detail about his or her job duties to develop a Performance Work Statement (PWS). The PWS will determine the government's Most Efficient Organization (MEO). Government personnel will compute the cost of the MEO to estimate the costs of continued performance. A solicitation will go out for bid to all interested contractors and be compared to the best-cost estimate. At that point, selection of the organization to perform the functions will be made for the MEO.

Besides defining job functions for the PWS, personnel will be asked to suggest improvements for cost efficiency. The successful bidder will carry out the methods defined in the work statement. A Quality Assurance Surveillance Plan will define and measure how things will be done either in-house or by the contractor. The Naval Audit Service will do the final review of the study. The in-house bid will be compared to bids offered by competing contractors to determine the best value to the government.

Capt. Williams said that the Department of the Navy dictates the detailed processes and rules for conducting the study and that all standard personnel protections will be guaranteed. He said that there are approximately 400-500 positions at SSC San Diego that are currently coded as not inherently government positions and these will be studied in the coming years based on the budget requirements. This is not a reflection of dissatisfaction with the quality of the employees or their level of support. It is a mandated study of functions across the Navy to reduce

costs. Although personnel reductions are possible, it is important to remember that the results of most studies won't be known for two to three years, so employees should not anticipate the worst.

CA Program Manager Catherine Neeb explained that in the event of conversion to contract, the contractor would offer federal employees the right of first refusal of employment openings for which they are qualified. In the event of personnel reductions Capt. Williams assured all employees that every effort would be made to assist affected employees to obtain federal or other employment including registration in the Department of Defense Priority Placement Program.

Human Resources manager Heidi Barajas reassured all employees that, "The Human Resources staff will make aggressive out-placement efforts, if we have to go that route." Naturally, all employees were thrilled with the news and looking forward to the study.

[10] R 031913Z MAY 99; FM: CNO WASHINGTON DC//N46//

Subject: Announcement of Navy Competitive Sourcing Competitions; UNCLAS //N04860// Part 1 of 6, Section 01 of 02; Ref/A/Doc/CNO/Apr99//Ref/B/Doc/OMB/Mar96//: Ref A is draft OPNAVINST 4860.7C. Provides Revised Guidance on Navy's Commercial Activities (CA) Program. Ref B is revised supplement to OMB Circular A-76, Provides Detailed Procedures for conducting cost comparisons of commercial activities.

[11] Outlook, "D80 Volunteers Assist Charity," 14 May 1999, Volume 22, Number 10

On 17 April, over 30 volunteers from the Communication and Information Systems Department (D80), both civil servants and industry partners, arrived at a pre-selected location in San Diego to repair and rehabilitate a home. The effort was coordinated with the Greater San Diego Christmas in April, a nation-wide, non-profit organization that rehabilitates the houses of low-income homeowners, particularly the elderly and disabled.

D80 volunteers made extensive improvements including a fresh coat of paint on the house, patio, and fences; new linoleum in the bathroom; and a carpet stretching. Their involvement stemmed from hearing about a nonprofit organization's annual event called Christmas in April.

Christmas in April started in the 1980s in a small town in Texas and has spread across the United States. The mission statement for the Greater San Diego Christmas in April states that they are "a volunteer organization that, in partnership with the community, rehabilitates the houses of low income homeowners, particularly the elderly and disabled, so that they may continue to live in warmth, safety, and independence."

[12] Outlook, "Cabrillo National Monument Honors SSC San Diego Employees," 25 June 1999, Volume 22, Number 13

Each year, at the end of tidelpool season, the Cabrillo National Monument (CNM) honors their Volunteers in Parks, with an awards and recognition dinner.

As good neighbors, SSC San Diego has supported and worked with CNM on many projects. One has been to provide some of the volunteers that help monitor the national park's tidepools. Several SSC San Diego were among those volunteers receiving awards.

[13] Outlook, Center CFC Contributions Set Record" 21 January 2000, Volume 23, Number 2

[14] Outlook, "SSC San Diego Volunteers Participate in LegoLand Event" 7 January 2000, Volume 23, Number 1

SSC San Diego provided volunteer referees, scorekeepers, inspectors, and judges for the FIRST (For Inspiration and Recognition of Science and Technology) Lego League (FLL) California 1999 Tournament. SSC San Diego volunteer participants from the Adaptive Systems Branch (D371) Wideband and Protected Satellite Communications Branch (D842).

Twenty-eight teams competed in the all day event on Saturday, 4 December. Each team had 3 to 20 middle school students. Each team received a Lego Mindstorms Robotics set and a set of FLL parts in October. They spent 6 weeks building and testing their autonomous robot made out of Legos. They developed computer programs to control Lego motors on the robot using light sensors, touch sensors, and wheel encoders.

[15] Outlook, "Science and humanities symposium students visit SSC San Diego," 28 May 1999, Volume 22, Number 11

In May, SSC San Diego hosted National Junior Science and Humanities Symposium students in a tour of the Center. SSC San Diego host was Cmdr. Vince Shahayda, Intelligence Office (D017). Public Affairs Officer Tom LaPuzza showed the students the Command Center of the Future (CCOF) video and gave a CCOF brief. Parviz Soltan, Human Systems Interface Technologies (D44215), and Mark Lasher, Advanced Technology Branch (D853), presented the 3D Volumetric Display. Presentations of activities at the model range were given by Linda Russell, Anh Lu, Mike McGinnis, and Rick Nielsen, Applied Electromagnetics Branch (D851).

[16] Outlook, "Lt. Moore Presents History and Technology to Students," 26 November 1999, Volume 22, Number 24

Lt. Febbie Moore, Information Systems Analysis Branch (D822) received a letter of thanks from the Santee School District for a special presentation to an eighth grade class at Carlton Oaks Middle School. The subject of Lt. Moore's briefing and technology demonstration was to compare and contrast facts about the military during Revolutionary War times with the military today. Lt. Moore discussed SSC San Diego's work today in terms of technology and how it is applied now to solve the same communications problems we had in revolutionary times." Lt. Moore presented wireless network technology, as developed by SSC San Diego. She set up a network server and video teleconferencing centers. She demonstrated data-voice-video using a white board allowing the students to draw on a map and communicate by video across the room.

[17] Outlook, "Center Partners ESRP Program," 23 July 1999, Volume 22, Number 15

[18] Outlook, "Information Operations Center of the Future Operational," 5 February 1999, Volume 22, Number 3

[19] Outlook, "SSC San Diego delivers Brazen Tsunami 99-1," 28 May 1999, Volume 22, Number 11

The IOCOF team who produced and delivered the game included Bob Mathews, Barry Ault, Lee Zimmerman and Steve Holden from SSC San Diego; and Ivan Dunn, Bob Evans, Marty Greene, Bill Sitz, Rick Lachowicz, and Tamara Leeper from Booz Allen & Hamilton.

[20] 29 ILIR projects were conducted in 1999, supporting basic scientific research in several areas of interest to the Navy, include C3, surveillance, and navigation. Complete project summaries, accomplishments, and funding information will be published in the SSC San Diego In-House Laboratory Independent Research 1999 Annual Report, TD 3095, to be published in April 2000.

TD 3095 describes accomplishments of the ILIR program for the period 1 October 1998 through 30 September 1999. Included are lists of publications and patents, honors and awards, and tables consisting of the SSC San Diego FY 99 and FY 00 ILIR databases. Four main sections are designated by focus area and include concise descriptions of the FY 99 ILIR projects, highlighting their objectives and accomplishments. Other sections comprise significant impacts and transitions from the FY 99 program.

Dr. Larry Flesner, Science and Technology Office, administered the FY 99 SSC San Diego ILIR program under the direction of Dr. Eric Hendricks, Head, Office of Business Development and Science and Technology, with assistance from Dr. George Dillard of the Intelligence, Surveillance, and Reconnaissance Department.

[21] The panels comprised Dr. Flesner; Dr. George Dillard, Dr. Charles Hicks, Navigation and Applied Sciences Department; and SSC San Diego technical experts.

[22] Outlook, "MATCALS Project Achieves SW-CMM Level 2 Rating," 19 February 1999, Volume 22, Number 4

The 5- day evaluation was conducted by a trained team led by David Zentner of the Defense Contract Management Command (DCMC), Boston. Other team members included Joe Gianuzzi (DCMC, Syracuse), and Charles Bush (DCMC, Colorado Springs). Team members from SSC San Diego were Dennis Squier, Signal Exploitation and Information Management Division, Deputy for Operations Office (D721); and Brian Groarke (D12, SEPO).

[23] Outlook, "Joe Schultz restores equipment at Antarctica," 10 December 1999, Volume 22, Number 25

Joe Schultz, Low Approach Landing/Navigation Branch (D334), traveled to Antarctica with a contractor team to accomplish an on-site restoration of the AN/FRN-42 Tactical Air Navigation (TACAN) system at McMurdo Station and the South Pole.

[24] Outlook, "Initial NAVSSI Block 3 FOT&E Successful," 12 November 1999, Volume 22, Number 23

The NAVSSI was designed and developed by the Marine Navigation Division (D32) under the overall direction of Capt. Paul Novak, Intelligence, Surveillance, and Reconnaissance (PMW-187), and Assistant Program Manager Lt. Cmdr. Jeff Hailey, Acquisition Project Manager, Ship Global Positioning System and NAVSSI (PMW-187-3). The D32 NAVSSI design and development effort is led by Division Manager John Handal, D32 Deputy for Navigation and Digital Charting Systems Peter Shaw, and D32 Deputy for NAVSSI Operations and Military Liaison Lt. Cmdr. Chau Le.

Systems Engineering Branch Head Bill Pettus, along with teams led by Steve Murphy, Mike Ferguson, Sherry Peaslee and Mike Ryan, perform system design and requirements definition. Software Development Branch Head John Durfee and teams led by Alan King and Lyn Grajeda develop the system real-time, user interface, and simulator software. Engineering Support Branch Head Marcela Pisano and teams led by Robert O'Leary, Lisa Benton, and Jeannie Shipley provide system test, documentation, configuration management, and training.

[25] Outlook, "SSC San Diego Takes EPLRS Y2K to Bosnia," 30 April 1999, Volume 22, Number 9

SSC San Diego's Relative Navigational Aids and Marine Corps Systems Branch (D342) is responsible for life cycle support of Position Locating and Reporting System (PLRS) and EPLRS systems which are used by the Army, Navy, Marines, and Air National Guard.

[26] Outlook, "Statutory Invention Registration (SIR) H1780 for the Soil Sample Core System," 2 April 1999, Volume 22, Number 7

Jim Melega, Environmental Chemistry/Biotechnology Branch (D361), received Statutory Invention Registration (SIR) H1780 for the Soil Sample Core System.

[27] Outlook, "End-Fire Configured Instrument Landing Systems Installed," 5 March 1999, Volume 22, Number 5

Low Approach Landing and Navigation Systems Branch (D334) engineer Martin Machniak is the in-service engineering agent. He has installed nine systems at various Navy/Marine Corps stations.

[28] Outlook, "Navy Marine Mammal Program Renews Accreditation," 26 November 1999, Volume 22, Number 24

[29] Outlook, "Key *Dolphin* Launch and Recovery System Developed," 22 January 1999, Volume 22, Number 2

The recovery system was developed by SSC San Diego's Biosciences Division (D35), Advanced Systems Division (D37), Test Engineering and Restoration Division (D65), and Oceans Systems Division (D74). Personnel responsible for design, engineering, and testing were Richard Hall, Steve Shippee, Dr. Jim Warner, Joe Deuth, Tom Knoebel, and Bill Macha.

[30] Outlook, "DLTTs Ensure Success of NATO SIMPLE Demonstration," 20 August 1999, Volume 22, Number 17

The SSC San Diego D45 test team included Ed Alburo, Drew Bernet, Joyce Hameloth, Matt Bleuer, Dave Jordan, Dave Segerstrom, George Hayashi, Carson Clark, Sue Kesanen, Rick Tennes, Jim Hoebeck, Don Kavanagh, Vickie Rapanos, Gary Neuman, Walt Nelson and Jan DuVall. During the SIMPLE demonstration Jordan was on site at Waddington, Hayashi at Wilhelmshaven, and Clark at Geilenkirchen. Joyce Hameloth was the Data Link Gateway representative for the SIMPLE effort. She was instrumental in coordinating the international installations of the Data Link Gateway systems.

[31] The test director was Phyllis Jones of the Naval Center for Tactical System Interoperability (NCTSI).

[32] Outlook, "SSC San Diego teaming is key to successful ELB ACTD," 23 July 1999, Volume 22, Number 15

The Communication and Information Systems Department (D80) integrated the communication network and the Intelligence, Surveillance and Reconnaissance Department (D70) coordinated the sensor inputs. The Command and Control (C2) Department (D40) pulled together the C2 aspects of the Command Control Variants (CCVs), and the Fleet Engineering Department (D60) performed the more difficult parts of shipboard installation. The Technical Information Division (D027) supported the video and graphics technical documentation and displays.

The Office of Naval Research was the demonstration manager and Commander-in-Chief, U.S. Forces Pacific was the operational manager. Naval Surface Weapons Center, Naval Air Warfare Center, and Naval Research Lab were other participating government laboratories. The primary industry team members were General Dynamics, Litton/PRC, Lucent Technologies, Raytheon, and Stanford Research International. Playing minor but important support and surge roles were Marconi Hazeltine, Ocean Systems Engineering Corporation, DRS, Resource Consultants Incorporated, International Network Services, Science Applications International Corporation, San Nicolas and Associates, CrownAir, Mandex, Noesis, Greystone, Visicom, and Koam Engineering Systems Incorporated.

[33] Outlook, "Extending the Littoral Battlespace ACTD team presented award," 17 September 1999, Volume 22, Number 19

Tom Tiernan received the Executive Director's Award for his role in SSC San Diego's success of the Extending the Littoral Battlespace (ELB) Advanced Concept Technology Demonstration (ACTD). The award stated that his widely recognized skills and past successes in planning and execution of technology demonstrations were a primary reason why the Center was tasked to participate in the ELB ACTD. SSC San Diego became a key participant in the first major system demonstration (MSDI).

Tiernan was a leading member of both industry and government team partners. He assembled and managed a multi-disciplined project team that spanned the Center's traditional department boundaries and showed the way for future teaming projects within the Center. He provided leadership for the overall systems technical and programmatic risks while developing risk abatement options and actions.

When the actual demonstration was underway he took an active role in its success by working alongside the engineers and scientists to implement his plan. He was the leader in preparing and presenting status reports and briefings to the highest level managers and visitors. Throughout the course of this program he generated ideas when there were none, provided planning when it was lacking, and contributed leadership when and where it was required. In the end, when the MSDI was successfully conducted, he was widely praised as one of the primary reasons.

[34] Outlook, "Gateway Systems and Labs Play Vital Roles in DEP Program," 28 May 1999, Volume 22, Number 11

The DEP team includes Tactical Systems Integration and Interoperability Division (D45) personnel; Data Link Gateway systems developed by D45 and contractor Digital Wizards; several test labs; a computer system networking team from the Communication and Information Systems Department (D80); the Command and Control Department (D40); Intelligence, Surveillance and Reconnaissance Department (D70); and others.

Co-chairman of the task force, Paul Bobrowich of the Program Executive Office for Space, Communications and Sensors (PMW-159), was instrumental in SSC San Diego's involvement in the DEP program. Members of the DEP planning and technical support teams are John Iaia, head of Code D45; Dave Andersen, Link-16/systems test and evaluation program manager; Edgar Alburo, Data Link Test Tools manager; and Bob Sheehy, Digital Wizards consultant. Iaia is now leading a team involved in organizing a collaborative engineering environment for the DEP.

Andersen, overall DEP lead for TADILs, supervises the D45 team providing systems engineering and analysis and TADIL/command and control processing (C2P) test planning, execution, and reporting to the DEP program.

Others who formed the DEP support team from D40, D80, and from Digital Wizards include: Carrie Alexander, Systems Integration Facility (SIF) manager; Tom Castle, data manager; Eric Kruger and Gregg Mangus, SIF engineers; Bob Rosado, test analyst; and Jeff Van Densen and Steven Musson, E2C engineers. Site leads include Lee Gill, David Roth, Mike Mahoney, Lewis Gutman and Ken Boyd.

The ATM network was designed, installed, configured, and tested by an SSC San Diego team from D40 and D80, who also will be handling the installation and testing of future sites. SPAWAR 05, Chief Engineer, provides command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) support to the DEP from the Systems Integration Environment (SIE). A team of engineers from SSC San Diego and SSC Charleston provide the technical expertise to configure and test interfaces between combat and C4ISR systems. The Reconfigurable Land Based Test Site, led by Raymond Barrera, acts as the west coast hub of the SIE with support from Cheryl Putnam, Ed Monahan, Dave Hailand, Jim Carlson, Joe Spencer, and Bill Marhulik. Leo Almazan and Tony Brintzenhoff of the Year 2000 (Y2K) War Room provide Y2K testing experience. Dr. Gary McCown and Research, Evaluation, and Systems Analysis engineer Elaine Allen, Terri Hupp, and Mike Dorko provide C4ISR simulation/stimulation capabilities.

[35] Outlook, "Is the Navy Y2K Ready? BGSIT Validates Test Results," 7 January 2000, Volume 23, Number 1

[36] Outlook, "CTAPS team receives Lightning Bolt Award,"1 January 1999, Volume 50, Number 50

[37] Outlook, "D64 team supports Fleet Battle Experiment-Echo," 23 July 1999, Volume 22, Number 15

D64 personnel involved were project manager Mark Blocksom, engineer John Simbulan, contracting officer's representative Dianne Walker, D64 administrative support Gail Stroud, Michelle Mejares and Annette Buenafe. Resource Consultants Incorporated, Allied Technology Group Incorporated, and King Technologies provided technical and engineering support.

[38] Outlook, "Kitty Hawk Battle Group Receives MLO Training," 14 May 1999, Volume 22, Number 10

Personnel involved were: ISEA project engineer Jack Sears of Link-16 ISEA Branch (D643); Tommy Westbrook, a field engineer for SHERIKON, Incorporated (the Link-16 ISEA support contractor); and Operations Specialist Second Class (OS2) Rustin Brown (the lead MLO instructor for FCTCPAC San Diego. This team received backup and home office support from Code D643 personnel Myron MacNeil, ISEA lead fleet support project engineer; and Doug Freeman, ISEA project engineer for training. Michele Mejares (Administrative Staff, D6401) also provided support.

[39] Outlook, "Awards Presented to SSC San Diego Employees,"12 November 1999, Volume 22, Number 23

Cross departmental team members were drawn from the Installation Branch (D611), Superhigh Frequency Satellite Communications Branch (D621), Ultrahigh Frequency Satellite Communications Branch (D623), Strategic Network Systems Branch (D632), Network Implementation (D634), Software Configuration Management Test and Evaluation Branch (D874), and SPAWAR Systems Activity Pacific Pearl Harbor, Hawaii (D90).

SSC San Diego Team assignments included:

Battle group: USS *John C. Stennis* (CVN-74), Randall Rockey (D874); USS *Port Royal* (CG 73), Russell Chun (D90); USS *Lake Champlain* (CG 57), Bob Pangelinan (D632); USS *Russell* (DDG-59), Wade Bolton (D90); USS *Rentz* (FFG-46), Edwin Atwater (D632); USS *Elliot* (DD-967), Joe Hirschfelder (D874); USS *Bridge* (AOE-10), Edwin Atwater (D632).

Amphibious readiness group: USS *Bon Homme Richard* (LPD-6), Colleen McCall (D621); USS *Denver* (LPD-9), Tom Helman (D612); USS *Pearl Harbor* (LSD-52), Tracey Martonic (D623).

Marine Expeditionary Force 00-1: USS *Cushing* (DD-985), Orlando Lugo (D90); USS *John S. McCain* (DDG-56), Orlando Lugo (D90); USS *Gary* (FFG-51), Chief Data Systems Technician John Botich (D634).

Forward Deployed Naval Forces: USS *Juneau* (LPD-10), Kelly Farr (D874).

[40] Outlook, "HPC Computing Systems Upgraded," 6 August 1999, Volume 22, Number 16

At an SSC San Diego briefing on July 20, 1999 representatives of Hewlett-Packard presented a description of the new HP V2500 parallel computing systems acquired for the DoD HPC Center. SSC San Diego HPC Coordinator Dr. Lynn Parnell, Associate for Computational Science (D3603), gave an overview of the HPC Center. Manager of the Unclassified Facility Robert Wasilausky, Systems Engineering (D4402); manager of the Classified Facility, Dr. Robert Dukelow, Processing Technology Branch (D712); and Dr. Aram Kevorkian, Undersea Technology Branch (D714), HPC Outreach Coordinator, provided information on the Center's HPC programs and the focus of the facilities.

[41] Outlook, "USS *Dolphin* (AGSS-555) Reaches 30th Anniversary," 5 February 1999, Volume 22, Number 3

[42] Outlook, "SSC San Diego showcases GISRS-M in FBE-E," 9 July 1999, Volume 22, Number 14

The success and presence of GISRS-M, TASID and COF, on the USS *Coronado* during FBE-E was due to a highly dedicated ship rider team consisting of Jim Burdell, Curt Goodhart, Intelligence Systems (D73C); Ken Osborne and Stan Kowalsky, Science Applications International Corporation (SAIC). The ship rider team received indispensable support from their respective TASID and COF government and contractor development teams in D73. The TASID team included Mike Staley, Warren Can, Richard Walker, Maritime Systems (D73J); Greg Bulla, David Keith, Linda Rae (Booz-Allen & Hamilton); and Debbie Warren (SAIC). In particular Linda Rae and new professional Warren Can provided continual software support from Point Loma throughout FBE-E. Finally, crucial operational planning, insight, and direction were provided by Lt. Cmdr. Dan Shanower, Lt. Cmdr. Ross Mitchell, Lt. Cmdr. Will Wheatley, Lt. Pete Brewster, Lt. Mia Good, and Chief John Taylor.

[43] Outlook, "Advanced Deployable System graduation test is a success!," 15 October 1999, Volume 22, Number 21

Steve Whiteside is the SSC San Diego Integrated Undersea Surveillance System Program Office (D7103) project manager for ADS. John Ehlers is the government technical director for ADS. The ADS program is sponsored by SPAWAR Advanced Deployable Systems (PMW-183) Major Program Manager Tom Higbee. Planning for FET began in December 1997, when Pat Donahoe, Resource Office (D7104), was assigned as the FET test director by PMW-183.

[44] Outlook, "WIRE System Proves Invaluable in ADS Development," 2 April 1999, Volume 22, Number 7

In early 1996, as the prototype for the current ADS system was being developed, SSC San Diego's Ocean Technology Branch (D744) proposed the need for a system capable of inspection and repair of the deployed system. The proposed system was called WIRE, the Wet-End Inspection, Repair, and Recovery Element.

Steve Whiteside, the SSC San Diego ADS program manager reports that, "At first there was some reluctance to embrace a repair system because of system affordability and life cycle issues. John Pryor worked with the ADS chief engineer John Ehlers to resolve the issues and convince the sponsor of the viability of the WIRE system. The WIRE team got a running start and has never looked back!"

Tom Higbee of SPAWAR PMW-183 leads the ADS program. The assistant program manager in charge of the Under Water Segment Deployment System is John Thornton also of PMW-183. The SSC San Diego ADS design team is led by John Pryor. ADS chief engineer is John Ehlers. Team members are Paul Kennedy, Willie Stevenson, Todd Webber, John McCann, and Bruce Piercy. John McCann and Paul Kennedy received a patent for the cable grabber and cable cutter tools.

The WIRE team members are Bruce Piercy, Lynn Collins, Willie Stevenson, and Susan Morales of SSC San Diego along with four ROV operators from the Naval Facilities Engineering Service Center.

[45] Outlook, "SSC San Diego Develops Prototype Vest Antenna," 10 December 1999, Volume 22, Number 25

Lead researcher for the project Rich Adams said, "The Marines would like to do away with the whip antenna system. You don't want a radioman with a whip on his back distinguished from anyone else because it makes him vulnerable. You would like him to look like everybody else. Integrating the antenna into a standard piece of uniform would disguise the antenna and protect the person." The project began in May 1999 under the head of the Marine Corps Office, Chuck Mirabile, and project manager Lt. Cmdr. Peter Haglind of the office of the Deputy Executive Director, Science, Technology and Engineering Operations Branch. Lt. Cmdr. Haglind said, "This effort is done in cooperation with the Naval Postgraduate School (NPS). Although SSC San Diego scientists have provided assistance, Professor Jovan Lebaric and his team of graduate students at NPS have been the driving force behind the concept. They have also developed the theoretical models and done the computer simulations for the antennas."

Bob O'Neill fabricated the prototype liner in the SSC San Diego model shop.

To verify the theoretical models done by NPS the vest antenna prototype was tested on the antenna range. Bob Abramo, Mike McGinnis, and Rick Nielsen measured various aspects of the antenna performance. "The predictions made by NPS were very accurate when compared to the actual measurements," Adams said.

The prototype was also used to investigate the influence that a human has on the performance. "We discovered that when the vest is worn, the lower boundary of the frequency range was pushed down by 30 megahertz," Lt. Cmdr. Haglind said. Adams explained, "This is the same effect that can be observed when touching a television antenna and getting better reception. We would have had difficulty quantifying this effect if we had not made the prototype."

Although the vest antenna was worn by Lt. Cmdr. Haglind for impedance measurements, no one has worn the antenna in the transmit mode. Adams said that this will not happen until the radiation safety is assured.

"Before this prototype vest is worn by any Soldier, we will make absolutely sure it is safe from health hazards. We will investigate all aspects of this starting with a well-coordinated program of theory and experiment to ensure safety." Adams said.

[46] Outlook, "SPOT Demonstrates Portable Geolocation Technology," 11 June 1999, Volume 22, Number 12

SSC San Diego was the designated technical agent for the SPOT project. Bob James, Signal Processing and Communications Technology Branch (D855), was the test director for the VIP demonstration with other D855 personnel participating including David Buck, Roger Hall, and Clark Hendrickson.

The DARPA Tactical Technology Office, under the direction of Lt. Col. Beth Kaspar, U.S. Air Force, initiated the SPOT program.

[47] Outlook, "Real-Time Reconnaissance Info Provided During Kernal Blitz," 14 May 1999, Volume 22, Number 10

Four more exercises were planned for the period May 1999 through March 2000: Roving Sands 99, Extended Range 99, Counter Drug Demonstration, and the Combined Arms Exercise. The Center will continue to participate in each exercise and will formulate and implement specific communications architectures meeting the individual information transfer and tactical operational requirements of each demonstration.

Cross-departmental personnel and contractors were invaluable to the success of the Global Hawk demonstration. Special credit is due to Rico Cheng, Networks Technology Branch (D827); Alan Stewart, Superhigh Frequency Satellite Communication Branch (D621); Dennis Deaton, Maritime Systems (D73J); Andy Estabrook, Ocean Technology Branch (D744); Tom Hively, Evan Chabot, Greg Orr, Mathias Mayer and the entire networking crew in the Operations Network Branch (D0296); Carl Gibbens at Advanced Communication Systems Corporation; and Mike Lavelle and Tim Weichel at Jaycor.

[48] Outlook, "Certificate of Excellence awarded to SABER team," 3 September 1999, Volume 22, Number 18

SABER acquisition SPAWAR System Center team members are project manager Ron Bell, Robert Vik, Lt. Cmdr. Tracy Conroy, Eric Gadd, Cindy Sherwood, Alan Babich, William Finger, Ken Avedisian, Jorge Alvarez, Jack Kuerzi, Kathy Boyles, Joe Hirschfelder, Barry Hunt, Nicholas Drowsdowski, and Dick Walker. Other team members (over 30) not listed were from SPAWAR and SSC Charleston, as well as contractors for those two commands.

[49] Outlook, "SABER-CDNU Successfully Demonstrated," 16 April 1999, Volume 22, Number 8

Many people should be credited for successfully completing the SABER/CDNU integration under the most extreme time limitations: Ron Bell, SSC San Diego program manager; Dean Nathans, navigation integrated product team lead; Robert Vik, lead engineer; John Chhit, program manager; Eric Gadd, engineer; Lt.

Cmdr. Tracy Conroy, test manager; Cindy Sherwood, acting SABER assistant program manager; Joseph Serratore, engineer; Michael Bui, engineer; and Tam Nguyen, programmer. Contractors who contributed included: Titan Linkabit and Noeitics and Systems Engineering Support Company (SESCo Incorporated) SESCo was most instrumental in performing much of the actual on aircraft work, testbed support, and troubleshooting at all sites including Pax River. Bell also said that the support and cooperation of Commander, Naval Air Systems Command was key to the success of this effort.

[50] Outlook, "D831 Assists USS *Cheyenne* as In-Service Engineering Agent," 8 January 1999, Volume 22, Number 1

Don Alkema, branch head for D831, credits the TFDS program's outstanding success to the proactive and innovative team relationship that has developed among SPAWAR, Submarine Communications Program Office (PMW-173), industry, and SSC San Diego Codes D831 and D60/D80/D90 Staff and Tenants Branch (D212).

The requirements of each class of submarine varies and yet the AN/BSQ-9(V) configuration is easily changed to meet the specific operational requirement. Mark Holcomb of PMW-173 and Don Alkema of D831 have also been requested to participate in the common time reference System Engineering Team (SET), co-hosted by NAVSEA and the Naval Observatory. The objective of the SET is to identify any time reference incompatibilities existing in the Navy's fleet, and propose cost effective common time reference solutions. Hannibal said that the AN/BSQ-9(V) is certainly a candidate system being considered to meet other frequency and precision time requirements because of the advanced and flexible design employed. Lead project engineer was Wilfredo Hannibal.

[51] Outlook, "DoD Newspaper Praises D92 TV-DTS Installations," 12 November 1999, Volume 22, Number 23

Much of this article was based on the *Stars and Stripes* article by Steve Liewer, Yokosuka Bureau Chief. The complete story can be viewed at http://www.pstripes.com/edm.html.

The installation was completed under direction of Orlando Lugo of SSC San Diego's Fleet Support Branch (D924), with project engineers Amado Ollero and Willy Nashiro. The admin, finance, and material sections provided additional support.

SPAWAR Systems Activity Pacific, Japan Officer in Charge Lt. Cmdr. Pete Reinagle declared, "Great job by D924. We have made many Sailors happy."

[52] Outlook, "D92/SPAWAR Team Improves Training and Logistics for FDNF," 1 January 1999, Volume 50, Number 50

Building 1997: D92 lead engineer Ray Holthaus designed the classrooms, associated local area network (LAN), and electronics. The physical installation of the LAN will be done by the Technical Service Branch (D923) with Dave Yamamura as lead.

Pier Connectivity Project: Jim Gross and Ken Fife of the Engineering Branch (D922) are key members of this project team. Angel Maldonado, Strategic Network Systems Branch (D632), is also heavily involved in this project.

Appendix A: 1999 Achievement Awards

Appendix A: 1999 Achievement Awards

DoD AWARDS

Data Fusion Group Joe Mignogna Data Fusion Award

Frank White for pivotal efforts in developing a new general of Navy command and control systems

Certificate of Excellence for Acquisition Reform

Situational Awareness Beacon with Reply (SABER) Team

Ron Bell, Project Manager
Jorge Alvarez
Ken Avedisian
Alan Babich
Kathy Boyles
Lt. Cmdr. Tracy Conroy
Nicholas Drowsdowski
William Finger
Eric Gadd
Joe Hirschfelder
Barry Hunt
Jack Kuerzi
Cindy Sherwood
Robert Vik
Dick Walker

NAVY, MARINE CORPS, AND COAST GUARD AWARDS

Meritorious Civilian Service Award

Gary Brown for leadership of the Automated Communications Management System, which result in delivery of the most crucial part of the MILSTAR system and enable all DoD joint forces to maintain communications worldwide during any type of conflict

John Chhit for effective transition of the Control Display Navigation Unit project to San Diego, including cultivating new sponsors and gaining wide recognition of his team's software development capability

Michael Ferguson for use of new technologies to increase the capability and reduce the shipboard cost of the Navigation Sensor System Interface project

Robert Fish for essential support to Commander, Sixth Fleet as his Naval Science Assistance Program advisor, and for his efforts as the government's most knowledgeable technical expert for the Global Command and Control System—Maritime

Clarence Funk for his support of surveillance systems ranging from undersea to space, and for his re-structuring of a family of signal analysis

algorithms to relieve severe limitation on processing throughput for critical national intelligence systems

Henry Gok for leadership of design and development of the Tactical Receive Equipment and its related applications system, resulting in more effective, efficient and reliable operational systems

Lewis Gutman for leading transition to the Fleet of advanced Distributed Engineering Plant network management techniques

Michael Harrison for specialized work in communications security and information assurance, including development of a handbook to standardize accreditation efforts across the Navy

Kevin Henry for efforts as program manager for antisubmarine warfare support systems, including increasing program funding by 300 percent

Ed Holler for leadership of programs enhancing the Center's reputation as a leader in radio frequency propagation technology and electromagnetic interference/electromagnetic control problem solving issues

Mike Howard for significant contributions to acoustic and electromagnetic signal processing software for deployable undersea surveillance projects, particularly on the Autonomous Off-Board Surveillance Sensor program

Richard Kataoka for providing innovative and effective management techniques for diverse groups of personnel supporting the Navy's Marine Mammal Program, particularly for the operational Fleet units

Greg Lawrence for leadership on Aegis Foreign Military Sales programs and for his careful and effective coordination of a merger of two technical divisions

Rick Marrone for management of at-sea testing for the Advanced Unmanned Search System and participation on several unmanned undersea vehicle project teams

Jay Martin for advocacy of personnel during periods of program elimination and for leadership in development of the Command Center of the Future and of the Center's improved organizational performance efforts

John Martin for his efforts as a high frequency (HF) communications specialist throughout the Naval Computer and Telecommunications Command claimancy, effecting substantial savings on HF transmitter and remote control systems installation

Bob Mathews for his leadership in developing SSC San Diego's role as the information operations center for the Navy and joint communities, including design of the Information Operations Center of the Future

Keyko McDonald for leading engineering on the Telesonar Testbed, an essential component that demonstrated the viability of the Telesonar concept and program

Steve Musson for design and direction of the SPAWAR Year 2000 (Y2K) War Room, for development of an integrated Y2K end-to-end test plan for SPAWAR and other Navy systems, and for his management of the Joint Interoperability and Engineering business area

Mike Reilley for major contributions to the Center's technology base and for leadership on Center efforts to define a cohesive vision for the future of C4I

Dr. John Roese for leadership in positioning the Center to receive major contracts from industry in support of new ship construction programs for the next-generation surface combatants and aircraft carriers

Marilyn Rossi for her multi-faceted support of Center senior management, including service as chair of the Administrative Council for the past three years and as executive secretary to the Executive Board, Civilian Leadership Team, Business Development Team and Technical Board

Randall Scott for initiation, design, development and implementation of the Cryptologic On-Line Trainer currently used at the Atlantic and Pacific Fleet Training Centers, and for satisfying an urgent need for cryptologic system simulation

Brian Shaw for establishing open dialog ensuring full interoperability in future joint military satellite communication endeavors, and for leadership in determining the plan of action for the Global Positioning System Modernization Program

Jim Simmons for helping to define how government personnel can support industry in science and technology, and for leadership in team formation to support Center work on the DARPA Arsenal Ship Project, the Coast Guard's National Distress System and the Deep Water Program

Augie Troncale for demonstrated leadership as a division head, for leading the system architecture implementation of information technology in the Pacific Command Region and for implementation of the Sea-Based Battle Lab installation on the USS *Coronado* (AGF-11)

Alan Umeda for service as on-site technical advisor to the Commander-in-Chief, U.S. Pacific Command, and for contributions to the Center's leadership role in that Command, including pursuit of business opportunities resulting in millions of dollars in funding for the Center

Frank White for leading efforts to create a consortium of Navy warfare centers to address time critical targeting as it relates to strike warfare, and for representation of the Center in developing a strong support role of the Naval Warfare Development Command. His proposal for the Center's key agent role in fleet battle experiments resulted in an additional $14 million in funding for the Center

Navy Award of Merit for Group Achievement

USS *John C. Stennis* Battle Group/USS *Bon Homme Richard* Amphibious Ready Group team

Edwin Atwater
Wade Bolton
Chief Data Systems Technician John Botich
Russell Chun
Kelly Farr
Sheryl Goodwin
Tom Helman
Joe Hirschfelder
Orlando Lugo
Tracy Martonic
Colleen McCall
Bob Pangelinan
Randall Rockey

Extending the Littoral Battlespace Advanced Concepts Technology Demonstration team

Tom Tiernan, Project Manager
Andres Albano
Alan Antczak
Dr. Donald Bamber
Peter Bauer
Susan Berzill
Christina Billingsley
Mark Blocksom
Lawrence Cain
John Chang
Gerald Clapp
Lt. Ray Cooke
James Culligan
Terrance Curran
Dr. Nikhil Dave
Albert Desrosiers
Ben Director
Gaylord Doerck
Mike Dorko
Dr. Lorraine Duffy
Roger Duran
Tom Enderwick
Ken Faucher
Marcus Fieger
Bob Frazier
Leroy Gibeson
Callis Goodrich
Doug Hardy
Dr. Steven Holste
Ken Kaiser
Jean Killian
Ricky Linh
Christine Liou
Steve Luby
Chuck March
Dr. Scott McGirr
Bob McPhail
Jerry Mosley
Chris Poulos
Jonathan Richardson
Elaine Schiller
Tom Schlosser
Dr. George Seymour
Ruth Shearer
John Simbulan
John Skadberg
Dr. Tom Staley
Win Starling
Lyle Steger
Robert Stephenson
Anh Truong
Mark Tukeman
Virginia Wallace
Dianne Walker

Coast Guard Meritorious Team Commendation

National Distress and Response System Modernization Program

Dave Morin, Project Manager
Mary Edwards
Jack Harden
Grady Johnson
Joseph Loughlin
Larry Martin
Galard Mills
Michael Reaves
Gabe Schmera
Jim Tomitagawa

SPAWAR Lightning Bolt Award

Contingency Theater Automated Planning System Y2K Team

Nelson Arguelles
Thomas Dang
Bob Giannaris
Mike Gillis
Cowboy Koelzer
Rosa Laturno
John Laughlin
Wes Lee
Jim MacMaster
Rob Matheny
Jean McConnaughey
Roy McConnaughey
Jeff Mobley
Tom Sangunitto
Steve Seaburg
Lt. Cmdr. John Sommers

Marine Corps Systems Command Amphibious Warfare Technology Directorate Awards

Chuck Mirabile for service as program manager for USMC command, control, communications, computers and intelligence (C4I) science and technology and Small Business Innovation Research programs

Joe McCarthy for support of the USMC C4I science and technology programs

Special Act Awards

Brad Carter for concept development, engineering design, installation and implementation of the Coalition Wide Area Network for Commander-in-Chief, U.S. Pacific Command

Donald Iwasaki for service as lead design and installation engineer Information Technology for the 21st Century Project in Manama, Bahrain

Special Act Group Award

Automated Communications Management System

Gary Brown, Program Manager
Sally Norvell, Deputy
Rita Lane, Deputy
Ben Barlin
Ron Betsworth
Kathy Boyles
Bob Cagle
Charlie Cox
Bob Delizo
Steve Goff
Joy Green
Larry Hermanson
Eric Jensen
Tom O. Jones
Vo Khuu
Margaret Kuan
Michelle Lee
Jeff Livermore
Fernando Lizardi
Roy Logan
Rob Lowe
Sandi Manchor
Donna Martin-Lim
Nanette Mata
Debbie Moore
Chinh Nguyen
Han Nguyen
Jim Pack
Tony Ramos
Brian Riegle
Bob Ryder
Jeff Siconolfi
Jim Slominski
Gleason Snashall
Howard Spackman
Carol Stultz
Rob Thurmond

ORGANIZATION AWARDS

Federal Laboratory Consortium Technology Transfer Certificates of Accomplishment

Matt McLandrich and Richard Orazi for the Polarization Independent Narrow Channel Wavelength Division Multiplexing coupler

AFCEA Copernicus Awards

Heidi Mohlenbrok for identifying the need for and creating the Battle Group Systems Integration Testing

Roger Ogden for devising a practical network architecture allowing the use of the Network Encryption System in the Fleet

San Diego Business Journal Women Who Mean Business Awards

Dr. Cynthia Hanson: Award for Engineering

Dr. Brenda-Lee Karasik: Award for Public Service

Sandra Wetzel-Smith: Award for Defense

Cabrillo National Monument Volunteers In Parks (VIPs) Awards

Barbara Fletcher, Beth Gramoy, Nancy Hupp, Mike Moser, Kevin O'Leary

CENTER AWARDS

Lauritsen-Bennett Awards

For science: Dr. Newell Booth for performance of a number of multi-agency ocean experiments that realistically demonstrate matched-field processing techniques

For engineering: Barry Hunt for pioneering innovative designs for a wide range of intelligence systems

Executive Director's Award

Tom Tiernan for leadership of the Extending the Littoral Battlespace Advanced Concept Technology Demonstration team, establishing the model for future Center team projects

Publications Awards

Publications of the Year

Dr. Bob Dinger, Deborah Duckworth, Ronald Gauthier, Susan Hutchins, Dr. Theodore Pavlopoulos, Dr. Ken Richter, David Sailors, William Wild

Distinguished

Dr. Jeffrey Allen, Dr. Thomas Jones, Dr. Jon Losee, Dr. Wayne McGinnis, Dr. Randy Moore, Douglas Murphy, Dr. Steven Murray, Willard Rask, Dr. Jim Rohr

Excellence

Dr. Newell Booth, Dr. Charles Hewett, Dr. Lawrence Hoff, Matthew McLandrich, Richard Orazi, Richard Paulus, Lee Rogers, Phil Schey, Mike Shrader, Thao Vu

Merit

Dr. Sabine Apitz, Christopher Dempsey, John Feist, Ron Iwamiya, Victoria Kirtay, Dr. Shing Li, Dr. Jeff Morrison, Robert Mumm, Robert Ollerton, Richard Orazi, Dr. Stephen Pappert, Bryan Riegle, Dr. Jim Zeidler

Secretarial Awards

Yolanda Gomez
Jennifer Sears

Exemplary Achievement Awards

Richard Arrieta
Ronald Ballard
Barbara Barber
Gary Barber
Brian Britt
James Burdell
Eugene Cabatu
Donald Carder
Vicki Cooper-Murphy
Debra Depew
Douglas Dickerson
Peter Donich
Mary Edwards
Leonila Espejo
John Fenstermacher
Marcus Fieger
Efrain Flores-Colon
Stephen Fox
Mark Gabriels
Gloria Galvan
Karen Gee
Roger Geisler
Gary Gilbert
Lawrence Gill
Peter Grossnickle
Michael Halderman
David Hayashi
Richard Heckman
Michael Herring
Elissa Huffstetler
Julie Interchuck
Robert James
Glenn Jimenez
Russell Johnston
Michael Juniper
Neil Kamakawa
William Kerr
Alan King
John Kmet
Genia Kyres
Mark Lasher
Phil Lazar
Willie Levett
Karen Levine
Christine Liou
Charles Manry
Charles March
Deborah Moore
Dean Nathans
Han Nguyen
Hanh Nguyen
Hoa Nguyen
Larry Nixon
Stephen Nunn
Jan Park
Michael Phillips
John Pryor
Barry Randall
Barbara Scarton
Alan Sczepaniak
Cheryl Smith
David J. Smith
Richard Snow
Thomas Staley
Raymond Stone
Patrick Sullivan
Greg Theriault
Louis Toth
Shirley Walbert
Elizabeth Walker
Virginia Wallace
Carl Whitley
Jeffery Wildasin
Maryann Wilk
Tony Williams
Elisa Wing
Matthew Wuest
Mark Zabriskie

MILITARY AWARDS

Legion of Merit

Captain Harold A. Williams, USN

Navy Achievement Medals

Engineman First Class (Surface Warfare) Brian Maloney

Chief Operations Specialist Kevin Cash for service as a Pacific Fleet command, control, communications, computers and intelligence (C^4I) training point of contact for SSC San Diego

Chief Operations Specialist Larry Rucks for service as the U.S. Navy Link 16 cryptocontrolling authority at SSC San Diego

SSC San Diego Sailor of the Year

Engineman First Class Ronaldo Reyes

Good Conduct Medals

Chief Aerographer's Mate (Surface Warfare)
Matthew White (third award)
Senior Chief Radioman (Surface Warfare) Jon Matcke
Chief Operations Specialist (Surface Warfare) Kevin Cash
Engineman First Class Ronaldo Reyes

Appendix B:
1999 Patent Awards

SSC SAN DIEGO CY 1999 PATENTS

Inventor(s)	Title	Patent No.	Date
Jacobs, Everett W. Boss, Roger D. Fisher, Yuval	Method of Encoding a Digital Image Using Adaptive Partitioning in an Iterated Transformation System	5,862,262	19 Jan 99
Russell, Stephen D. Sexton, Douglas A.	Photon Controlled Decomposition of Nonhydrolyzable Ambients	5,877,392	02 Mar 99
Bond, James W. Hui, Stefen Stein, David Zeidler, James	Frequency Domain Kernel Phase Processor	5,889,688	30 Mar 99
Shapard, Thomas D. Zacharias, Merle J.DaBose, Michael W. Duke, David Uzun, Roger	System and Method for Effectuating Communications Between Networks Operating Asynchronously with Respect to One Another	5,892,765	06 Apr 99
DeJaco, Jerome F. Rask, Willard F.	Impulsive Snap-Through Acoustic Pulse Generator	5,894,451	13 Apr 99
Russell, Stephen D. Kasa, Shannon D. Walker, Howard W.	Ring Oscillator Based Chemical Sensor	5,895,629	20 Apr 99
Stein, David	Coherent Hidden Markov Model	5,900,835	04 May 99
Bond, James W. Hui, Stefen Stein, David Zeidler, James	Frequency Domain Kernel Processor	5,903,483	11 May 99
Ho, Thinh Q. Logan, James C. Rockway, John W.	Frequency Selective Surface Integrated Antenna System	5,917,458	29 Jun 99
Maltby, John D. Fogg, Robert K., Jr.	Braked Linear Nipper	5,919,333	06 Jul 99
Sun, Chen–Kuo Chang, Ching T. Albares, Donald J. Nguyen, Richard	Optically Activated Back-to-Back Pin Diode Switch Having Exposed Intrinsic Region	5,920,065	06 Jul 99
Bullat, David M. Vasishtha, Niraj	Biorepellent Matrix Coating	5,925,370	20 Jul 99
Shensa, Mark J.	Quotient Coding Modem	5,926,507	20 Jul 99
Szpak, Stanislaw J. Boss, Pamela A.	Electrochemical Cell Having Beryllium Compound Coated Electrode	5,928,483	27 Jul 99
Andrews, John M. Martini, Leonard J. Lieberman, Stephen H. Smith, Leon V. Anderson, Gregory W.	Underwater Spectroscopic Detector	5,929,453	27 Jul 99
Whitesell, James Eric	Electroluminescent Arrays Layered to Form a Volumetric Display	5,929,572	27 Jul 99

SSC SAN DIEGO CY 1999 PATENTS (Continued)

Inventor(s)		Patent No.	
Bond, James W. Schmidt, Henry J.	Beamformer with Adaptive Processors	5,933,446	03 Aug 99
Russell, Stephen D. Dubbelday, Wadad B.	Liquid Level Sensor and Detector	5,942,748	24 Aug 99
Acantilado, Neil P.	Computer Program for a Three-Dimensional Volumetric Display	5,945,966	31 Aug 99

Appendix C: 1999 Distinguished Visitors

Appendix C: 1999 Distinguished Visitors

JANUARY

6 Dr. William Mularie
Director
Information Systems Office
Defense Advanced Research Projects Agency

11 Major General Michael Hagee, USMC
Commanding General
1st Marine Divison

13 Rear Admiral William Cross, USN
Program Executive Officer for Aircraft Carriers

19 Dr. Ann Miller
Deputy Assistant Secretary of the Navy C4I/EW/Space//
Department of the Navy Chief Information Officer
Office of the Assistant Secretary of the Navy for Research,
Development & Acquisition

25 Rear Admiral David Polatty, III, USN
Commander
Carrier Group One

25 Mr. John D. Robusto
Deputy Commander
C4ISR Programs
Marine Corps Systems Command

FEBRUARY

17 Mr. Ed Miller
Program Executive Officer for Intelligence & Information Systems
U.S. Southern Command

19 Dr. Paris Genalis
Deputy Director for Naval Warfare
Office of the Secretary of Defense

23 Mr. Pete Verga
Deputy to the Undersecretary of Defense (Policy) for Policy Support
Office of the Secretary of Defense

26 Dr. Frank Fernandez
Director
Defense Advanced Research Projects Agency

MARCH

2 Dr. Ann Miller
Deputy Assistant Secretary of the Navy C4I/EW/Space//
Department of the Navy Chief Information Officer
Office of the Assistant Secretary of the Navy for Research,
Development & Acquisition

Vice Admiral Dennis V. McGinn, USN
Commander
Third Fleet

2 Rear Admiral Winford G. Ellis, USN
Oceanographer of the Navy
Office of the Chief of Naval Operations

Rear Admiral George D. Vaughan, USN
Program Executive Officer for Mine Warfare

Rear Admiral Larry D. Newsome, USN
Program Executive Officer for Air Anti-Submarine Warfare Assault and Special Mission Programs
Naval Air Systems Command

Rear Admiral Albert H. Konetzni, Jr., USN
Commander
Submarine Force, U.S. Pacific Fleet

Rear Admiral Charles B. Young, USN
Director
Submarine Technology
Naval Sea Systems Command/
Commander
Naval Undersea Warfare Center

Rear Admiral David T. Hart, Jr., USN
Deputy Director
Surface Warfare Division (N86B)
Office of the Chief of Naval Operations

Mr. Daniel E. Porter
Chief Information Officer
Department of the Navy

Mr. Dale F. Gerry
Deputy Assistant Secretary of the Navy
for Mine and Undersea Warfare

5 Commodore Lars-Ivar Nero, RSwN
Head of Delegation
Swedish Advanced Command Course
Swedish National Defence College

9 Rear Admiral James Maslowski, USN
Director
Navy International Programs Office

APRIL

8 Admiral James R. Hogg, USN (Ret.)
Director
Strategic Studies Group
Office of the Chief of Naval Operations

13 Mr. Joe Eash
Deputy Undersecretary of Defense (Advanced Systems & Concepts)
Office of the Secretary of Defense

14 Mr. Dave Wennergren
Deputy Chief Information Officer for Y2K
Department of the Navy

15 Rear Admiral Dennis Wright, USN
Fleet Surgeon
U.S. Pacific Fleet/
Command Surgeon
U.S. Pacific Command

16 Dr. Marv Langston
Chief Information Officer for Policy & Implementation
Office of the Deputy Assistant Secretary of Defense

27 Mr. Jim Barbarello
Director
Command & Control, Advanced Research & Development
Communications Electronics Command

27-29 Dr. Richard Ivanetich
Panel Chair
System Architecture; Information Management Dissemination, Protection, Assurance; Command & Control
Naval Studies Board

28 Rear Admiral Robert Nutwell, USN
Deputy Assistant Secretary of Defense for C3ISR & Space Systems
Office of the Secretary of Defense

28-29 Mr. Timothy E. Douglass
Program Executive Officer for Undersea Warfare

30 Brigadier General James D. Bryan, USA
Director
Command, Control, Communications & Computer Systems
U.S. Pacific Command

MAY

10 Representative Brian Bilbray (R-CA)
U.S. House of Representatives

11 Major General George Close, USA
Director for Operational Plans & Interoperability
Joint Chiefs of Staff

17 Rear Admiral Timothy Beard, USN
Commander
Naval Strike and Air Warfare Center

19 Rear Admiral P.S. Muetstege, Royal Netherlands Navy
Assistant Chief of Staff for CIS
Supreme Allied Command Atlantic

20	Honorable Richard Danzig Secretary of the Navy
20	Rear Admiral (Select) Kevin Cosgriff, USN Director White House Situation Room/ Director Systems & Technology Planning National Security Council
27	Admiral Jorge Arancibia Chief of Naval Operations Commander-in-Chief, Chilean Navy
	Commodore Raul Silva Chief of Staff
	Rear Admiral Christian Cifuentes Naval Attache to Washington
28	Mr. Tom Pendergraft Executive Director Naval Surface Warfare Center Dahlgren

JUNE

2	Mr. Hugh Montgomery Director Science & Technology Requirements Division Office of the Chief of Naval Operations
10–11	Rear Admiral (Select) Dale E. Baugh, USN Commanding Officer Puget Sound Naval Shipyard/ Prospective Deputy Commander for Fleet Logistics Naval Sea Systems Command
16	Rear Admiral Albert Konetzni, Jr., USN Commander Submarine Force, U.S. Pacific Fleet
17	Rear Admiral (Select) David J. Antanitus, USN Major Program Manager Deep Submergence Programs Naval Sea Systems Command/ Prospective Vice Commander Space and Naval Warfare Systems Command
24	Lieutenant General Alberto Zignani Secretary General of Defense/ Director National Armaments Ministry of Defense, Italy
	Vice Admiral Vicenzo Ascoli Member, Italian Delegation

Rear Admiral Mario Bartoli
Member, Italian Delegation

24 Brigadier General Gianni Botondi
Chief of Third Department of General Secretariat &
National Armament Directorate

Brigadier General Giuseppe Bernardis
Defense, Air & Defense Cooperation Attache
Embassy of Italy

30 Mr. John Robusto
Command, Control, Communications, Computers & Intelligence Office
Marine Corps Systems Command

JULY

7 Dr. Eric Labs
National Security Analyst
Congressional Budget Office

7 Commodore Duncan Phillip Greenish, RN
Director, Operational Requirements (Sea Systems)
Royal Navy

7 Mr. Lars Danielsson
State Secretary for International and EU Affairs
Prime Minister's Office, Sweden
Chairman
Defence Commission

Mr. Hakan Juholt
Member
Standing Committee on Defence
Swedish Parliament/
Member of the Defence Commission

Mr. Anders Svard
Member of the Defense Commission

Mr. Ulf Birath
Deputy Assistant Under Secretary
Ministry of Defence
Secretary of the Defence Commission

Brigadier General Nils Rosenqvist
Military Attache
Swedish Embassy

19–20 Brigadier General James Bryan, USA
Deputy
Command, Control, Communications and Computer Systems
U.S. Pacific Command

20 Vice Admiral Herbert A. Browne, Jr., USN
Deputy Commander-in-Chief
Chief of Staff
U.S. Space Command

27 Mr. Bran Ferren
President
Research & Development
The Disney Corporation

Rear Admiral David Polatty, III, USN
Commander
Carrier Group One

AUGUST

4 Lieutenant General Bruce Knutson, USMC
Commanding General
1st Marine Expeditionary Force

4 Mr. Bennett Hart
Director
Command, Control & Communications
Office of the Assistant Secretary of Defense (C3I)

6 Vice Admiral Thomas R. Wilson, USN
Director
Defense Intelligence Agency

Rear Admiral Richard B. Porterfield, USN
Director for Intelligence
U.S. Pacific Command

25 Major General Johan Kihl
Acting Chief of the Operations Directorate
Swedish Armed Forces Headquarters

Brigadier General Hakan Bergstrom
Chief of the Command, Control & Communications Division

SEPTEMBER

9 Major General Anthony J. Raper, CBE, RN
Chief Executive
Defence Communications Services Agency
Ministry of Defence, United Kingdom

16 Dr. Fred Saalfeld
Deputy Chief of Naval Research/
Technical Director
Office of Naval Research

20–23 Mr. Donald M. Harrison, Jr.
Communications, C2 Battle Management Directorate
Office of the Assistant Secretary of Defense

21–23 Captain John J. Higbee, USN
Acting Deputy Assistant Secretary of the Navy for C4I/EW/Space

23 Captain Robert Simeral, USN
Commander
Office of Naval Intelligence

OCTOBER

12 Mr. Dan Porter
Chief Information Officer
Department of the Navy

13 Mr. Paul O'Brien
Ms. Dorothy Delong
Committee on Appropriations
Surveys and Investigations Staff
U.S. House of Representatives

19 Brigadier General James Bryan, USA
Director
Command, Control, Communications and Computer Systems
U.S. Pacific Command

21 Rear Admiral Richard W. Mayo, USN
Director
Space, Information Warfare, Command and Control
Office of the Chief of Naval Operations

29 Mr. John Heath
U.K. Ministry of Defence
Mr. John Holmes
U.K. Embassy, Washington, D.C.

NOVEMBER

4 Rear Admiral James B. Plehal, USNR
Commander
Naval Reserve Security Group Command

8–9 Rear Admiral David Polatty, III, USN
Commander
Carrier Group One

15 Lieutenant General Phillip Ford, USAF
Deputy Commander-in-Chief
U.S. Strategic Command

Major General John Campbell, USAF
Vice Director
Defense Information Systems Agency/
Commander
Joint Task Force-Computer Network Defense

16 Admiral James R. Hogg, USN (Ret.)
Director
Strategic Studies Group
Office of the Chief of Naval Operations

16–18 Dr. Marv Langston
Chief Information Officer for Policy & Implementation
Office of the Assistant Secretary of Defense

29 Rear Admiral Curtis A. Kemp, USN
Program Executive Officer for Mine Warfare
Office of the Assistant Secretary of the Navy for Research, Development & Acquisition

DECEMBER

8 Major General Peter Franklin, USA
Deputy Director
Ballistic Missile Defense Organization

Mr. Jeff Baxter
Professional Staff Member
U.S. House of Representatives

13 & 16 Rear Admiral (Select) David J. Antanitus, USN
Vice Commander
Space and Naval Warfare Systems Command

15 Brigadier General Stephen J. Ferrell, USA
Director of Plans/Commander, U.S. Army Element
United States Space Command

29 Dr. Frank Fernandez
Director
Defense Advanced Research Projects Agency

Appendix D: 1999 Major Conferences and Meetings

Appendix D: 1999
Major Conferences and Meetings

JANUARY

5–7	Radio Communications and Wireless Networks Meeting
6–7	CR2 Developers Conference
19–22	Sentinel Workshop
26	Institute of Navigation National Technology Meeting Vision 2010
26–27	Information Systems Technical Advisory Committee Meeting
26–27	Defense Advanced Research Projects Agency Information Assurance Working Group

FEBRUARY

3–4	Modeling and Simulation Users' Conference
23–26	Naval Symposium on Underwater Acoustics

MARCH

2–4	National Defense Industrial Association Symposium
3–4	High Performance Computing Service/Agency Approval Authority Meeting
4–5	Submarine C4I Executive Steering Committee Meeting
10–11	Amphibious C4ISR Architecture Workshop
15–19	Information Systems Technology Workshop
16–17	Asynchronous Transfer Mode Security Technology Workshop/Fast Lane Users' Conference
30–31	Weather Impact Decision Aid Meeting

APRIL

8–9	Ballistic Missile Defense Organization US/Japan Cooperative Technical Working Group Meeting
15	Town Hall Meeting on "Acquisition Reform…Part of the Administration's Conversation with America"
22	Ballistic Missile Defense Organization BMC4I Industry Day
26–28	Automated Communications Management System Build-To-Requirements Interpretation Technical Interchange Meeting
27–29	United Kingdom Ocean Survey Program Survey System Operational Support Program Review
27–28	High Performance Computing Modernization Program Security Implementation Group Meeting
29–30	High Performance Computing Defense Research Engineering Network Panel Meeting
30	SSC San Diego Micro-Electro-Mechanical Systems (MEMS) Day

MAY

4–6	Joint TENCAP Directors Conference
11	Program Executive Officer for Theatre Surface Combatants Topside Working Group Meeting
14	Chief Of Naval Operations/Commander Naval Air Force Pacific N–6 C4ISR Flag Conference
17–21	46th Annual The Technical Cooperation Program (TTCP) Maritime Systems Group Meeting
24–28	The Technical Cooperation Program (TTCP) Coordinated Maritime Battlespace Management Symposium

JUNE

8–10	Airborne Strike Requirements Target Acquisition, Targeting and Battle Damage Assessment Meeting
14	Joint Aerospace Weapon Systems Support, Sensors and Simulation Symposium
29–Jul. 1	UHF Electronically Steered Antenna Workshop
30	Defense Advanced Research Projects Agency Briefing and Demo of the Joint Logistics Advanced Technlogy Demonstration Concept

JULY

14–15	Intelink Conference
19–30	Naval Research Advisory Committee (NRAC) Summer Study
21–22	Navy Laboratory/Center Coordinating Group (NLCCG) Meeting
30	19th Annual ESRI Users' Conference Intelligence Community GIS Meeting

AUGUST

3–4	1999 Crossbow Symposium
9–12	Office of Naval Research Active Signal Processing Peer Review
18–19	Interservice Mission Planning Working Group Meeting
24–26	Link 16 Users' Conference

SEPTEMBER

14–16	West Coast Antenna Meeting
20	Integrated Broadcast Service Tutorial
21–13	Integrated Broadcast Service Users' Conference
27–30	US/Australia Joint Study Group Meeting

OCTOBER

5–7	Ninth French Navy/USN C4 Interoperability Working Group Meeting
18–22	NATO Improved Link Eleven (NILE) Steering Committee Meeting
25–29	The Technical Cooperation Program (TTCP) Sensor Group, Action Group Five Meeting
26–28	Information Operations (IO) Symposium

NOVEMBER

3	Concealed Weapons Detection Meeting
8–9	Office of Naval Research/Commander Carrier Group One Technical Meeting
15–17	Joint Meteorology and Oceanography Database Working Group Meeting
16	National Defense Industrial Association Undersea Warfare Division and Strike Land Attack and Air Defense Committee Meetings
30–Dec. 1	Naval Science Assistance Program (NSAP) Program Managers Meeting
30–Dec. 2	Global Command and Control System–Maritime Systems Engineering Working Group Meeting

DECEMBER

6–10	U.S. Army TENCAP Users' Working Group Meeting

Appendix E : Acronyms

Appendix E: Acronyms

AAALAC	Association for Assessment and Accreditation of Laboratory Animal Care
ABN	Aegis Broadcast Network
ACC	Aegis Computer Center
ACSC	Aegis Combat Systems Center
ACTD	Advanced Concept Technology Demonstration
ADS	Advanced Deployable System
AFCEA	Armed Forces Communications and Electronics Association
ARG	Amphibious Ready Group
ATGWP	Afloat Training Group Western Pacific
ATM	Asynchronous Transfer Mode
ATRC	Aegis Training and Readiness Center
BDA	Battle Damage Assessment
BDI	Business Data Input
BG	Battle Group
BGIT	Battle Group Interoperability Test
BGSIT	Battle Group Systems Integration Testing
BWS	Bridge Workstation Subsystem
C2	Command and Control
C2P	Command and Control Processor
C3	Command, Control, and Communication
C4	Command, Control, Communications, Computers
C4I	Command, Control, Communications, Computers and Intelligence
C^4ISR	Command, Control, Communication, Computers, Intelligence, Surveillance, and Reconnaissance
CA	Commercial Activities
CDNU	Control Display Navigation Unit
CID	Combat Identification
CINCLANTFLT	Commander in Chief, U.S. Atlantic Fleet
CINCPACFLT	Commander in Chief, U.S. Pacific Fleet
CNET	Chief of Naval Education and Training
CNN	Cable News Network
CNO	Chief of Naval Operations
COE	Common Operating Environment
COF	Common Operating Framework
COMWIN	Combat Wear Integrated
COMCARGRU	Commander Carrier Group
COMCRUDESGRU	Commander Cruiser Destroyer Group
COMDAC–INS	Command, Control and Display–Integrated Navigation
COMM	Communications
COMPTEVFOR	Commander, Operational Test and Evaluation Force
COMSEC	Communications Security
COMTHIRDFLT	Commander, Third Fleet
CONs	Customer Order Numbers

COP	Common Operational Picture
CORBA	Common Object Request Broker Architecture
COTS	Commercial-off-the-Shelf
CRADA	Cooperative Research and Development Agreement
CTAPS	Contingency Theater Automated Planning System
CY	Calendar Year
DAMA	Demand-Assigned Multiple-Access
DARPA	Defense Advanced Research Projects Agency
DCS	Display Control Subsystem
DDG	Guided Missile Destroyer
DEP	Distributed Engineering Plant
DERA	Defence Evaluation and Research Agency
DIFMS	Defense Industrial Financial Management System
DII COE	Defense Information Infrastructure Common Operating Environment
DII	Defense Information Infrastructure
DISA	Defense Information Systems Agency
DISN–LES	Defense Information Systems Network, Leading Edge Services
DLTTs	Data Link Test Tools
DoD	Department of Defense
DREN	Defense Research and Engineering Network
DWQR	Data Warehouse Query and Reporting
EIP	Embeddable Infosec Product
ELB	Extending the Littoral Battlespace
ELINT	Electronic Intelligence
EODMUTHREE	Explosive Ordnance Disposal Mobile Unit Three
EPLRS	Enhanced Position Locating Reporting System
FAA	Federal Aviation Administration
FBE-E	Fleet Battle Experiment-Echo
FCTCPAC	Fleet Combat Training Center Pacific
FET	Fleet Exercise Test
FID	Friendly Identification
FIT	Final Integration Test
FOT&E	Follow-On Test & Evaluation
FY	Fiscal Year
G&A	General and Administrative
GBS	Global Broadcast Service
GCCS–M	Global Command and Control System–Maritime
GISRS–M	Global Intelligence Surveillance and Reconnaissance System–Maritime
GOTS	Government-off-the-Shelf
GPS	Global Positioning System
GTEs	Gateway Terminal Emulators
HAE UAV	High Altitude/Endurance Unmanned Aerial Vehicle
HP	Hewlett–Packard
HPC	High-Performance Computing
HPCMP	High Performance Computing Modernization Program

IAT	Integrated Article Test
ICSTF	Integrated Combat Systems Test Facility
IDB	Integrated Data Base
ILIR	In-House Laboratory Independent Research Program
ILS	Instrument Landing System
IMU	Inertial Measurement Unit
INFOSEC	Information Security
IO	Information Operations
IOC	Initial Operational Capability
IOCOF	Information Operations Center of the Future
IPL	Image Product Library
ISEA	In-Service Engineering Agent
ISR	Industrial Security Regulation
ISR	Intelligence, Surveillance and Reconnaissance
IT	Information Technology
IT-21	Information Technology for the Twenty-First Century
JAT	Joint Acceptance Tests
JECG	Joint Exercise Control Group
JICPAC	Joint Intelligence Center Pacific
JONs	Job Order Numbers
JSC	Joint Strike Cell
JTIDS	Joint Tactical Information Distribution System
JTW	Joint Targeting Workstation
JWICS	Joint Worldwide Intelligence Communications System
KTO	Korean Theatre of Operations
LAN	Local Area Network
LAWS	Land Attack Warfare System
LBT	Land-Based Test
LORAN	Long-Range Navigation
LQMB	Link Quality Management Board
MATCALS	Marine Air Traffic Control and Landing System
MCE	Mission Control Element
MIDW	Management Information Data Warehouse
MOUT	Mckenna Military Operations in Urban Terrain
NAEW	NATO Anti-Early Warning
NATO	North Atlantic Treaty Organization
NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command
NAVSSI	Navigation Sensor System Interface
NCS	Net Control Station
NCTAMSPAC	Naval Computer and Telecommunications Area Master Station Pacific
NCTC	Naval Computers and Telecommunications Command
NCTSI	Naval Center for Tactical System Interoperability
NES	Network Encryption System
NIMA	National Imagery and Mapping Agency
NIPRNET	Nonclassified Internet Protocol Router Network

NPS	Naval Postgraduate School
NSA	Naval Support Activity
NSF	National Science Foundation
NSWC PHD	Naval Surface Warfare Center, Port Hueneme Division
NSWC DD	Naval Surface Warfare Center, Dahlgren Division
NWCF	Navy Working Capital Fund
ONR	Office of Naval Research
OOB	Order of Battle
OSD	Office of Secretary of Defense
OSW	Operation Southern Watch
OTAR	Over the Air Re-Keying
OTH	Over-the-Horizon
OV	Operational Validation
PACMEF	Pacific Middle Eastern force
PAO	Public Affairs Office
PAS	Processing and Analysis Segment
PATs	Process Action Teams
PECOF	Precision Engagement Center of the Future
PINC	Polarization Independent Narrow Channel
PLI	Position Location Information
PLRS	Position Locating and Reporting System
PNT	Positioning, Navigation, and Training
PTW	Precision Targeting Workstation
PVC	Polyvinyl Chloride
Q&R	Query and Reporting
QMB	Quality Management Board
R&D	Research and Development
RRDT&E	Research, Development, Test and Evaluation
RHIB	Rigid-Hulled Inflatable Boats
RIMPAC	Rim of the Pacific
RISC	Reduced Instruction Set Computer
ROV	Remotely Operated Vehicle
RTS	Real Time Subsystem
SA	Situational Awareness
SABER	Situational Awareness Beacon with Reply
SAR	Synthetic Aperture Radar
SBBL	Sea Based Battle Lab
SDFI	STARS/DIFMS Financial Interface
SERF	Scientific Environmental Research Foundation
SIF	Systems Integration Facility
SIMPLE	Standard Interface for Multiple Platform Link Evaluation
SINCGARS	Single Channel Ground and Airborne Radio System
SIPRNET	Secure/Secret Internet Protocol Router Network
SIR	Statutory Invention Registration
SLEP	Service Life Extension Program
SNAPE	Simple NATO Analysis Panel Executive

SNIPER	Specialized Navigation for Indoor Personnel
SOCAL	Southern California
SOSUS	Sound Surveillance System
SPAWAR	Space and Naval Warfare Systems Command
SPOT	Soldier Position Orientation and Tracking
SSA PAC	SPAWAR Systems Activity Pacific
SSC San Diego	Space and Naval Warfare Systems Center, San Diego
SSDS	Ship Self Defense System
STARS	Standard Accounting and Reporting System
STELLA	System to Estimate Latitude and Longitude Astronomically
SUO	Small Unit Operations
SW-CMM	Software Capability Maturity Model
TACAN	Tactical Air Navigation
TADIL	Tactical Data Link
TAMD	Theater Air and Missile Defense
TASID	Tactical Advanced Situation Display
TBMCS	Theater Battle Management Core Systems
TDDS	Trap Data Dissemination System
TDOA	Time Difference of Arrival System
TFDS	Time Frequency Distribution System
TRAP	Tactical Receive Equipment-Related Applications Report
TV-DTS	Television-Direct to Sailor
UAVs	Unmanned Aerial Vehicles
UHF	Ultrahigh Frequency
USCINCPAC	Commander-in-Chief, U.S. Pacific Command
USN	U.S. Navy
USNO	U.S. Naval Observatory
UUV	Unmanned Undersea Vehicle
WDM	Wavelength Division Multiplexing
WIRE	Wet-End Inspection, Repair, and Recovery Element
Y2K	Year 2000

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