

NAVAL SEA SYSTEMS COMMAND

ON WATCH

SUPPORTING THE 21ST CENTURY WARFIGHTER



2003



Keeping America's Navy #1 in the World



In support of the 21st Century Warfighter, and the Navy's strategic vision—Sea Power 21—the Naval Sea Systems Command (NAVSEA) has established five priority areas it will focus on in 2003.

In collaboration with the fleet and our nation's defense industry, the NAVSEA Team will apply the goals of Sea Enterprise, making necessary changes in ship system development and acquisition to better support joint and combined forces in the battlespace.

These priorities are critical to NAVSEA mission success and will require changes in thinking, metrics, processes, and industry relationships.

- **Maintenance Initiatives**

Forging new maintenance philosophies that will support a surging naval force at war.

- **Increased Organizational Efficiency and Effectiveness**

Building public and private consortiums that can bring about effectiveness in an efficient manner.

- **Define and Implement New Policies/Processes for NAVSEA Organizations**

Doing business in a new way requires that new relationships, missions and metrics be defined and implemented to effect improved readiness and capabilities.

- **Resource Alignment and Development**

Harvesting all possible savings for the re-capitalization of the fleet.

- **Virtual SYSCOM**

Addressing the interaction of all command elements so that the organization serves all system/platform development and production requirements.

Warfighters Serving Warfighters Enterprising Fleet Readiness





Keeping America's Navy #1 in the World

ON WATCH: 2003

SUPPORTING THE 21ST CENTURY WARFIGHTER

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Enterprising Fleet Readiness

The Naval Sea Systems Command—NAVSEA—is Sea Enterprise.

Sea Power 21 is the Chief of Naval Operations' (CNO's) vision for a 21st Century Navy, and NAVSEA plays a critical role as the industrial base for that vision. However, if we are going to build the next fleet and the fleets thereafter, while optimizing today's naval force, we must also be a part of what is called *Sea Enterprise*.

Sea Enterprise seeks to improve organizational alignment, refine requirements, and reinvest savings to buy the platforms and systems needed to transform the U.S. Navy. Last year, NAVSEA re-organized itself to better align its functions with Sea Power 21's enterprising principle. Now we are poised to execute the CNO's vision and are already harvesting efficiencies that will be used to recapitalize our Navy.

Previously, the ways of doing business served a rotational naval force that deterred a known and predictable Cold War enemy. In winning the Cold War, the Navy was asked to be effective in its mission—and it was extraordinarily effective.



New York City (May 22, 2002)—The United States Coast Guard Cutter Eagle passes the amphibious assault ship USS Iwo Jima (LHD 7) on the Hudson River. Both ships were in New York to kick off Fleet Week 2002. U.S. Navy photo by Photographer's Mate 1st Class Michael W. Pendergrass.

Today, because of the uncertain nature and duration of the war against terrorism, the Navy's business practices must become more efficient to achieve enhanced warfighting effectiveness. Increasing our efficiency is important, and we will; but never at the cost of reduced readiness and capability. We must be effective in what we do. The risks are too high not to get this right—for our people in harm's way, for our nation, and for the entire free world.

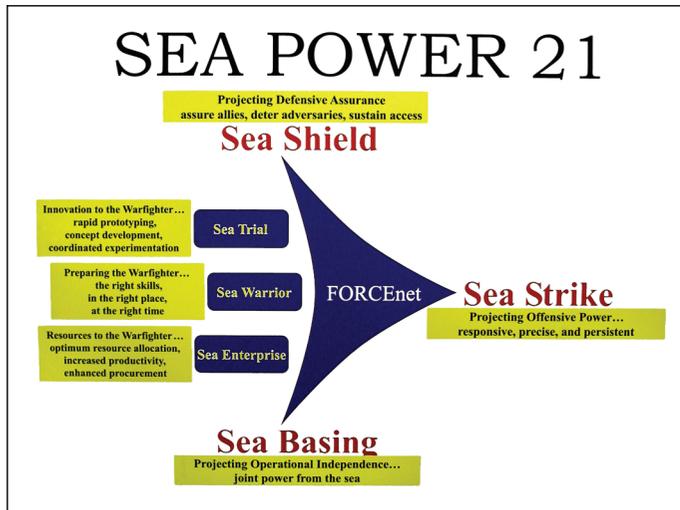


As NAVSEA enterprises fleet readiness in 2003, we are setting aside old paradigms. We are adopting innovative processes to deliver increased combat capability. As improvements are implemented, new metrics will be applied to accurately measure our *Sea Enterprise* achievements. Any success will require continuous monitoring of changes in business practices to minimize risk and meet the challenges ahead.

NAVSEA radically realigned itself in November 2002. Three new Program Executive Offices (PEOs) and three new NAVSEA directorates were established to break down production boundaries and eliminate the *stovepipes* that undermined more efficient and effective progress. The new organization is dynamic and structured to use the *best athletes* on the job to deliver the *best solution* in the spirit of *Sea Enterprise*.



New York City (May 22, 2002)—The amphibious assault ship USS Iwo Jima (LHD 7) pulls into Pier-88 after sailing up the Hudson River to kick off Fleet Week 2002 in New York City. More than 6000 Sailors, Marines and Coast Guard personnel aboard 22 ships sailed into New York City today for the 15th Annual Fleet Week. U.S. Navy photo by Photographer's Mate 1st Class Michael W. Pendergrass.



Sea Power 21 is the Navy's strategic vision for the 21st century. It provides a framework to align, organize, and integrate the Navy to meet the many challenges that lie ahead.

With the right organizational structure in place, I established five priority areas under which the command will support the 21st Century warfighter in 2003 and the Navy's way ahead through *Sea Power 21*. In collaboration with the fleets, NAVSEA will apply the goals of *Sea Enterprise*. We will make the necessary changes in ship-system development and acquisition to better support joint and combined forces in the battlespace. These priorities require changes in our thinking, our metrics, our processes, and our industry relationships (See the NAVSEA Enterprise Guide inside this publication).

We must focus on maintenance philosophies that will support a surging naval force at war. This requires the pursuit of a *one-shipyard* concept to harvest all the best abilities across the public and private yards. It also means that we break down boundaries in maintenance practices and reduce the inherent churn. NAVSEA is already re-engineering ship maintenance through new initiatives such as SHIPMAIN (Ship Integrated Maintenance) and Distance Support. The paradigms are changing as we do the right maintenance, at the right time, at the right location.

Though restructured, NAVSEA is still assessing its critical mission and abilities to further increase its efficiency and effectiveness. The command is identifying optimal outsourcing opportunities as well as public-private sharing and partnerships. These will build consortiums that can bring about the necessary innovation and expedite our production. As we do so, new organizational policies and processes need to be defined to completely establish our alignment with *Sea Power 21*.

As it enterprises fleet readiness, NAVSEA is determined to capture organizational savings for the recapitalization of our Navy. This year, a headquarters/command productivity analysis is aimed at achieving \$585 million in savings for fiscal year 2004.

As we refine our own operation, it is important that we con-

sider how NAVSEA's mission fits in with the other systems commands. The initiation of a Virtual SYSCOM will address the interaction of the four acquisition SYSCOMs, so that the organization serves all system/platform development and production requirements—now and in the future.

This is a pivotal moment in NAVSEA's history. In 2002 and into this year, NAVSEA has already made clear progress with many *Sea Enterprise* applications. As you read our *On Watch* publication, I hope you come away with a sense of that progress and our accomplishments in building our Navy. I also hope you gain an appreciation for the forward-leaning course that NAVSEA is charting as we shape the next Navy.

NAVSEA has taken ownership of *Sea Enterprise*. We define it not just in terms of best business practices and harvested efficiencies, but more so in terms of our support for the 21st century warfighter. Across the Command, the NAVSEA team is enterprising fleet readiness and redefining shipbuilding for decades to come.

—Vice Adm. Phillip M. Balisle



Norfolk, Va. (Dec. 20, 2002)—Family members and friends brave a chilly rain as they cheer the arrival of USS George Washington (CVN 73) at the Naval Station Norfolk. Washington is completing a six-month deployment during which the ship and her battle group supported Operation Enduring Freedom. U.S. Navy photo by Photographer's Mate 2nd Class Michael Sandberg.

The NAVSEA Team

The Naval Sea Systems Command is the U.S. Navy's ship-systems program manager, engineer, and technical authority. NAVSEA relies on more than 46,000 Civilians and Sailors, along with thousands of private industry contractors, to engineer, build, and support the U.S. Navy's ships and combat systems.

NAVSEA's team of engineers, naval architects, scientists, artisans, technicians, and staff manages over 100 acquisition programs. It also provides engineering, technical authority, and logistics support to the fleet. This team includes five affiliated Program Executive Offices (PEOs), four Naval shipyards, nine supervisors of shipbuilding (SUPSHIPs), two warfare centers, the Naval Ordnance Safety and Security Activity, the Naval Sea Logistics Center, headquarters operations, and a number of smaller organizations. NAVSEA also administers a sizeable foreign military sales program involving 65 countries and four North Atlantic Treaty Organization (NATO) organizations, with sales well into the billions annually. With its relocation in 2001 to the historic Washington Navy Yard in the District of Columbia, NAVSEA's headquarters has returned to the roots of America's naval shipbuilding.



USS Antitem (DDG 54) sits in drydock.



Mayport, Fla. (Feb. 13, 2003)—Standing before hundreds of U.S. Navy Sailors, President George W. Bush speaks to an audience gathered at Mayport Naval Station. "The United States Navy carries the might and the mission of America to the farthest parts of the world," the President said. U.S. Navy Photo by Photographer's Mate 3rd Class Joshua Karsten.

The largest of the U.S. Navy Systems Commands (SYSCOMs), NAVSEA's fiscal year 2002 budget of approximately \$17.4 billion accounted for approximately 17.6 percent of the Navy's \$98.9 billion budget. Its 2003 budget of \$19.1 billion accounts for over 17 percent of the Navy's \$111.2 billion budget. Despite its size and these budget numbers,



USS Buckeley (DDG 84) awaits repairs to its twisted rudder.

NAVSEA works closely with the other SYSCOMs; together they form a Virtual SYSCOM. This union addresses the interaction of the four SYSCOMs, so that the organization serves all system-platform development and production requirements.

The realignment began at NAVSEA with a streamlining of the program executive offices and the establishment of new directorates last fall that focuses on the numerous aspects of shipbuilding and acquisition, technology insertion, spiral development, weapon systems, and Sailor and Marine performance.

The Family of Ships that is starting with DD(X), and that includes the littoral combat ship (LCS) will be the basis for the next Navy. Another major part of that Navy will be CVN 21—the next-generation aircraft carrier. In addition, NAVSEA is participating in the development of theatre ballistic missile defense. In collaboration with the fleet, NAVSEA is adopting new processes that will result in radically improved capabilities. Some areas where NAVSEA is instrumental are embodied in the following:

- **DDX, CVN 21, and Littoral Combat Ship (LCS):** These revolutionary ships will combat an unpredictable enemy across a dispersed battlespace in the next decades. Their pro-



An artist's concept of the Navy's 21st Century Destroyer, DD(X).

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Supporting the 21st Century Warfighter

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Camp Patriot, Kuwait (Feb. 28, 2003)—The Navy's Joint Venture (HSV-X1), a high-speed sealift catamaran built and designed by Australian shipbuilders, sits pier-side. The vessel design was coordinated by the Navy Warfare Development Command in close partnership with elements of the Army, Navy, Marine Corps and Coast Guard. Operation Enduring Freedom is the first time the craft has been deployed for military operations. U.S. Navy photo by Journalist 1st Class Joseph Krypel.

duction cannot be measured by the old standards. NAVSEA will establish new standards and define shipbuilding in the 21st century. These ships will be modular, with multimission capabilities. NAVSEA is building a FORCENet centric Navy for freedom and homeland defense.

- **SSGN Conversion:** NAVSEA and the Naval Research Laboratory experiment *Giant Shadow* underscored the great potential in converting ballistic missile submarines into conventional missile platforms. Reconstituting SSBNs to SSGN service requires a Sea Enterprise approach that will deliver unprecedented power, stealth, and asymmetric capabilities to joint and combined forces within the next few years.
- **Ballistic Missile Defense (BMD):** Like SSGN, BMD is expanding and transforming the life and role of existing platforms for new missions. It will help shape the next Navy and the Navy after next. NAVSEA is leveraging technology and using spiral development, as with LCS, to provide the weapons systems necessary to meet our country's national security demands.

The new PEOs and directorates are involved in current readiness for the Navy and the development of future systems. One of the new directorates that NAVSEA established is the Human Systems Integration (HSI) Directorate (SEA 03). It is leading NAVSEA's effort to institutionalize HSI as a fundamental element of systems engineering. In part, the directorate is establishing corporate policy and standards, develop human performance metrics, and evaluation techniques.

The fleet is more than ships, submarines, aircraft, and the systems we install on them. The fleet is also Sailors and Marines—energetic, talented, and exceptionally dedicated

Americans who volunteered to perform incredibly complex duties in a harsh and often hostile environment. Without these highly motivated and well-trained Sailors, our ships, submarines, and aircraft are lifeless and inanimate platforms.

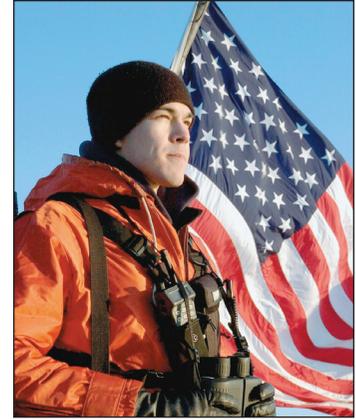
The HSI Directorate is NAVSEA's certification authority to ensure new systems delivered to the fleet are useable, enhance Sailor and Marine performance, optimize manpower and training, and promote safety, survivability and quality of service.

By designing systems with input from Sailors and Marines addressed up front, crews can perform tasks more efficiently and with fewer people.

In addition, the HSI Directorate works closely with the Fleet, the Chief of Naval Operations, Naval Education and Training Command and Naval Personnel Development Command to support and implement Sea Warrior and Task Force EXCEL initiatives.

It is NAVSEA's duty to ensure that every ship it builds and every system it delivers is designed, acquired, and supported with performance, training, safety, and survivability in mind. When all is said and done, how our Sailors and Marines perform makes the difference between victory and defeat.

In its realignment, NAVSEA also established the Ship Design, Integration, and Engineering Directorate (SEA 05).



Aboard USS Harry S. Truman (CVN 75) Feb 4, 2003—Aviation Ordnanceman Airman Apprentice Vincent L. Carrillo stands force-protection watch on the ship's flight deck while in port Koper, Slovenia. U.S. Navy photo by Photographer's Mate Airman Ryan O'Connor.



An artist's concept of CVN 21, the U.S. Navy's next-generation aircraft carrier.

The NAVSEA Team

Supporting the 21st Century Warfighter



At sea aboard USS San Jacinto (CG 56) Mar. 5, 2003—Fire Controlmen man the ship's launch-control watch-station in the Combat Information Center (CIC) aboard the guided missile cruiser during a Tomahawk Land Attack Missile (TLAM) training exercise. U.S. Navy photo by Photographer's Mate 1st Class Michael W. Pendergrass.

SEA 05 is the Technical Authority for ships, submarines, surface craft, and ship systems. It manages ship design for acquisition of these types of vessels. Another major responsibility of SEA 05 is in working with the fleet, program managers, and sponsors to resolve cross-platform or major systemic performance concerns. In addition, it leads ship, submarine and surface craft concept development and strategies for technology insertion.

NAVSEA also stood up the Warfare Systems Engineering (SEA 06) Directorate. SEA 06 deals with combat systems and systems of systems issues. In part, it establishes appropriate standards and policies and implements systems engineering processes to guide the PEO program managers. It also serves as the principle advisor to the Commander NAVSEA and as Technical Authority for naval warfare, combat, and weapons systems. Another important focus of SEA 06 is managing the Battleforce Interoperability program.

Program Executive Offices

NAVSEA's five affiliated PEOs—Ships, Aircraft Carriers, Integrated Warfare Systems, Littoral and Mine Warfare, and Submarines—were realigned last fall. They are responsible for all aspects of life-cycle management for their assigned programs. NAVSEA provides the PEOs with total ship system engineering, establishes and coordinates technical policy and procedures, and delivers integrated logistics support. The PEOs report directly to the Assistant Secretary of the Navy for Research, Development, and Acquisition (ASN, RD&A) for designated acquisition matters. They report to the Commander, NAVSEA (COMNAVSEA) for planning and execution of in-service support.



The operations room for the Area Air Defense Commander (AADC) capability. AADC is an integrated Theater Air Defense (TAD) battle-management system.



At sea with USS Essex (LHD 2) Amphibious Readiness Group (ARG) Mar. 11, 2002—USS Essex, USS Juneau (LPD 10), USS Germantown (LSD 42), and USS Fort McHenry (LSD 43) with the 31st Marine Expeditionary Unit (MEU) embarked, practices formation steaming during the semi-annual amphibious integration training exercise known as Blue-Green Workups. U.S. Navy photo by Photographer's Mate Airman Apprentice Stephanie M. Bergman.

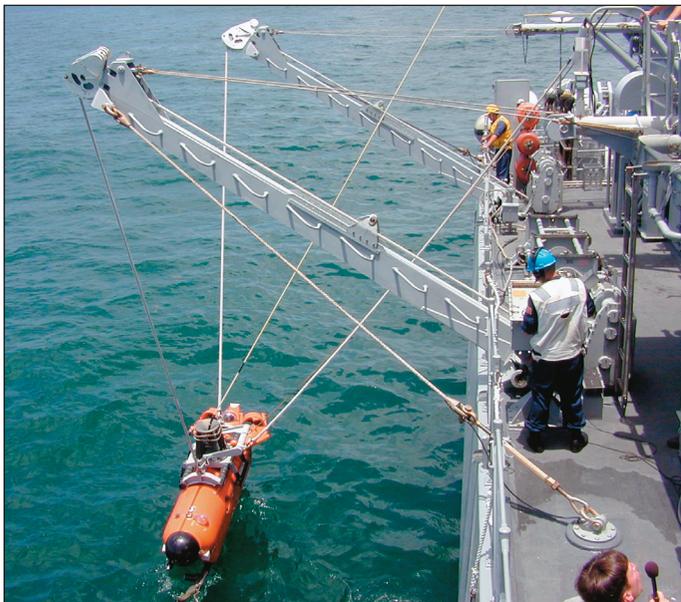
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The basic responsibilities of the new PEOs are highlighted below:

- **PEO Ships:** Serves all surface platforms: streamlining processes, shortening production timelines, and focusing on common infrastructure through teaming with shipyards and industry.
- **PEO Integrated Warfare Systems:** Manages surface combat systems across sub and surface platforms, creating an open architecture that will share a singular software baseline whose applications can be upgraded without rewriting the base code.
- **PEO Littoral & Mine Warfare:** Serves mission integration from deep water over the horizon and into the littoral; incorporate modular mission capabilities across the battle group, including unmanned vehicles.



At sea aboard USS Champion (MCM 4) Jul. 22, 2002—Sailors aboard the mine countermeasures ship prepare to lower the ANISLQ-48 Mine Neutralization Vehicle into the water. The remotely operated vehicle uses sonar and video cameras to find and identify underwater objects. If the operators find a mine, the vehicle can place small explosive charges near the mine to neutralize it. U.S. Navy photo by Lieutenant Marc Boyd.

Naval Shipyards: One Shipyard—Four Locations

America's ships and submarines have been vital in the nation's war on terrorism. Ensuring that they are ready to deploy at a moment's notice and that they can stay deployed for extended periods is a priority of NAVSEA, its Naval Shipyards, and its Supervisors of Shipbuilding, Conversion and Repair. In the past 18 months, the four Naval Shipyards have stepped up the pace to keep ships and subs on station during Operation Enduring Freedom. The increased operational tempos require the shipyards both to accelerate previously planned depot availabilities and to shorten the duration of those availabilities.

The shipyards have come through with flying colors. Some examples of their accomplishments:

- Puget Sound NSY completed a planned incremental availability (PIA) on *Carl Vinson* on a compressed schedule of five months instead of the originally planned six-month schedule. Puget Sound also moved up by three months the start date for the *Stennis* PIA.
- Norfolk NSY completed availabilities on the aircraft carriers *Roosevelt* and *Truman* and the large-deck amphibious ships *Bataan*, *Saipan*, and *Kearsarge*—all under cost and ahead of schedule.
- Portsmouth NSY completed a depot maintenance period (DMP) on USS *Miami* (SSN 755) and an engineered refueling overhaul (ERO) on USS *City of Corpus Christi* (SSN 705), both well ahead of schedule. It also set a record, completing USS *Alexandria's* (SSN 757) DMP in fewer than 11 months.
- Pearl Harbor NSY & Intermediate Maintenance Facility has been performing DMPs on SSNs as well as dozens of shorter fleet maintenance availabilities on subs and surface combatants.



USS Buckeley in drydock awaiting repairs to its rudder.



New York, N.Y. (Sep. 7, 2002)—Former Secretary of the Navy, Gordon England, announces the naming of a planned amphibious transport dock ship, LPD-21, New York, to honor the state, the city, and the victims of Sept. 11. With the former Secretary, from left, are New York Governor George E. Pataki, Deputy New York City Mayor Carol Robles-Romano, and Dr. Phil Dur, president of Northrop Grumman Ships Systems. U.S. Navy photo by Capt. Kevin Wensing.

These shipyard successes are the result of a dedicated, highly skilled work force, standardizing maintenance and business practices, and initiatives such as Carrier Team One (aircraft carriers), A Team (LHA/LPD), and the Submarine Factory. These initiatives bring together the stakeholders from both the Navy and private industry who are involved in availabilities to focus on improving key planning and execution processes and ultimately perform more maintenance and modernization for the dollar.

One of the most influential steps that NAVSEA and the shipyards are embarking on is the vision of one unified ship-

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Puget Sound Naval Shipyard, Wash. (Apr. 19, 2002)—Shipyard worker Terry Smith directs the crane operator to position one of four 64,000 pound screws from USS Carl Vinson (CVN 70) onto pier side support blocks. U.S. Navy photo by Photographer's Mate 3rd Class Kerryl Cacho.

yard, operating in four locations to provide the necessary quality and maintenance for the fleet. One of the ways this has been done is by the development of a factory concept to accomplish submarine work. For the submarine force to meet its commitments, the Navy requires the refueling and overhauling of its submarine fleet to be carried out without a commensurate increase in the shipyard work force, and without affecting maintenance requirements for the surface fleet. The submarine factory concept allows the Naval Shipyards to quickly share the lessons learned across the yards in a combined effort designed to both increase productivity and deliver the number of submarines needed for operational commitments.

The shipyards now incorporate the new processes or lessons learned into current availabilities. Thus, they can deliver more



Bremerton, WA (Jun. 8, 2002)—Wayne Weight, a shipyard worker from Paulsbo, Wash., works on revamping the JP-5 fuel-overflow system on the aircraft carrier USS Carl Vinson (CVN 70). U.S. Navy photo by Photographer's Mate Airman Ryan Jackson.

maintenance with less engineering support. The Portsmouth Naval Shipyard has developed processes, which reduce maintenance time by six weeks, to better sequence work on tanks. These processes are now being exported to the other yards.

Another initiative emerging in the shipyards is focused on Ship Integrated Maintenance (SHIPMAIN). This is a Sea Enterprise initiative directed by the CNO in his 2003 guidance to improve fleet readiness and sustain the war against terrorism. SHIPMAIN is streamlining ship alterations/maintenance planning processes in order to reduce redundant work and promote better communication among all the players involved in ship maintenance.

SHIPMAIN focuses on the planning phase of ship maintenance. By finding greater process efficiencies in the planning phase, SHIPMAIN allows resources redirected towards recapitalization and modernization, getting more out of maintenance dollars.

SHIPMAIN is also developing a single process for surface ships that ensures that the right maintenance is identified and performed at the right time. SHIPMAIN examines best practices from maintenance initiatives such as Carrier Team One (aircraft carriers) and A Team (amphibs) and, where possible, standardize them throughout all levels of ship maintenance.

SHIPMAIN cross-functional teams are developing metrics to measure the effective pieces of the planning, engineering, material ordering and modernization processes.

SUPSHIPs

NAVSEA's nine Supervisors of Shipbuilding, Conversion, and Repair (SUPSHIPs) serve as the Department of Defense's (DoD's) designated contract administrators for shipbuilding and repair contracts. Located near private shipbuilding facilities throughout the United States, the SUPSHIPs act as NAVSEA's on-site technical, contractual, and business agents. Working side by side with the shipbuilders, these agents are instrumental in bringing each new ship from the design phase to the fleet, and



Boston, Mass. (Nov. 9, 2002)—Senator Edward M. Kennedy of Massachusetts addresses the audience at the commissioning ceremony of the guided missile destroyer USS Preble (DDG 88). U.S. Navy photo by Chief Photographer's Mate Johnny Bivera.

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The amphibious transport dock ship San Antonio (LPD-17) under construction at Northrop Grumman Ship Systems Avondale in New Orleans. San Antonio is scheduled for launching in July 2003 and should be commissioned in 2005.



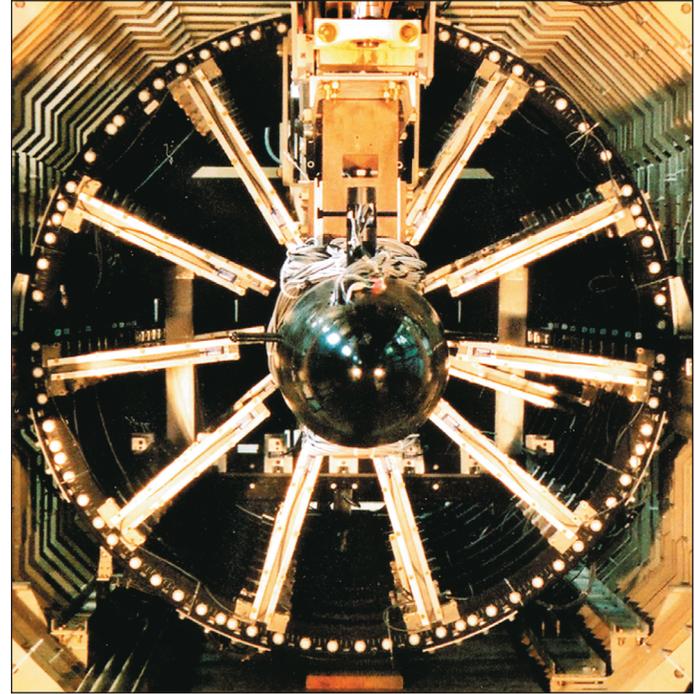
San Diego, Calif. (Jan. 01, 2003)—The first sunset of the year provides a beautiful backdrop for the destroyers USS Elliot (DD 967), USS Olendorf (DD 972), USS Fitzgerald (DD 62), and the amphibious assault ship USS Peleliu (LHA 5). The ships are decorated with holiday lights as they are moored in San Diego. U.S. Navy photo by Geoffrey Patrick.

ensuring the ship's health and technical superiority throughout its service life. The SUPSHIPs are the Navy's waterfront leadership, responsible and accountable for shipbuilding, ship repair, maintenance, modernization, and disposal in the private sector for the fleet, DoD, and other government customers.

The nine SUPSHIPs and their three detachments employ over 2,400 civilians and 230 military personnel who provide oversight to approximately 150 contractors employing over 70,000 people. In fiscal year 2002, the SUPSHIPs administered new construction contracts worth \$5 billion and maintenance and modernization contracts worth \$2.3 billion. SUPSHIP personnel supervised 83 CNO ship repair availabilities, two ship christenings, three ship commissionings, seven ship deliveries, four launchings, and four keel layings, as well as the delivery of hundreds of smaller repair packages.

Naval Surface Warfare Center

The Naval Surface Warfare Center (NSWC) is comprised of six divisions—Carderock (with locations in Bethesda, Md. and Philadelphia, Pa.); Crane (in Crane, Ind.); Dahlgren (with locations in Dahlgren, Va., Panama City, Fla., and Dam Neck, Va.); Indian Head (in Indian Head, Md.); Port Hueneme (with locations in Port Hueneme and San Diego, Calif.; White Sands, NM; Louisville, Ky.; and Virginia Beach, Va.); and Corona (in



A scale-model submarine in the Magnetic Fields Laboratory at NSWC Carderock is poised to slip into a tunnel of electromagnetic sensors.



Test of a CKU-5B/A Rocket Catapult (ROCAT)—an essential part of ejection seats for nearly all first-line aircraft, including F-15 Eagle, F-16 Fighting Falcon, and F-117A Nighthawk.

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Corona, Calif.). NSWC has about 16,400 civilian and 300 military employees. It has a business base of \$3 billion. It is the Navy's principal research, development, test, and evaluation activity for ship and submarine platform and machinery technology for surface ship combat systems, ordnance, mines, and strategic systems support. A re-invention laboratory for both the DoD and the Department of the Navy (DoN), NSWC performs warfare analysis, research, design, development, test, evaluation, assessment, systems integration, strategic missiles systems support, special, and amphibious warfare support, diving and life support, and fleet engineering services.



The autonomous underwater vehicle (AUV) Seahorse is a 28-foot long, 38-inch diameter torpedo-like system that is designed for underwater survey and bottom mapping.

Naval Undersea Warfare Center

The Naval Undersea Warfare Center (NUWC) is the Navy's full-spectrum research, development, test and evaluation, engineering and fleet support center for submarine systems, autonomous underwater systems, and offensive and defensive weapons systems associated with undersea warfare. With two divisions—Newport, R.I., and Keyport, Wash., NUWC employs approximately 4,000 civilian and military personnel, and has a business base of \$910 million. NUWC is a re-invention laboratory for DoD and DoN, exercising great flexibility in streamlining processes. NUWC is a leader in undersea warfare modeling and analysis, submarine combat and combat control systems, surface ship and submarine sonar systems, submarine electronic warfare, submarine communications, submarine weapons systems, undersea ranges, torpedoes, and torpedo countermeasures.

Naval Ordnance Safety and Security Activity

The Naval Ordnance Safety and Security Activity (NOSSA) is a tenant command at NSWC Indian Head, Md. NOSSA is responsible for managing the DON Explosives Safety Program, the DON Insensitive Munitions Program, the NAVSEA Ordnance Quality Evaluation Program, and the Navy Ordnance Environmental Support Program.

Naval Sea Logistics Center

The Naval Sea Logistics Center (NSLC), headquartered in Mechanicsburg, Pa., specializes in providing integrated logistics, engineering, and information technology expertise to meet the needs of its worldwide customer base, and features hands-on management of various logistics business processes along with customized consulting services on the development and implementation of logistics information technology enabling tools.

NSLC provides a range of products and services to all facets of the Navy's logistic support structure, including the operating fleet, the Department of the Navy Secretariat, and the Office of the Secretary of Defense.

Naval Reserve Program

NAVSEA's Naval Reserve community is a highly skilled and talented workforce that provides experience and perspective that NAVSEA can leverage in performing its mission. Reserve personnel provide diverse core competencies that meet a variety of mission requirements, including waterfront support, the donated ship inspection program, and the environmental safety historical information program. While the Naval Reservists accrue valuable mobilization training, they are able to apply their unique skills and best commercial practices from their civilian job experiences to the military and industrial environments, and they effectively contribute the latest industry ideas to the development of the NAVSEA business model.



At sea aboard USS Kearsarge (LHD 3) Feb. 8, 2003—U.S. Navy Lt. j.g. Karen Sankes stands watch as Officer of the Deck while transiting the Red Sea. U.S. Navy photo by Photographer's Mate 2nd Class Alicia Tasz.

SEA STRIKE

PROJECTING PRECISE AND PERSISTENT OFFENSIVE POWER



Keeping America's Navy #1 in the World

Projecting decisive combat power has been critical to every commander who ever went into battle, and this will remain true in the decades ahead. Sea Strike operations are how the 21st-century Navy will exert direct, decisive, and sustained influence in joint campaigns

—Chief of Naval Operations Adm. Vern Clark

NAVSEA and its field activities are at the forefront of keeping the U.S. Navy unmatched in its ability to carry out the will of the nation. With its highly skilled employees, among them some of the world's finest scientists and engineers, NAVSEA plays a critical role in building a Navy uniquely able to fight and win around the globe in any environment.

Testing Paves Way for Tactical Tomahawk

Tactical Tomahawk, the next generation of the Navy's Tomahawk cruise missile, completed a successful functional ground test (FGT) at the Naval Surface Warfare Center, Indian Head, Md. rocket motor test facility. This test is a major milestone



At sea aboard the guided missile cruiser USS Bunker Hill (CG 52) Sep. 8, 2002—USS Bunker Hill leads two other surface ships firing a standard SM-2 surface-to-air missile during a live-fire exercise near San Diego. U.S. Navy photo by Photographer's Mate Airman Jason D. Landon.

in the development of this Tomahawk variant, which is a product of the teaming between Raytheon Systems Co. and Indian Head.

During this test, the missile is exercised at the system level, as it would be in free flight except that the missile is restrained in a test stand. A real-time, six degree of freedom simulation developed by Raytheon and integrated into the FGT test platform by Indian Head engineers was used to provide input to the missile's guidance system to simulate actual flight.

The Tactical Tomahawk (Block IV) is due to reach the fleet in 2004. The Tomahawk is launched from surface ships and submarines and was first employed operationally during Desert Storm. Since then, the missile has been heralded for its accuracy and lethality.



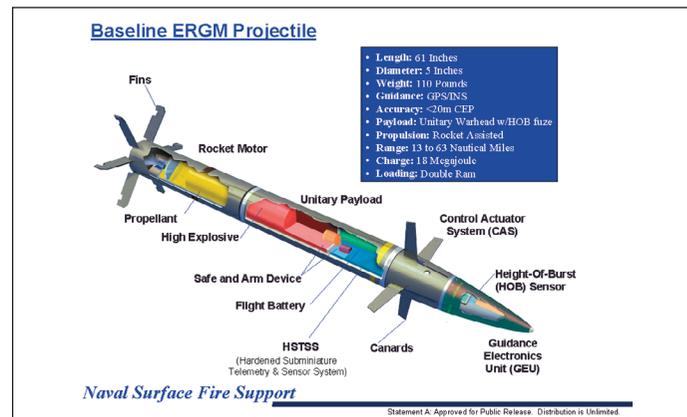
A functional ground test (FGT) of the Navy's Tactical Tomahawk cruise missile.

Extended-Range Guided-Munition Tested

NAVSEA's Naval Surface Fire Support Program Office conducted an all-up round guided flight of the extended-range guided-munition (ERGM) at White Sands Missile Range, White Sands, N.M.

This test was the successful culmination of a series of sub-system level tests that demonstrate significant progress toward the 2006 Initial Operational Capability of ERGM. This was the last major all-up round test event before the start of the Land-Based Flight Test series.

The test, designated Guided Gunfire-1 (GG-1), met all objectives, including canard deployment, rocket motor operation, telemetry function, global positioning system (GPS) acquisition and track. A significant achievement beyond the initial successful control test vehicle (CTV-2) flight test was the oper-



The extended range guided munition (ERGM) uses a high-energy propellant and a rocket motor to achieve maximum range. It will be fired by the 5-inch, 62-caliber, Mod-4 gun now being installed on new Arleigh Burke-class destroyers.

ation of the round at the tactical gun-launch acceleration of 10,100 Gs. The test was conducted at approximately 5500 Gs. Post-test review of in-flight telemetry data verified proper operation of all flight control systems.

A key element of the U.S. naval forces' power-projection capability, the 5-inch, rocket-assisted ERGM, will provide ships with the ability to support forces ashore with sustained, accurate firepower. ERGM's increased range and precision guidance provide a revolutionary capability in Marines support and other ground forces ashore. ERGM uses a high-energy propelling charge and rocket motor to achieve maximum projectile range and will be fired by the new 5-inch, 62-caliber, Mod-4 gun now being installed on new *Arleigh Burke*-class destroyers.

NAVSEA, McCampbell Partner for Successful Aegis Baseline Testing

NAVSEA and the crew of USS *McCampbell* (DDG 85) teamed up for the first fleet testing of the newest *Aegis* baseline 6, phase 3, during *McCampbell's* Combat Systems Ship Qualification Testing (CSSQT).

This baseline is the first combat systems operating system run via local area networks that integrate *Aegis* legacy equipment with commercial-off-the-shelf (COTS) technology. In baseline 6, phase 3, COTS technology actually controls all primary processors instead of only using COTS for backups and secondary processing.

The CSSQT Team, which includes technicians from Lockheed Martin, NSWC Port Hueneme, Calif., and NSWC Dahlgren, Va., helped build system understanding and develop new procedures.

The NAVSEA-McCampbell team worked very hard to overcome challenges, said Lt. Cmdr. Skip Shaw, McCampbell's executive officer. The expertise of the CSSQT civilian team combined with the dedicated efforts of the crew allowed for a unique partnership that helped develop new operating procedures and provided critical feedback to the program executive office. As a result of this collaboration, there is true Sailor input, changes and implementations, to Baseline 6, phase 3.

McCampbell's CSSQT also includes the testing of the new Antisubmarine Warfare suite, SQQ 89 V (14), the 5-inch 62-caliber lightweight gun mount, the Advanced Tomahawk Weapons System, and new information dissemination technology provided by the computer-aided DRT (CADRT)/Tactical Decision Support System (TDSS).

Additionally, *McCampbell* tested an improved force-protection modification, which takes advantage of spaces formerly dedicated to CIWS and provides for 11 separate .50-caliber and MK 19 40-mm grenade-launcher positions.



An Evolved Sea Sparrow Missile (ESSM)—an advanced ship self-defense missile—launched on the Naval Air Warfare Center Weapons Division's sea range.

Evolved Sea Sparrow Missile Scores Firsts in Aegis Destroyer Launch

The Evolved Sea Sparrow Missile (ESSM) was successfully launched for the first time from USS *Shoup* and destroyed an incoming target.

In addition to being the first ESSM firing from an *Aegis* destroyer, this was also the first firing from an Mk 41 at sea, and the first firing with a Navy crew.

ESSM is an advanced ship self-defense missile, designed to protect ships by destroying currently fielded and near-term projected antiship missiles, particularly those that fly at low altitudes and maneuver during their terminal flight phase.

NSWC Indian Head Developing Agent Defeat Warhead

The Agent Defeat Warhead—a warhead that will destroy biological and chemical manufacturing and storage facilities—is being developed by NSWC Indian Head and Lockheed Martin.

This Advanced Concept Technology Demonstration (ACTD) project was selected by the Department of Defense in 2002. The ACTD program focuses on rapidly placing maturing technologies in the hands of warfighters.

The Agent Defeat Warhead can destroy chemical and biological agents with the high-temperature incendiary fill in the weapon. The fill produces a very intense heat source of long duration with low overpressure. This low overpressure performance will prevent the dispersal of chemical and biological agents. The fill also produces a disinfectant chlorine gas as a byproduct of the fill reaction that provides enhanced biological agent defeat.

Bomblets containing explosively backed copper plates initiated by a thermal detonator will also be incorporated into the warhead. The copper plates are dispersed at high velocity to create holes in chemical and biological tanks to facilitate their destruction.

This cooperative effort involves the U.S. Air Force Air Armament Center (AAC), the Office of Naval Research (ONR) and the Defense Threat Reduction Agency (DTRA).



USS Greenville (SSN 772) with the Advanced SEAL Delivery System (ASDS) attached to its topside during a test of the system.

Advanced SEAL Delivery System Ready for Operational Evaluation

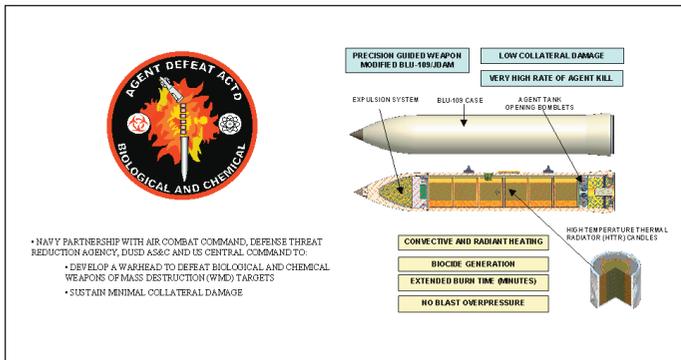
USS Greenville (SSN 772) successfully launched and recovered the Advanced SEAL Delivery System (ASDS), marking the last significant test of the system before its operational evaluation.

ASDS is a minisubmarine that can transport Navy SEALs and their combat gear to and from hostile shores for special operations missions.

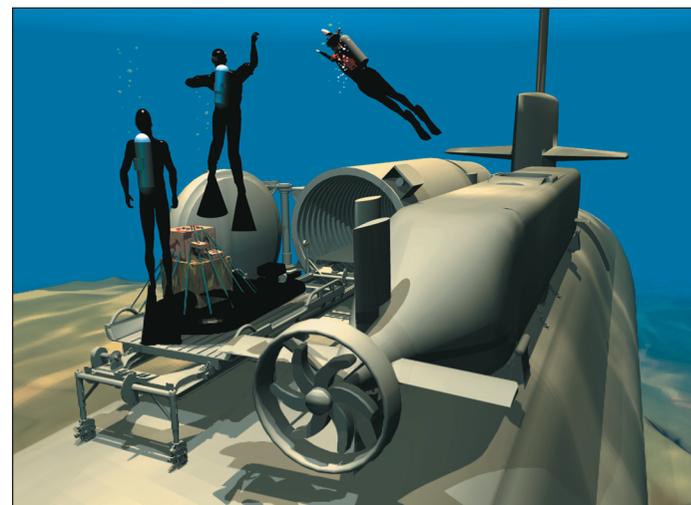
This test involved successful multiple launch and recovery docking scenarios with Greenville.

The Navy’s plans to convert four Ohio-class ballistic missile submarines (SSBNs) to guided missile submarines (SSGNs) include the capability for the SSGNs to carry up to two ASDS vehicles. ASDS is a key element in the transformational capabilities of the SSGN.

The ASDS was designed and developed by Northrop Grumman Corp., NAVSEA, and the U.S. Special Operations Command.



NSWC Indian Head is developing an agent defeat warhead that will destroy biological and chemical manufacturing and storage facilities.



Artist's conception of SEALs on a reconnaissance mission as they exit a submerged ASDS.

Ship Self-Defense System Mod Nears Deployment

Moving one step closer to operational deployment, the latest modification in the Ship Self-Defense System (SSDS) program, the SSDS MK-2, Mod 1 was successfully tested at Surface Combat Systems Center Wallops Island, Va. The event was held on the USS *Ronald Reagan* (CVN 76) and sponsored by the Program Executive Office for Integrated Warfare Systems.

The test consisted of aircraft flying various combat aircraft profiles to demonstrate SSDS capabilities. Each run demon-

strated various functions associated with SSDS, including manual, semi-auto, and automatic modes of engagement, as well as a two-node cooperative engagement capability (CEC) net between the SSDS and Aegis facilities.

SSDS is designed to defend against antiship missile and aircraft attack in the cluttered littoral conflict environment where reaction times are exceedingly short.

Constructed of commercial-off-the-shelf equipment, including a fiber-optic local area network and distributed processors, SSDS MK 2, Mod 1 is the latest step in support of carriers and large deck amphibious vehicles.



Caribbean Sea (Feb. 27, 2003)—The destroyer USS O'Bannon (DD 987) launches a RIM-7 NATO Sea Sparrow missile during an exercise conducted with the Atlantic Fleet Weapons Training Facility. U.S. Navy photo by Photographer's Mate 2nd Class Chantel Chapman.



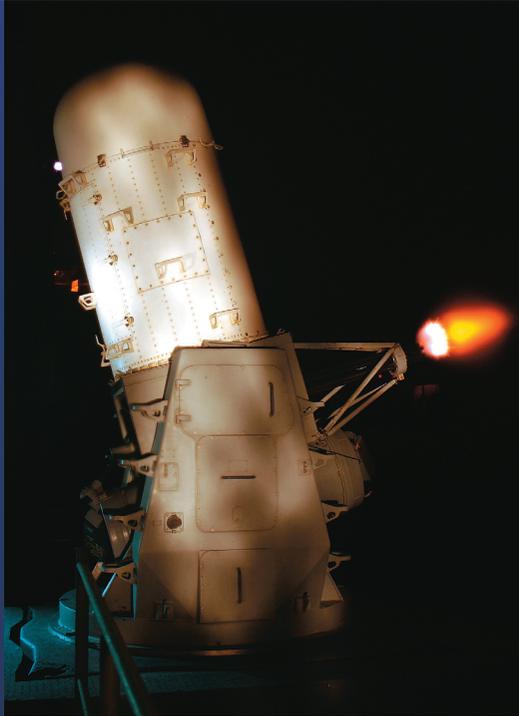
At sea aboard USS Theodore Roosevelt (CVN 71) Jan. 14, 2003—One of the ship's Sea Sparrow RIM-7 surface-to-air missiles launches during a training exercise. The Navy uses the Sea Sparrow version aboard ships as a surface-to-air anti-missile defense. The versatile Sparrow has all-weather, all-altitude operational capability and can attack high-performance aircraft and missiles from any direction. U.S. Navy photo by Photographer's Mate 2nd Class Luke Williams.



Gulf of Aden (Dec. 23, 2002)—U.S. Marines stand watch on the main deck aboard USS Mount Whitney (LCC/JCC 20) during gun quarters. U.S. Navy photo by Chief Journalist Robert Benson.

SEA SHIELD

PROJECTING GLOBAL DEFENSIVE ASSURANCE



Keeping America's Navy #1 in the World

NAVSEA

Supporting the 21st Century Warfighter

Sea Shield

Sea Shield will protect our national interests with layered global defensive power based on control of the seas, forward presence, and networked intelligence. It will use these strengths to enhance homeland defense, assure access to contested littorals, and project defensive power deep inland.

—Chief of Naval Operations Adm. Vern Clark

The Naval Sea Systems Command and PEO IWS have taken the lead in developing solutions to the most difficult problems that the Navy faces in an operating environment that ranges from blue water to coastal operations. From detecting and neutralizing mines, to real-time sharing of theater intelligence, NAVSEA is partnering with U.S. industry to bring state-of-the-art solutions to the fleet, enhancing homeland defense, assuring access to contested littorals, and projecting defensive power across the globe.

Aegis Ballistic Missile Defense

NAVSEA, PEO IWS, and the Missile Defense Agency (MDA) are developing Standard Missile-3 (SM-3) as part of the Aegis Ballistic Missile Defense System (BMDS) that will provide allied forces and the United States protection from short to intermediate range ballistic missiles.



At sea aboard USS Lake Erie (CG 70) Jan. 25, 2002—A Standard Missile 3 (SM-3) leaves the ship's vertical launch system (VLS) during a combined Missile Defense Agency and U.S. Navy flight test, conducted in the continuing development of a Sea-Based Midcourse (SMD) Ballistic Missile Defense System (BMDS). U.S. Navy Photo



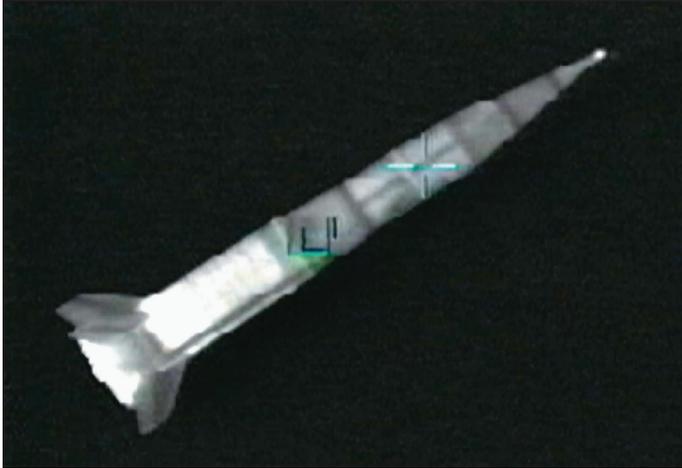
Pacific Missile Range Facility, Kauai, Hawaii (Jun 13, 2002)—The Missile Defense Agency (MDA) and the U.S. Navy announced a successful flight test in the continuing development of the Sea-Based Midcourse (SMD) element of the Ballistic Missile Defense System capability. Flight Mission Three (FM-3) involved the firing of a developmental Standard Missile Three (SM-3) from the Aegis cruiser USS Lake Erie (CG 70) to intercept an Aries ballistic missile target launched for the Pacific Missile Range Facility on the island of Kauai, Hawaii. U.S. Navy photo.

The SM-3 kinetic warhead (KW) is designed to intercept an incoming theater ballistic missile outside the earth's atmosphere.

The Aegis BMDS builds upon the Strategic Defense Initiative Organization/Ballistic Missile Defense Organization investment in Lightweight Exoatmospheric Projectile (LEAP) technology and the Navy's Aegis weapon system, including the Standard Missile and the MK 41 Vertical Launching System currently deployed on many U.S. Navy and international surface ships.

The SM-3 KW is a highly modular, compact space-tested kinetic warhead designed to defend against short to intermediate range ballistic missile attacks. The Aegis LEAP Intercept program (ALI) has demonstrated the design capabilities of the SM-3 KW with a series of ground and flight tests.

ALI culminated in two successful ballistic missile intercepts on the first two engagement missions. Flight Mission two, flown on January 25, 2003, and Flight Mission three on June 13, 2002, were completely successful, allowing the program to proceed into testbed development.



Kauai, Hawaii (Nov. 21, 2002)—The Aries ballistic missile target is seen through the infrared seeker of the developmental Standard Missile-3 (SM-3) Kinetic Warhead moments before intercept at an altitude of approximately 500,000 feet. The target missile was launched from the Pacific Missile Range Facility, Barking Sands, Kauai, Hawaii, while the intercept missile was launched from the Pearl Harbor-based Aegis cruiser USS Lake Erie (CG 70). This was the third consecutive successful intercept by the Aegis Ballistic Missile Defense program and the first intercept during the ascent phase of the target's flight. U.S. Navy photo.

The sea-based missile-defense test ship concept provides a testbed for the advanced radar system, which is comprised of prototype solid-state S-band and trainable solid-state X-band radar. This test ship supports various mission demonstrations in the boost, midcourse, and terminal phases.

Plans are to demonstrate extended target surveillance, including early warning, cueing track, early observation, threat group typing, discrimination and interceptor guidance support leading to target intercepts. This test ship configuration provides risk-reduction for an operation sea-based missile defense system.

In the post-ABM Treaty era, *Aegis*-equipped ships in the Pacific Ocean will track a test target in flight. This exercise will mark the first use of a tactical ship in strategic antimissile tests. Sea-based assets were banned under the 1972 ABM Treaty.

New Minehunting System Provides Effective Defense for Ships

PEO for Littoral and Mine Warfare is developing the Remote Mine Hunting System (RMS), an organic mine reconnaissance system. It will offer carrier strike group ships an effective defense against mines through the use of an unmanned remote vehicle.

A mine that costs only a few thousand dollars can cause hundreds of millions of dollars in damage to Navy ships and take them out of action for months.

Since the beginning of the Cold War, more than a dozen U.S. Navy ships have been casualties of mines. In 1988, USS *Samuel B. Roberts* nearly sank after striking an Iranian mine.

RMS will effectively reduce the threat of hidden mines by

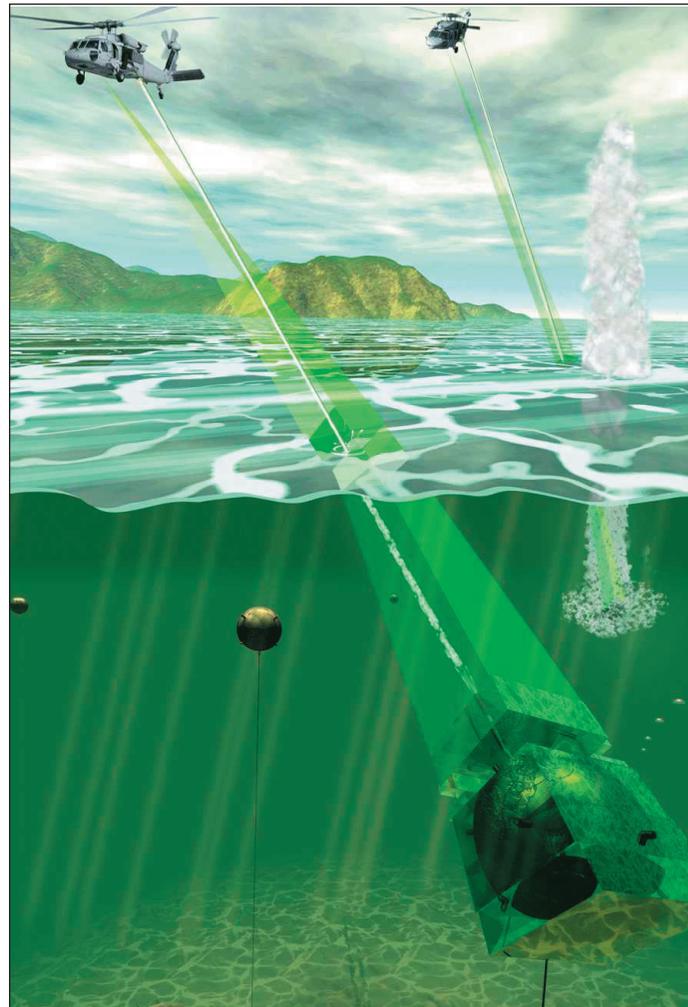
detecting, classifying, and identifying mines and recording their precise location for avoidance or removal.

RMS is being designed for installation aboard *Arleigh Burke*-class (DDG 51), Flight IIA destroyers. Current plans call for RMS to be first installed aboard the destroyer *Pinckney* (DDG 91) in 2004.

LMW Introduces New Minehunting Sonar

The Program Executive Office for Littoral and Mine Warfare (formerly PEO for Mine and Undersea Warfare) introduced the AN/AQS-14A (V1) helicopter towed minehunting sonar system to Helicopter Mine Countermeasures Squadron Fourteen (HM-14) at Naval Air Station Norfolk, Va.

The AN/AQS-14A (V1), developed by Northrop Grumman Corp., is a side-looking sonar system towed by an electro-mechanical cable. The AN/AQS-14A and the AN/AQS-14A (V1) are the only airborne high-speed minehunting sonar systems deployed by the Navy. The system uses high-power solid-state technology to provide high-resolution imagery to locate mine-like objects.



An artist's concept of the AN/AQS-14A (V1) helicopter towed minehunting sonar system.

The AN/AQS-14A (V1) also has a laser electro-optical, mine-identification upgrade that gives operators the capability to identify mines. The upgrade provides increased side-scan sonar resolution four times greater than the current resolution at close range and two times greater at long range.

The features and enhancements of the AN/AQS-14A (V1) significantly reduce the time needed to identify and clear minefields and increase the speed and safety of mine-clearance operations. The ability to positively identify mines also reduces the number and length of dives by explosive ordnance disposal divers.



At sea aboard USS Rainer (AOE 7) Feb. 13, 2003—The Phalanx Close-in Weapon System (CIWS) is a rapid-fire, computer-controlled, radar-guided gun system designed to defeat antiship missiles and other close-in air and surface threats. The system employs a pneumatically driven 20-mm Gatling gun with a fire rate of 4,500 rounds per minute and closed-loop-spotting radar technology to engage threats. U.S. Navy photo by Chief Fire Controlman Brian Kirkwood.

Phalanx Block 1B Scores Success on USS Howard

The USS *Howard* (DDG 83) successfully tested the Phalanx Block 1B Close-in Weapon System. The test was part of *Howard's* Combat System Ships Qualification. *Howard*, commissioned in September 2001, was the first *Aegis* destroyer to have Phalanx 1B installed. Phalanx 1B scored two kills and more than 50 hits, as well as completing multiple surface engagements.

Phalanx 1B is the latest in the line of evolutionary enhancements to the Phalanx system, a rapid-fire, computer-controlled radar and gun system that automatically acquires, tracks, and destroys enemy threats that have penetrated all other ship defense systems. Block 1B is a dual antisurface (ASW) and anti-air warfare (AAW) mission gun system. Its multispectral, passive search, track, and engagement capability improves existing AAW capabilities, while providing a unique surface mode capability to counter asymmetric littoral warfare threats, including small, high-speed surface craft, helicopters, small terrorist craft, unmanned aerial vehicles and surface mines.

Joint Fires Network: The Transformation of Naval Warfare

The partnership of NAVSEA, Naval Air Systems Command and Space and Naval Warfare Command, through the Joint Fires Network (JFN) Program Office, is supporting USS *Lincoln*. *Lincoln* deployed with JFN, a transformational network-centric warfare family of systems that provides near real-time intelligence correlation, sensor control and planning, target generation, precise target coordinates, moving target tracks, and battle-damage assessment capabilities to support more timely engagement of time critical targets. This capability allows *Lincoln* to quickly share a greatly improved battlespace picture with other ships in the area of operations, and with Army, Air Force and Marine sites with the services' versions of JFN in the Southwest Asia area of operations.

USS *Kitty Hawk*, also completed installation of JFN components.

Cooperative Engagement Capability Tested on Destroyers

Two *Arleigh Burke*-class destroyers, undergoing their final stages of construction, conducted the first-ever DDG-51 class Cooperative Engagement Capability (CEC) tests.

USS *Shoup* (DDG 86) transferred radar data with USS *Cape St. George* (CG 71). *Cape St. George* was in the Gulf of Mexico near Pascagoula, Miss., preparing for a joint exercise.

USS *McCampbell* (DDG 85), while finishing initial outfitting at Bath Iron Works in Bath, Maine, successfully established a CEC link with a CEC-capable E-2C Hawkeye from Naval Air Station, Patuxent River, Md.

While CEC has been deployed on several *Aegis* cruisers, this represents the first successful installation of CEC on *Aegis* destroyers.



Ships launch missile salvo during the first-ever DDG-51 class Cooperative Engagement Capability (CEC) tests.

AADC Demonstrates Battle Management During Millennium Challenge 2002

Millennium Challenge 2002, a joint warfighting experiment, was the backdrop for the integration of the Area Air Defense Commander (AADC) Capability. The experiment brought together live field forces and computer simulation at several locations in the United States.

AADC is an integrated Theater Air Defense (TAD) battle-management system under PEO IWS. It supports performance of centralized, collaborative planning, and decentralized execution of TAD

for Joint Force Commander objectives. It performs two basic functions: Air defense planning and current operations support.

The robust, collaborative air-defense planning capability greatly reduces time and labor. Its advanced war-gaming capability evaluates and compares courses of action and performs rapid re-planning in minutes as events develop.



A view of the aerial monitor screen of the Area Air Defense Commander (AADC) capability.



The AADC operations room during Millennium Challenge 2002, a joint warfighting experiment.

Force-Protection Warning Device

Naval Surface Warfare Center (NSWC) Crane personnel traveled to Japan to test one of the fleet's newest force-protection warning devices aboard the Seventh Fleet flagship, USS *Blue Ridge* (LCC 19).

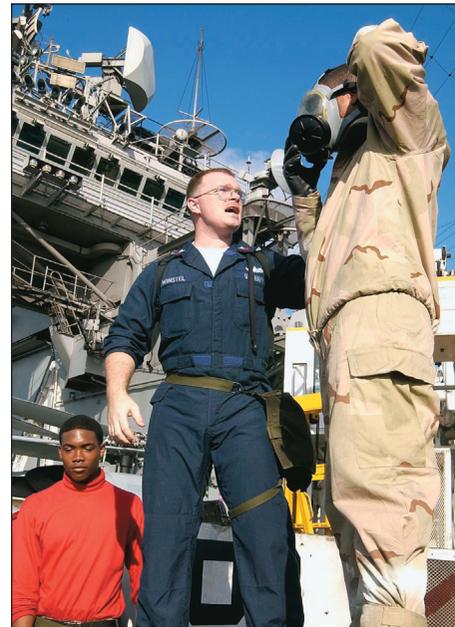
The Unambiguous Warning Device (UWD) is a cross between a 50-caliber gun mount and an aircraft flare. It is designed to warn approaching small craft that they are

encroaching into an unwelcome area and it will advise them to leave immediately.

The idea for UWD came from a need for a more effective way for ships to warn off intruders. Intruders often misinterpreted the pen flares that were used as an invitation to come closer, rather than a warning to stay away.

Through a joint integration effort between NSWC Crane, NAVSEA's Program Manager for Advanced Tactical Aircraft Protection and the Naval Ordnance Safety and Security Activity (NOSSA), a prototype system was developed, tested and readied for delivery to *Blue Ridge* within 10 days of the initial request.

New Center for Research and Development on Chem-Bio Defense



At sea aboard USS *Constellation* (CV 64) Dec. 9, 2002—Personnelman 1st Class William Winstell demonstrates proper techniques and procedures for putting on the Advanced Protective Chemical Garment (APCG) with Aviation Boatswain's Mate Leonel Polanco during Chemical, Biological, and Radiological training on the ship's flight deck. U.S. Navy photo by Photographer's Mate 2nd Class Felix Garza Jr

An \$8.6 million, two-story, 35,000-square-foot building along the Potomac River houses chemical and biological laboratories, test areas, bays, mockup centers, libraries and administrative offices will help in the war on global terrorism.

The center's facilities will develop detectors, shipboard collective protection systems, and computer simulated models, while also planning and implementing Navy survivability research, development, testing and evaluation (RDT&E) efforts against chemical and biological warfare threats.

Naval Surface Warfare Center (NSWC) Dahlgren, Va., dedicated the building in honor of the late Congressman Herbert H. Bateman, who represented the 1st Congressional District of Virginia for 18 years.

As the Navy's lead laboratory for joint activities in all aspects of chemical-biological defense, NSWC Dahlgren provides the technology base, threat analysis, and a full spectrum of engineering expertise necessary to design and develop the equipment needed to protect naval and joint services afloat and ashore.