Sea Shield

PLATFORMS

AIRCRAFT

Broad Area Maritime Surveillance (BAMS) Unmanned Aerial Vehicle (UAV)

Description
Along with the Multi-mission Maritime Aircraft (MMA) and Aerial Common Sensor (ACS), BAMS UAV is integral in recapitalizing the Navy's airborne ISR force. BAMS UAV will provide a persistent maritime ISR capability that will play a significant role in the Sea Shield and FORCEnet pillars of *Sea Power 21*. In its Sea Shield role, BAMS UAV's on-station persistence enables unmatched awareness of the maritime battlespace by sustaining the maritime Common Operational Picture for Surface Warfare and Global War on Terrorism. The system will serve as a FRP enabler while acting as a trip wire for surge forces. In its FORCEnet role, it will support decision superiority precision and mobility while providing IP-based wideband transponder services that net the battlespace.

BAMS UAV is an endurance-class UAV that will operate from land-based sites around the world. Sites most likely will be located at current P-3 aircraft, (or its planned successor, MMA) operating sites. Because BAMS UAV and the MMA/P-3 have related, complementary missions, co-location enhances manpower, training and maintenance efficiencies. Systems of up to 5-6 air vehicles at each operating location provide persistence by being airborne 24 hours a day, 7 days a week out to on-station ranges of 2000 nautical miles. Worldwide access is achieved by providing coverage over nearly all the world's high-density sea-lanes, littorals, and areas of national interest from its operating locations.

Status
The BAMS UAV analysis of alternatives, operational requirements document, and initial CONOPS are approved. Milestone B is scheduled for the fourth quarter, FY 2007; OIC FY 2013.

Developers
To be determined.

MH-60R/S Seahawk Multi-Mission Combat Helicopters

Description

The MH-60R and MH-60S multi-mission combat helicopters are the two pillars of the CNO's Naval Helicopter Concept of Operations (CONOPS) for the 21st century. Under the Helicopter CONOPS, the Seahawk will deploy as companion squadrons embarked in the Navy's aircraft carriers, surface warships, and logistics ships. The MH-60R will provide surface and undersea warfare support to Sea Shield operations with a suite of sensors and weapons that include low frequency (dipping) sonar, electronic support measures, advanced Forward Looking Infrared, and precision air-to-ground missiles. The MH-60S will provide mine warfare support for Sea Shield and will partner with the MH-60R for surface warfare missions-carrying the same Forward Looking Infrared air-to-ground sensors and weapons. The MH-60S will be reconfigurable to provide Combat Search and Rescue and Naval Special Warfare support to joint theater operations. Airborne mine countermeasures operations will be accomplished using advanced sensor and weapons packages to provide detection, localization and neutralization to anti-access threats. The MH-60S will anchor the fleet logistics role in carrier strike group and expeditionary strike group operations. MH-60R/S platforms are produced with 85 percent common components (e.g., common cockpit and dynamic components) to simplify maintenance, logistics, and training.

Status

The MH-60R completed its Technical Evaluation and plans to begin its Operational Evaluation in third quarter FY 2005. It is scheduled for a full Rate Production decision in FY 2006. The Navy plans to acquire 254 MH-60Rs. The MH-60S was approved for full-rate production in August 2002 and is currently undergoing scheduled block upgrades for combat and airborne mine countermeasure missions. The Navy plans to acquire 271 MH-60Ss.

Developers

Lockheed Martin; Owego, New York
Sikorsky; Stratford, Connecticut

P-8A Multi-Mission Maritime Aircraft (MMA)

Description

The MMA will replace the P-3C Orion aircraft, which has reached the end of its service life. The MMA's transformational bottom-up architecture will tailor integration of its onboard mission suite with unmanned aerial vehicles and satellite-based systems and sensors to assure maritime access in support of the Sea Shield pillar of *Sea Power 21*. MMA will provide unparalleled persistent undersea warfare capability as well as significant

anti-surface warfare and intelligence, surveillance, and reconnaissance (ISR) capability as fallout benefits. MMA will leverage global logistics support infrastructure and established advanced training applications to provide both higher availability and improved warfighting readiness. Finally, MMA will implement a new Human Capital Strategy that uses contractors to perform most of the maintenance functions presently performed by Sailors, thereby lowering operating and support costs well below that of the legacy platform.

Status
The MMA program received a milestone 0 decision in March 2000 and explored concepts for MMA with industry. Included in the concepts was the integration of UAVs to augment MMA capability. An Analysis of Alternatives (AoA) began in the summer 2000 and leveraged previous analyses and the results of the industry studies. The AoA concluded that manned aircraft are an essential element of providing broad area maritime and littoral armed ISR, and that UAVs provided a transformational opportunity for obtaining additional capability for warfighters. In 2002, the Navy re-engaged industry in Component Advanced Development, refining concepts, matching architecture to fill the Navy vision and validating requirements. USD(AT&L) approved a revised acquisition strategy to focus MMA on P-3 replacement. The operational requirements document/concept development document was endorsed by the Navy staff and received the required certifications from the Joint staff in preparation for a 2004 Milestone B (entry into System Development and Demonstration). That milestone was successfully passed in May and the Navy selected the McDonnell-Douglas Corporation, a wholly owned Subsidary of the Boeing Company, as the single system integrator in June 2004.

Developers
The Boeing Company; Renton, Washington

P-3C Orion Modification, Improvement, and Sustainment

Description
The P-3C Orion provides effective undersea warfare, anti-surface warfare, and C4ISR capabilities to naval and joint commanders including support for carrier strike groups and expeditionary strike groups. The current force is 12 active and seven reserve squadrons. The Navy's P-3 roadmap focuses on three areas: inventory sustainment, modernization, and re-capitalization by the Multi-mission Maritime Aircraft (MMA) to provide a force optimized for regional and littoral crisis and conflict.

Specific program elements include:
Inventory Sustainment: A service life assessment program has been completed to determine what actions must be taken to safely extend the airframe service life. A program of Special Structural Inspections (SSIs), which will allow extension of P-3 service life, started in FY 2003. More comprehensive inspections and preemptive repairs are being performed under the Enhanced Special Structural Inspection (ESSI) program that started in FY 2004. The Special Structural Inspection-Kit (SSI-K) program that starts in FY 2005 is similar to ESSI but has expanded scope and includes use of new design/materials to increase fail-safe margin. These programs will allow sustainment of the P-3 fleet until the MMA starts replacing the P-3 in 2013.

Modernization: The Anti-Surface Warfare Improvement Program (AIP) provides enhanced sensor, C4ISR, and weapon capabilities. The program includes the incorporation of improved C4I systems, an advanced imaging radar, an infrared/electro-optic sensor, an improved Electronic Support Measures (ESM) system, improved weapons capability, and enhanced survivability measures. AIP aircraft will be equipped with the USQ-78B acoustic processor for improved littoral ASW effectiveness.

The P-3C Update III Block Modification Upgrade Program (BMUP) converts P-3C Update II and II.5 aircraft to the Update III system architecture. BMUP aircraft are also equipped with the USQ-78B.

Status
Twenty-seven SSIs are complete and six ESSIs are complete. Sixty-four of 73 funded AIP aircraft have been delivered (one has been struck). Eight of 25 BMUP kits have been delivered.

Developers
Lockheed Martin; Marietta, Georgia; Eagan, Minnesota; Greenville, South Carolina, Manassas, Virginia
L3Com; Greenville, Texas

RQ-8B Fire Scout Vertical Takeoff and Landing Tactical UAV (VTUAV)

Description
Fire Scout VTUAV will provide multi-mission tactical UAV support to the Littoral Combat Ship (LCS). Fire Scout will support LCS core mission areas of MIW, ASW, and ASUW with modular payloads as well as organic ISR, targeting, and communication-relay functions. The Fire Scout will employ the Tactical Control System (TCS) and the Tactical Common Data Link (TCDL) as the primary means for UAV command and control and sensor payload dissemination. Fire Scout is a critical component of LCS off-board sensors.

Status
Fire Scout is currently in Engineering, Manufacturing and Development (EMD) with developmental test ongoing. Fire Scout is scheduled to IOC in FY 2008. Current plans call for one Fire Scout system (three air vehicles and a GCS) aboard each of the Flight 0 LCS and two systems for each three LCS Flight 1.

Developers
Northrop Grumman; San Diego, California
Schweitzer Aircraft Corporation; New York, New York

S-3B Viking Sustainment Program

Description
The S-3B Viking provides multi-mission support to battle group and joint commanders as the carrier strike group's primary anti-surface warfare platform. In addition, it provides electronic surveillance and overland strike support and will remain the sole organic aerial refueling asset until the full integration of the F-18E/F Super Hornet.

Status
The S-3B Viking community was selected for retirement in October 2002, which will be coordinated with the fielding of the F/A-18E/F Super Hornet tanker capable aircraft through FY 2009. All current avionics/navigation/computer upgrade programs required to safely sustain the aircraft through its projected retirement schedule have been approved for full-rate production and will be complete in FY 2005.

Funding requirements in FY 2005 and beyond have been reduced to comply with approved retirement schedules and inventories. The majority of Viking pilots and naval flight officers will transition to other Naval Aviation communities as an integral part of the S-3B Sundown Plan.

Developers
Lockheed Martin; Fort Worth, Texas

SUBMARINES

SSN-21 Seawolf Class

Description
The *Seawolf* (SSN-21)-class attack submarines provide robust open-ocean sea-control capabilities against current and future submarine threats, as well as significant multi-mission littoral warfare capabilities. The design emphasis in the *Seawolf*-class is on high-speed, submerged, deep-depth operations, with significantly improved machinery quieting, combat systems, sensor

systems, and payload capacity compared to the improved *Los Angeles* (SSN-688I) attack submarines (SSN-751 and later units). Continuing trials of the SSN-21 have confirmed the ship's superior capabilities in all critical warfighting areas.

Status
The USS *Seawolf* (SSN-21) was commissioned in July 1997 and the USS *Connecticut* (SSN-22) was commissioned in December 1998. The third submarine of the class, the USS *Jimmy Carter* (SSN-23) was commissioned in February 2005. USS *Jimmy Carter* is a unique multi-mission platform modified with additional volume and services to accommodate advanced technology for naval special warfare and tactical surveillance operations. The details of this modification and the advanced technologies, while classified, support the Defense Science Board's 1998 recommendations for improved payload capabilities and a flexible interface with the undersea environment. This is accomplished without sacrificing current *Seawolf*-class multi-mission warfighting capability and stealth.

Developers
General Dynamics' Electric Boat Corporation; Groton, Connecticut

SSN-774 Virginia-Class Nuclear-Powered Attack Submarine

Description
The *Virginia* (SSN-774)-class submarine will provide advanced acoustic technology and will perform traditional open-ocean anti-submarine and anti-surface missions, yet is specifically designed for multi-mission littoral and regional operations. These advanced submarines will be fully configured to conduct mining and mine reconnaissance, Special Operations Forces insertion/extraction, battle group support, intelligence-collection and surveillance missions, sea-control, and land attack. Further, the *Virginia* SSNs will be specifically configured to adapt easily to special missions and emerging requirements.

The 30-ship SSN-774 program is the first major program to implement acquisition reform initiatives fully. The tenets of the *Virginia*-class affordability are Integrated Product and Process Development (IPPD), modular construction, parts reduction, and aggressive insertion of advanced COTS technologies and an open-architecture computing environment. The IPPD concept teams the Navy, shipbuilders, designers, and vendors to assure the most efficient and effective design early in the design process. Modular construction allows construction, assembly, and testing of systems prior to installation in the ship's hull, thereby reducing costs, minimizing rework, and simplifying system integration. The ship's modular design will also facilitate technology insertion in both new-construction future ships and back-fit into existing ships, throughout their 30-year service lives.

Status
The first seven ships are being built under an innovative teaming arrangement between General Dynamics' Electric Boat Corporation (EB) and Northrop Grumman Newport News (NGNN). Under the teaming arrangement, construction of the ships will be shared by ship section. NGNN is building the bow, stern, sail, and selected forward sections for each submarine. EB is building the hull sections, the engine room modules, and the command-and-control system operating spaces. EB will assemble and deliver the first, third, and fifth ships; NGNN, the second, fourth, and sixth. Construction of USS *Virginia* (SSN-774) began in FY 1998. *Texas* (SSN-775) began construction in FY 1999. *Hawaii* (SSN-776) began construction in FY 2001. *North Carolina* (SSN-777) began construction in FY 2002. *New Hampshire* (SSN-778) began construction in FY 2003. *New Mexico* (SSN-779) began construction in FY 2004 and SSN-780 began construction in FY 2005. *Virginia*-class acquisition continues throughout the FYDP. The Navy's program in PB 2005 began procuring two ships per year in FY 2009. The FY 2006 request included the third SSN in the five-year contract, with a cost savings around $80 million per hull or $400 million throughout the course of the multi-year contract.

Developers
General Dynamics' Electric Boat Corporation; Groton, Connecticut
Northrop Grumman; Newport News, Virginia

SURFACE AND EXPEDITIONARY WARFARE SHIPS AND CRAFT

CG-47 Ticonderoga-Class Aegis Guided-Missile Cruiser Modernization

Description
The 27 *Ticonderoga* (CG-47)-class guided missile cruisers have a combat system centered on the Aegis Weapon System and the SPY-1 A/B multi-function, phased-array radar. *Ticonderoga*-class cruisers provide multi-mission offensive and defensive capabilities, and operate independently or as part of carrier strike groups, expeditionary strike groups, and surface action groups for Global concepts of operation. The *Ticonderoga*-class combat system includes the Standard Missile (SM-2), unparalleled land-attack systems, advanced anti-submarine and anti-surface warfare systems, embarked sea-control helicopters, and robust command-control-and-communications systems in a potent, multi-mission warship. In addition, 22 of the 27 cruisers are equipped with the MK-41 Vertical Launching System (VLS), giving them a significant surface fire capability with the Tomahawk Land-Attack cruise Missile (TLAM) and, in the future, the Tactical Tomahawk (TACTOM).

Status
The 22 VLS-capable Aegis cruisers are planned for Cruiser Modernization beginning in FY 2008, and will receive upgrades in air dominance (cooperative engagement capability, SPY radar upgrades), maritime force protection (CIWS 1B, ESSM, Nulka, SPQ 9B), undersea warfare (SQQ 89A(V)15) and mission life extension (SmartShip, all-electric auxiliaries, weight, and moment). The cruisers are viable candidates for a ballistic missile defense role. The Cruiser Modernization warfighting improvements will extend the Aegis combat system's capabilities against projected threats well into the 21st century and, with the DDG-51 destroyers, serve as the bridge to the surface combatant family of ships: DD(X); LCS; and CG(X).

Developers
General Dynamics, Bath Iron Works; Bath, Maine
Northrop Grumman Ship Systems; Pascagoula, Mississippi
Lockheed Martin; Moorestown, New Jersey

CG(X) 21st Century Cruiser

Description
One of the tenets of the 1998 Joint Staff-approved Surface Combatant 21st Century Cost and Operational Effectiveness Analysis (SC-21 COEA) was a need for a surface combatant to replace the *Ticonderoga* (CG-47)-class ship, at the end of its service life. The SC-21 COEA identified a multi-mission platform that could dominate the future battlespace in all warfare areas as the best solution for the Navy. Additionally, the COEA recommended maintaining the maximum commonality possible with DD(X) as the most cost-effective way to develop the future cruiser. Current Navy campaign and joint missile defense analysis has demonstrated a critical mission need for the CG(X) late next decade.

Status
Presently, the Navy is conducting analysis under the new Joint Staff capability-based doctrine, to determine if the SC-21 COEA recommendations are still valid. The Navy anticipates the Initial Capabilities Document (ICD) for Maritime Defense of the Joint Force to be through Joint Staff review in the fall of 2005, followed immediately by an analysis of alternatives to generate the specific requirements for CG(X) in FY 2006.

Developers
To be determined.

DDG-51 Arleigh Burke-Class Aegis Guided-Missile Destroyer

Description

The *Arleigh Burke* (DDG-51)-class guided missile destroyers are equipped with the Aegis Combat System which includes the SPY-1D multi-function, phased-array radar. The *Burke*-class combat system includes the MK-41 Vertical Launching System (VLS), an advanced Anti-Submarine Warfare (ASW) system, Standard Missile (SM-2), and Tomahawk land attack cruise missiles. Incorporating all-steel construction and gas-turbine propulsion, DDG-51 destroyers provide multi-mission offensive and defensive capabilities and can operate independently or as part of carrier strike groups, surface action groups, and expeditionary strike groups. The Flight IIA variants currently under construction incorporate facilities to support two embarked helicopters, significantly enhancing the ship's sea-control capabilities. These ships have the Aegis Weapons System Baseline 6 Phase 3 and Baseline 7, which incorporates Cooperative Engagement Capability (CEC) and Evolved Sea Sparrow Missile (ESSM) warfighting capabilities. The improved SPY-1D(V) radar, the Remote Mine-Hunting System (RMS) in DDGs 91-96, as well as advanced open-architecture combat systems using commercially developed processors and display equipment. These capabilities are being introduced as part of Baseline 7 Phase I, commencing with USS *Pinckney* (DDG-91). Together with the Cruiser Modernization program, these highly capable warships will be the bridge to the next-generation surface combatant family of ships: DD(X), LCS, and CG(X).

Status

Forty-five *Arleigh Burke*-class destroyers have been delivered or were in service at the beginning of FY 2005; with a total of 62 to be delivered at the end of production. Four flight IIA ships were delivered in FY 2004: USS *Momsen* (DDG-92) from Bath Iron Works, and USS *Pinckney* (DDG-91), USS *Chung-Hoon* (DDG 93), and USS *James E. Williams* (DDG 95) from Northrop Grumman. Four DDGs are scheduled for delivery in FY 2005. The purchase of the last three DDGs, to complete a ship class of 62, was completed in January 2005.

Developers

General Dynamic, Bath Iron Works; Bath, Maine
Northrop Grumman Ship Systems; Pascagoula, Mississippi
Lockheed Martin; Moorestown, New Jersey

DD(X) 21st-Century Destroyer

Description

After the 2001 QDR, and in conjunction with the Navy's recognition of the transformational imperatives of the future, the Navy determined that a family of surface combatants is required to meet future warfighting requirements—not just a single ship

class. DD(X) is the Navy's investment in future multi-mission capability, while also serving as the primary precision strike and volume-fires provider of the "family," DD(X) will be armed with Tactical Tomahawks (TACTOM) and the Advanced Gun System (AGS), which fires Long-Range Land-Attack Projectiles (LRLAP). (See separate program summaries.) DD(X) will provide sustained and precise firepower at long ranges to support distributed joint and coalition forces ashore and will conduct independent attacks against land targets. With state-of-the-art network-centric information technologies, DD(X) will operate seamlessly with other naval, ground, and land-based air forces. The DD(X) program's emphasis on "sensor-to-shooter" connectivity will provide a naval or Joint Task Force commander with the multi-mission flexibility to destroy a wide variety of land targets while simultaneously countering maritime threats. DD(X) capabilities in undersea warfare, surface warfare, and air warfare are designed for enhanced performance in the littoral environment, providing an unparalleled Sea Shield capability as part of the defense of other ships in the expeditionary strike group or carrier strike group. DD(X) will take advantage of advanced stealth technologies rendering it significantly less detectable to potential adversaries and more survivable to enemy attack than the ships than the current fleet.

DD(X) will feature an Integrated Power System (IPS), with all-electric drive, to provide power for advanced propulsion systems as well as high-powered combat systems and ship service loads. An open architecture distributed combat system will support a "plug-and-fight" environment, allowing future systems to be installed in DD(X) such as Electromagnetic Railgun. Current elements of the DD(X) combat systems include the modular and highly survivable peripheral vertical launch system, the AGS (see separate program summary) and the Dual Band Radar (DBR) suite, composed of the Multi-Function and Volume Search Radars (see separate program summaries). Other DD(X) features include an advanced hull form, optimal manning based on comprehensive human-systems integration and human-factors engineering studies, extensive automation, advanced apertures, and dramatic reductions across the entire spectrum of signatures (radar, acoustic, magnetic and infrared). DD(X) will use a "spiral-design" review process, ensuring that each of these breakthrough technologies responds to future operational requirements. Once validated aboard DD(X), appropriate technologies will be incorporated into other members of the family of surface combatants, including a CG(X) next-generation cruiser and the Littoral Combat Ship (LCS), as well as future carriers and amphibious ships.

Status

The Navy competitively awarded the DD(X) Phase III Contract to Northrop Grumman Ship Systems (NGSS) April 29, 2002 to perform as the DD(X) Design Agent and technology developer of the total ship system. Raytheon Systems, Inc is the systems

integrator. As the Design Agent, NGGS is executing the design, development and testing of ten Engineering Development Models (EDMs), to mitigate risk associated with transitioning key DD(X) technologies. In concert with the EDM activities, NGGS is maturing the DD(X) system design culminating in the Critical Design Review in FY 2005. The Navy expects to award the DD(X) Phase IV contract in FY 2006.

Developers
Northrop Grumman Ship Systems (NGSS); Pascagoula, Mississippi
Raytheon Systems, Inc.; Sudbury, Massachusetts
NGSS has brought together a DD(X) National Team of more than 80 companies, including Boeing, Lockheed Martin, United Defense Limited Partnership, and General Dynamics Bath Iron Works.

FFG-7 Oliver Hazard Perry-Class Guided-Missile Frigate Modernization

Description
The *Oliver Hazard Perry* (FFG-7)-class guided-missile frigates are capable of operating as an integral part of a carrier strike group or surface action group. They are primarily used today to conduct maritime interception operations, presence missions and counter-drug operations. A total of 55 *Perry*-class ships were built-51 for the U.S. Navy and four for the Royal Australian Navy. Of the 51 ships built for the United States, 21 remain in active commissioned service, and eight are in the Navy Reserve Force (NRF). The FFG modernization improvements will assist the class in reaching its 30-year expected service life.

Status
The 29-ship FFG class is undergoing a modernization package that commenced in FY 2003 with USS *Kauffman* (FFG-59). It corrects the most significant maintenance and obsolescence issues in order to maintain the ships through their full 30-year service lives. The FFG-7 modernization package includes replacement of four obsolete Ship Service Diesel Generators (SSDG) with COTS SSDG; obsolete evaporators with COTS Reverse Osmosis (RO) units; and existing boat davit with COTS Slewing Arm Davit (SLAD). Other major HM&E alterations include ventilation modifications, AMR #3 AFFF Sprinkling modifications, Self-Contained Breathing Apparatus (SCBA) installation, replacement of water-cooled 400 Hz converters with air cooled frequency converters. Combat Systems improvements include the installation of CIWS 1B and Nulka, which will be completed earlier than scheduled (both are expected to be completed by FY 2006). The modernization effort is scheduled for completion by 2010.

Developers
General Dynamics, Bath Iron Works; Bath, Maine

Littoral Combat Ship (LCS)

Description

Future joint and combined operations will hinge on our ability to provide access in the face of an unpredictable and asymmetrical threat. This has been recognized for some time; however, the events of the last few years, including the Global War on Terrorism, have brought a renewed sense of urgency to these missions. The anti-access threats challenging our naval forces in the littorals include quiet diesel submarines armed with a variety of anti-ship weapons, mines, and attacks by small surface craft. Such threats have great potential to be effectively employed by many less-capable countries and non-state actors to prevent U.S. forces from unhindered use of littoral areas. LCS, as one element of the future "surface combatant family of ships," will be optimized to defeat these anti-access threats in the littoral. It will use open-systems architecture design, modular weapons and sensor systems, and a variety of manned and unmanned vehicles to expand the battlespace and project offensive power into the littoral.

Technology has matured to the point where we can employ significant warfighting capability from a small, focused-mission warship like the LCS in support of Sea Strike and Sea Shield operations. Focused-mission LCS mission packages are being developed that will provide capabilities critical to Sea Shield's forcible entry, sea/littoral superiority, and homeland defense missions. The ship will also possess inherent capabilities to conduct missions supporting intelligence, surveillance, reconnaissance, special operations, and maritime interception and homeland defense, regardless of mission package installed. Fully self-deployable and capable of sustained underway operations from homeports to any part of the world, the LCS will have the speed, endurance, and underway replenishment capabilities to transit and operate independently or with carrier strike groups, expeditionary strike groups, or expeditionary strike forces.

Status

The LCS is being rapidly developed using evolutionary acquisition and Spiral Development methodologies. As currently envisioned, LCS will be built in at least two flights. Flight 0 consists of accelerated procurement of four platforms (seaframes and concurrent mission package development and procurement). The seaframe portion of Flight 0 consists of two different designs (all types and materials). The detail design and construction option for the first (Lockheed Martin) of four Flight 0 ships was exercised in December 2004. The first Flight 1 ship is slated for detail design and construction award in FY 2008. The Flight 0 Seaframe—the "core" LCS system to which the mission modules connect—will build upon lessons learned and risk mitigation efforts from several Navy experimental ships, such as HSV, X-Craft, and others.

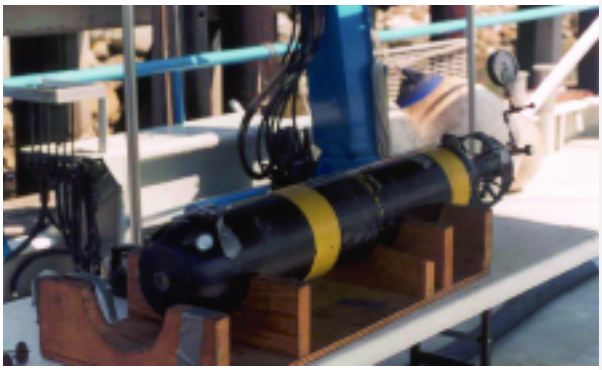
Mission modules for Flight 0 will be adaptations of existing or near-term development unmanned vehicles and systems modularized for integration with the LCS Seaframe. Flight 1 modules will be spiral upgrades to the Flight 0 modules so they can reflect new requirements. LCS received congressional approval in the FY 2003 Defense Authorization Act. In July FY 2003 LCS preliminary design contracts were awarded to Industry Teams led by General Dynamics, Lockheed Martin, and Raytheon. In May FY 2004, the Navy down-selected General Dynamics and Lockheed Martin for final design, moving toward first ship delivery in FY 2007. In the spirit of Spiral Development, the LCS program will be supported by the Flight 0 Capability Development Document (CDD) developed to support the milestone A decision. A second CDD will support milestone B for Flight 1 ship construction in FY 2008. This requirements strategy supports both the streamlined acquisition and the Spiral Development strategies for LCS. The philosophy of the LCS program is to accelerate delivery of combat-capable ships to the fleet and to apply rapidly lessons in construction and operations to enhance next-flight capabilities.

Developers
Flight 0 teams led by General Dynamics and Lockheed Martin.

WEAPONS

AIRBORNE

Airborne Mine Neutralization System (AMNS)

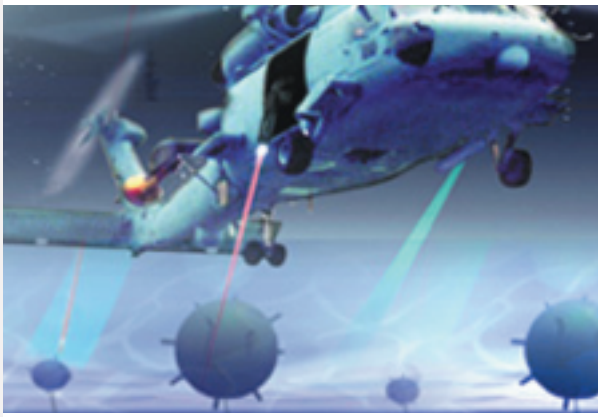


Description
The AMNS is an expendable, remotely operated mine neutralization device that leverages NDI and COTS technologies, deploys from MH-60S helicopters, and provides identification and neutralization of proud (i.e., not buried), close-tethered, and in-volume naval mines. The MH-60S will deploy a remotely operated AMNS neutralization device to a previously detected mine location where it will reacquire and neutralize identified targets. The AMNS will be fully integrated into the MH-60S avionics architecture.

Status
Beginning in FY 2003, AMNS systems have been procured for the MH-53E to provide a near-term fleet-interim MCM capability. Follow-on AMNS system integration into the MH-60S began in FY 2003 and will continue through a FY 2007 Milestone C decision. The Navy projects a FY 2007 IOC for the AMNS on the MH-60S.

Developers
Lockheed Martin; Syracuse, New York
STN Atlas; Germany

Rapid Airborne Mine Clearance System (RAMICS)



Description
The RAMICS will fire a special 30mm supercavitating projectile from a Bushmaster II gun to neutralize surface and near-surface mines. The RAMICS system will ultimately be hosted onboard the MH-60S helicopter as one of five developing Airborne MCM (AMCM) weapon systems organic to the Strike Group.

At the heart of this system is a supercavitating Tungsten projectile that is specially designed for traveling tactical distances in air and water and through a casing, causing a low-order deflagration of the mine. The gun is controlled by a fire-control system with targeting algorithms coupled with a Light Detection and Ranging (LIDAR) system. The LIDAR locates and targets the mines and provides aiming coordinates to the gun's fire control system to fire a burst of rounds at the mine, causing immediate and positive mine neutralization.

Status
The RAMICS program awarded an EMD contract in July 2002 and is fully supported in the Navy's FY 2005 budget request. Procurement of systems begins in FY 2009 with first installments in FY 2010. RAMICS IOC is scheduled for FY 2010.

Developers
Northrop Grumman; Melbourne, Florida

SUBSURFACE, SURFACE, AND EXPEDITIONARY

Assault Breaching Systems (ABS)

Description
The ABS program focuses on development of standoff weapons systems to counter mine and obstacle threats in the surf and beach zones. The program uses a "System of Systems" approach that includes development and fielding of Counter Mine Counter Obstacle (CMCO) kill mechanisms; Intelligence, Surveillance, Reconnaissance, and Targeting (ISR/T); Precision Craft Navigation; Lane Marking; and C4I capabilities. Near-term capability is scheduled to be fielded in FY 2007 with a far-term capability by FY 2016 (IOC). Potential platforms for employment of the breaching (kill) mechanisms may be naval strike aircraft, Air Force combat aircraft, or naval surface fire ships.

Status
The program is funded. Navy decision funds "system of systems" approach at $270.2 million over FYDP.

Developers
Coastal Battlefield Reconnaissance and Analysis system (ISR/T) developer is Northrop Grumman. Other system developers are to be determined.

Aerial Targets

Description

The Navy Aerial Target Program assesses foreign threats, develops targets to represent the threats, and procures targets for fleet training and weapon system test and evaluation. The current inventory includes drones that represent the following types of threats: high-altitude supersonic diving missiles (AQM-37), aircraft (QF-4), subsonic sea-skimming anti-ship cruise missiles (BQM-34/74), and supersonic sea-skimming cruise missiles (MQM-8G ER/EER Vandal, MA-31). New efforts within the program include the development and procurement of a next-generation Supersonic Sea-Skimming Target (SSST), the GQM-163 Coyote, designed to validate fleet readiness and weapon system effectiveness against a family of supersonic anti-ship cruise missiles. In addition, the Navy is conducting a pre-planned product improvement on the primary subsonic aerial target, the BQM-74E. The follow-on to the BQM-74E, the BQM-74F will be a faster, more maneuverable subsonic aerial target with increased range and endurance to challenge weapons systems and better train sailors.

Status:

The GQM-163A developmental contract was awarded in June 2000 to Orbital Sciences, with first delivery in FY 2005 as a replacement for the Vandal and MA-31 SSSTs. BQM-74F targets will enter the fleet in FY 2007. The Navy is also evaluating the potential of incorporating autonomous pre-planned flight profiles for the BQM-74, which would reduce the need for target control stations as well as enabling the target to fly in areas where target control is not available. The Navy has discontinued its QF-4 program and now conducts test and evaluation events with Navy crews on Air Force ranges against QF-4s procured from the Air Force. Also, the Navy and Air Force are in the early stages of forming a team to develop a follow on full scale target to replace the aged QF-4.

Developer

BQM-74 E/F: Northrop Gruman; Rancho Bernado, California
GQM-163A: Orbital Sciences; Chandler, Arizona
MA-31: Boeing Company; St. Louis, Missouri

Lightweight Hybrid Torpedo (LHT)

Description

The MK-54 LHT is a modular upgrade to the lightweight torpedo inventory and is designed to counter quiet diesel-electric submarines operating in the shallow water littoral environment. LHT combines existing torpedo hardware and software from the

MK-46, MK-50, and MK-48 Advanced Capability (ADCAP) programs with advanced digital COTS electronics. The resulting MK-54 LHT offers significantly improved shallow water counter-countermeasures capability at reduced life-cycle costs. While the baseline MK-54 will provide the warfighter with improved shallow water performance, the MK-54 P3I program will modernize the MK-54 by taking continuous advantage of technology advancements during the hardware acquisition process while addressing current weapon limitations and evolving threats and countermeasures. The MK-54 modernization plan will leverage the spiral acquisition process to synergistically introduce new hardware and software updates that will provide step-like increases in probability of kill while reducing life-cycle cost and allowing the torpedo to remain ahead of the evolving littoral submarine threat.

Status
MS II was achieved in FY 1996 along with an EMD contract award. A successful CDR was held in November 1999 with developmental testing beginning in July 1999. The LRIP contract was awarded in early FY 2000. The MK-54 Program completed OPEVAL in third quarter FY 2004, and achieved IOC in fourth quarter FY 2004. Procurement will include 94 LHTs in FY 2005, and approximately1,500 for the total program. The torpedoes will be procured in economic order quantities from FY 2007 through FY 2011 to achieve a full operational capability in FY 2011.

Developers
Raytheon; Mukilteo, Washington

MK-15 Phalanx Close-In Weapon System (CIWS)

Description
The MK-15 CIWS is a radar-controlled, rapid-fire gun capable of firing 4,500 rounds per minute. An integral element of ship self-defense and the anti-air warfare, defense-in-depth concept, CIWS provides terminal defense against Anti-Ship Cruise Missiles (ASCMs) and high-speed aircraft penetrating outer fleet defensive envelopes. Additionally, CIWS Block 1B Surface Mode provides defense against small, fast, surface craft and slow-flying helicopters and aircraft. Other Block 1B improvements include better sensor support for close-in engagements [Forward Looking Infra Red/Video Tracker/Enhanced Radar (Ku Band)], the Enhanced Lethality Cartridge, and Optimized Gun Barrels. Existing CIWS mounts (Block 1 Baseline 0 through 2 and Block 1A) are being upgraded to CIWS Block 1B, outfitting all deploying ships by FY 2010 and completing installation by FY 2012. CIWS 1B upgrades and new production programmed for aircraft carrier, cruiser, destroyer, frigate, and amphibious warships (LHD, LHA, and LPD) classes.

Status
More than 400 CIWS systems have been deployed at sea on U.S. warships since the system was first tested in August 1973. Development and Operational Testing of the fire-control system was completed in FY 1996, using the Self-Defense Test Ship. Testing of the Phalanx Surface Mode capability was completed in FY 1998, again using the Self-Defense Test Ship, and initial delivery was made in FY 2000. Acquisition continues in sufficient numbers to support new-construction warship delivery. In FY 2005 22 CIWS 1B are being procured, and 176 CIWS 1B are scheduled for the FYDP (FY 2006-2011).

Developers
Raytheon; Tucson, Arizona

MK-48 Advanced Capability (ADCAP) Torpedo

Description
MK-48 heavyweight torpedoes are used solely by submarines and are employed as the primary ASW and ASUW weapon in attack submarines and as the principal defensive weapon in strategic ballistic-missile submarines. Additionally, three allied countries have acquired the MK-48 torpedo. With a need to continue torpedo performance-upgrade programs to counter continuously evolving threats, the Navy developed the MK-48 Mod 5 ADCAP torpedo.

MK-48 ADCAP: The MK-48 Mod 5 ADCAP torpedo is the replacement for the MK-48 Mod 4 torpedo. Authorized for full production in 1990, the ADCAP counters surface-ship and submarine threats with greater speed and accuracy than any other submarine-launched torpedo in the Navy's history. It is a heavyweight acoustic-homing torpedo with sophisticated sonar, all-digital guidance-and-control systems, digital fusing systems, and propulsion improvements. Its digital-guidance system allows for repeated improvements to counter evolving threats through software upgrades. The last new ADCAP torpedo was delivered in 1996. To improve future performance, several upgrades are being made to the existing ADCAP inventory. Details of the upgrades follow:

MODS ADCAP (MK-48 Mod 6): The MODS ADCAP combines two improvements, one in guidance and control (G&C Mod), and the other in the torpedo propulsion unit (TPU Mod). The G&C Mod improves the acoustic receiver, replaces the guidance-and-control set with updated technology, increases memory, and improves processor throughput to handle the expanded software demands required to improve torpedo performance against evolving threats. The TPU Mod provides a tactically significant reduction in torpedo radiated-noise signatures.

Operational Software Upgrades: Software upgrades have been and will be developed and integrated into the MK-48 ADCAP. Changes in threat scenarios, such as the inclusion of littoral operating areas, the increased availability of modern countermeasures, and the proliferation of diesel submarines, are the major impetus for updating software. Performance issues, including deficiencies discovered during fleet exercises and developmental testing, also will be resolved during these updates. The MK-48 ADCAP Torpedo Spiral Development program involves improving torpedo performance through software upgrades primarily against the shallow water diesel threat. Spiral 1 is expected to provide a 25 percent increase in torpedo effectiveness against targets in shallow water.

Common Broadband Advanced Sonar System (CBASS): CBASS is a significant hardware and software upgrade to the MK-48 Mod 6 torpedo. The CBASS program is a joint development program with the Royal Australian Navy. It will include a new broadband sonar system (and its associated software) to achieve significant increases in operating bandwidth. The system will also include new broadband processing algorithms that will improve CCM and shallow-water performance while retaining deep-water performance characteristics. With the standup of a Royal Australian Navy MK-48 ADCAP intermediate maintenance capability in Australia, both Navies will be ready for joint operational testing to be conducted in waters off Australia. With the first CBASS in water runs conducted in September 2004, the MK-48 Mod 7 CBASS torpedo is on schedule for IOC in FY 2006. The MK-48 ADCAP is and will remain the Navy's primary submarine-launched conventional Anti-Submarine Warfare and Anti-Surface Warfare torpedo through 2026.

Status

The first phase of Spiral 1 has been completed and released for exercise use until completion of operational testing. Full Spiral 1 developmental and operation testing will be completed in FY 2006. Spiral 2 development is in progress with DT/OT expected in FY 2007. Spiral 3 and 4 are planned for FY 2008 and FY 2009. The MK-48 ADCAP Mod 6 ACOT completed DT in November 2004 and will complete OT in February 2005 with IOC expected in July 2005. A total of 388 units are slated for production with the final units delivered in FY 2008. The MK-48 ADCAP Mod 7 (CBASS) is in DT with OT scheduled for FY 2005 and IOC scheduled for FY 2006. A total of 1,263 units are slated for production through the life of the program.

Developers

Raytheon Systems Corporation; Keyport, Washington

Navy Ballistic Missile Defense (BMD)

Description

Aegis BMD includes modifications to the Aegis Weapon System and the development and upgrade of the Standard Missile 3 (SM-3) with its hit-to-kill kinetic warhead. This combination will give select Aegis cruisers and destroyers the capability to intercept short and medium-range ballistic missiles in the ascent, mid-course, and descent phases of their exo-atmospheric trajectories. Additionally, Aegis BMD will provide surveillance and tracking capability against long-range ballistic missiles. Together, these capabilities will provide robust defense-in-depth to U.S. and allied forces, vital political and military assets, population centers, and large geographic regions against the threat of ballistic missile attack. The Missile Defense Agency and the Navy fielded the Aegis BMD long-range surveillance and tracking capability as an element of the Ballistic Missile Defense System (BMDS) in October 2004. A short and medium range ballistic missile emergency engagement capability will be fielded in 2005. The Aegis BMD Program Office continues a two-pronged engineering development effort of supporting SM-3 test flights and participating in risk-reduction activities.

Status

In October 2004 USS *Curtis Wilbur* (DDG-54) successfully conducted the initial at-sea shakedown of the Aegis BMD Long Range Surveillance and Tracking (LRS&T) capability, with outstanding results. By the end of calendar year 2005, a total of eight Aegis destroyers will have the LRS&T capability, enabling them to cue the greater BMDS. The Navy and the Aegis BMD Program Office continue to develop a sea-based engagement capability as well. In February 2005, an SM-3 fired from the USS *Lake Erie* (CG-70) successfully intercepted a unitary (non-seperating) a ballistic missile target outside the earth's atmosphere. This was the fifth successful intercept in six test flights since January 2002. With this successful test firing, a contingency engagement capability is now available. One additional Flight Mission is scheduled in calendar year 2005. By demonstrating the ability to track long-range ballistic missiles, and the aggressive plans in place to demonstrate a sea-based engagement capability, the Aegis fleet has paved the way for the Navy to play a significant role in the nation's BMDS.

Developers

Lockheed Martin; Moorestown, New Jersey
Raytheon; Tucson, Arizona

Naval Mines 2010 Mine

Description
The 2010 Mine — also described as the Modular Autonomous Undersea Weapon System (MAUWS) — is a follow-on weapon to replace the in-service MK-56 Mine, an aircraft-delivered medium-depth mine primarily designed for Cold War-era Soviet threats. The 2010 Mine will be optimized to be effective against high-priority threats in the littorals, including, medium sized surface combatants, slow/quiet submarines, fast patrol craft, and air-cushion vehicles. The 2010 Mine will have provisions for airborne, surface, and sub-surface delivery.

Status
A three-year Navy laboratory/industry advanced-technology demonstration program sponsored by the Office of Naval Research (ONR) was completed in 2001. The effort explored technologies applicable to medium-depth mining, including: multi-influence (acoustic, magnetic, pressure, seismic) sensing and data fusion, standoff wireless mine and mobile warhead control, and cooperative minefields and mobile warhead concept evaluation. An Initial Capabilities Document (ICD) was initiated in 2004, to be followed by the development of an overarching concepts of operations and the completion of (1) Function Needs Analysis; (2) Function Area Analysis; and (3) Function Solutions Analysis planned during FY 2005.

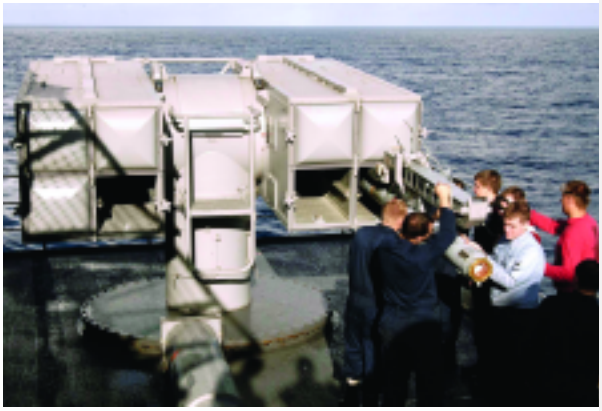
Developers
To be determined.

Naval Mines Quickstrike Mines

Description
The current Quickstrike family of aircraft-delivered bottom mines is being enhanced significantly by procurement of the programmable Target Detection Device (TDD) MK-71. Engineering development efforts include new advanced algorithms for ship detection, classification, and localization against likely threats, including quiet diesel-electric submarines, mini-subs, fast patrol boats, and air-cushioned vehicles

Status
Limited in-service support continues for current inventories and funding is in place for algorithm development and procurement the TDD MK-71. In September 2002 the Navy awarded the contract to begin procuring the TDD MK-71.

Developers
SECHAN Electronics, Inc.; Lititz, Pennsylvania



RIM-7, RIM-162 NATO Sea Sparrow Missile System (NSSMS) and Evolved Sea Sparrow Missile (ESSM)

Description

The MK-57 NSSMS is deployed on more than 50 Navy ships (CVN, LHD, LHA, DD, AOE classes) and numerous NATO ships as their primary surface-to-air ship self-defense missile system. Modifications to the Sea Sparrow continue, including the re-architecture combat system upgrade for CVNs, which reduces maintenance and manpower requirements, increases firepower, integrates the ESSM, and reduces cost of ownership through the use of COTS components. ESSM is the next generation of Sea Sparrow missiles, selected for the *Arleigh Burke* (DDG-51) Flight IIA Aegis destroyer self-defense system as well as for Aegis cruisers receiving Cruiser Modernization and aircraft carriers. ESSM is a kinematic upgrade to the improved RIM-7P missile. The upgrades consist of a more powerful rocket motor, a tail control section for increased responsiveness, VLS capability, upgraded warhead, and a quick-strike electronic upgrade. Enhanced ESSM kinematics and warhead lethality will leverage the robust RIM-7P guidance capability to provide increased operational effectiveness against high-speed maneuvering anti-ship cruise missiles at greater intercept ranges than is now possible with the RIM-7P. ESSM will be incorporated into the Aegis Baseline 6 Phase III and Baseline 7 Weapon Systems for short to medium-range missile defense. Additionally, the MK-29 trainable guided missile launcher will be modified to fire ESSM on CVNs. ESSM development is being pursued as an international cooperative initiative involving ten countries in the NATO Sea Sparrow Consortium.

Status

In-service support of NATO Sea Sparrow systems is complete. A memorandum of understanding was signed in June 1995, and 10 countries signed a production memorandum of understanding for ESSM in December 1997. ESSM successfully completed operational evaluation testing in mid-2003 and reached milestone III and achieved full-rate production in January 2004. IOC occurred in FY 2004 with fleet introduction on an *Arleigh Burke* Flight IIA destroyer.

Developers

Raytheon; Tucson, Arizona

RIM-66C SM-2 Standard Missile-2 Blocks III/IIIA/IIIB

Description

The Standard Missile-2 (SM-2) is the Navy's primary surface-to-air theater air warfare weapon. Deployed SM-2 Block III/IIIA/IIIB configurations are all-weather, ship-launched, medium-range surface-to-air missiles in service with the Navy and several allies. A robust area air defense missile is a prerequisite for maintaining

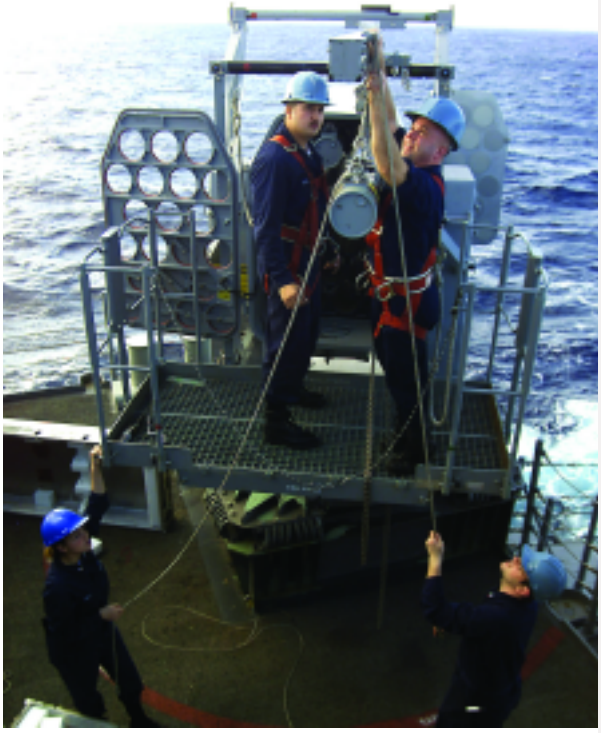
forward naval presence, operating in the littorals, and projecting and sustaining U.S. forces in distant anti-access or area-denial environments. Each of the blocks is progressively more capable against more challenging threats and in more difficult electronic countermeasures (ECM) environments. The SM-2 is launched from the Mk 41 Vertical Launching System (VLS) installed in Baseline 2 Aegis cruisers (CG-52) and above as well as all Aegis guided-missile destroyers. It employs inertial mid-course guidance with command updates from the shipboard fire control system and an ECM-resistant monopulse receiver for semi-active radar terminal homing.

The SM-2 continues to evolve to counter expanding threat capabilities as the Navy continues to implement modular improvements in very high- and very low-altitude intercepts, particularly stressing ECM environments. Block III features improved performance against low-altitude threats and more fully uses the trajectory shaping resident within command guidance from the Aegis weapons system by implementing Trajectory Shaping and Fuse Altimeter engineering change improvements.

Block IIIA features significantly enhanced performance and lethality against sea-skimming threats due to a new directional warhead and Moving Target Indicator (MTI) fuse design in addition to enhanced trajectory-shaping functionality. Block IIIB builds on the Block IIIA improvements by adding an infrared (IR) guidance mode capability developed in the Missile Homing Improvement Program (MHIP) to improve performance in a stressing electronic countermeasures environment. The IIIB MHIP dual-mode RF/IR guidance capability is being incorporated to counter a specific fielded and proliferating electronic warfare system in existing aircraft and cruise missile threats. Blocks IIIA/IIIB will be the heart of the SM-2 inventory for the next 15 years. The latest generation of Block IIIB missiles include a maneuverability upgrade (SM-2 Block IIIB w/MU) to enhance IIIB performance against low-altitude, supersonic maneuvering threats.

Status
SM-2 Block III/IIIA/IIIB missiles are currently deployed. Block IIIB is the only variant in production for the U.S. Navy, although Block IIIA is still produced for Foreign Military Sales. Block IIIBs are being produced as new all-up rounds and as upgrades from older Block III missiles. FY 1995 was the first year of production for the SM-2 Block IIIB, which achieved IOC in FY 1997. The resource-constrained procurement plan is limited to 1,500 Block IIIB AUR and 1,100 upgrades, and procurement is currently scheduled to end in FY 2015. The Block IIIB Maneuverability Upgrade went into production in FY 2004.

Developer
Raytheon; Tucson, Arizona



RIM-116A Rolling Airframe Missile (RAM)

Description

RAM is a high-firepower, low-cost system designed to engage anti-ship cruise missiles (ASCMs) in the stressing electronic countermeasures (ECM) littoral conflict environment. RAM is a five-inch diameter surface-to-air missile with passive dual-mode radio frequency/infrared (RF/IR) guidance and an active-optical proximity and contact fuse. RAM has minimal shipboard control systems and does not require shipboard information after launch. Effective against a wide spectrum of existing threats, the RAM Block 1 IR upgrade incorporates IR "all-the-way-homing" to improve performance against evolving passive and active ASCMs. Current plans are for RAM to continue evolving to keep pace with emerging threats.

Status

RAM is installed in all five *Tarawa* (LHA-1)-class amphibious assault ships; seven *Wasp* (LHD-1)-class amphibious assault ships; eight *Whidbey Island* (LSD-41)-class dock landing ships; four *Harpers Ferry* (LSD-49)-class dock landing ships, and seven aircraft carriers; RAM is also planned for installation on all remaining aircraft carriers by FY 2007 as well as for all *San Antonio* (LPD-17)-class landing platform dock ships and flight 0 LCS. Block 0 missiles and launchers completed their final production run on schedule, and the missile has had successful intercepts in 177 of 186 production-acceptance and ship-qualification tests. The Block 1 missile has completed the most stressing OPEVAL ever attempted using the Self-Defense Test Ship-23 of 24 successful firings-and has completed Developmental/Operational Testing, with Initial Operational Capability in FY 2000. Block 1 is currently at full-rate production. So far the program has procured 90 missiles in FY 2002, 106 in FY 2003, 90 in FY 2004, with an additional 90 planned for FY 2005 and 360 from FY 2006-2011.

Developers

Raytheon; Tucson, Arizona
RAMSYS; Germany

SM-6 Extended-Range Active Missile (ERAM) Block I/II

Description

The Navy's next-generation Extended Range Anti-Air Warfare (ER AAW) interceptor, SM-6 is a transformational surface-to-air missile. With its active-seeker technology, SM-6 will meet the anticipated theater air and missile warfare threat well into the next decade, providing an essential element of the Navy's Sea Shield vision. Introduction of active-seeker technology to AAW in the Surface Navy reduces Aegis Weapon System reliance on illuminators and provides improved performance against stream

raids and targets employing advanced characteristics (maneuverability, low radar cross section, kinematics, and advanced electronic countermeasure features). SM-6 is a critical pillar of the Navy's Integrated Fire Control-Counter Air (NIFC-CA) capability and will provide a significant contribution to the Joint Integrated Fire Control operational architecture. The evolutionary acquisition strategy will leverage alignment of technology paths among Naval Sea Systems Command (NAVSEA), Naval Air Systems Command (NAVAIR), and the Air Force across multiple missions and missile production lines to dramatically reduce technology development recurring production and life cycle costs. The SM-6 ERAM acquisition strategy is characterized as a low-risk development approach which leverages the SM-2 Block IV/IVA program Non-Developmental Items and Raytheon's Advanced Medium Range Air-to-Air Missile (AMRAAM) Phase 3 active seeker program for NAVAIR. The SM-6 need is documented in the Mission Needs Statement for Joint Theater Air and Missile Defense, Theater Air and Missile Defense Capstone Requirements Document (CRD), and in the Ship Class Anti-Air Warfare Self-Defense CRD. The specific requirements are documented in the Operational Requirements Document for Standard Missile-6 (SM-6) "TALON" ERAM, signed by the CNO on May 1, 2004. The SM-6 missile will be fielded on legacy DDG-51 and CG-47 class ships as well as the future DD(X) and CG(X) family of warships.

Status
Navy established the SM-6 ER AAW program in PB04, with an FY 2010 Initial Operational Capability (IOC). The Joint Requirements Oversight Council (JROC) approved the Operational Requirements Document June 23, 2004 following a milestone B Defense Acquisition Board decision June 15, 2004 designating SM-6 an ACAT 1D program. SM-6 will complete preliminary design review in FY 2005 and transition to detailed design review in FY 2006 well ahead of schedule. Spiral development for Block II will achieve full Joint Integrated Fire Control engagement operations and could include expanded capabilities to support sea-based terminal ballistic missile defense.

Developers
Raytheon; Tucson, Arizona

UGM-133A Trident II/D5 Submarine-Launched Ballistic Missile (SLBM)

Description:
The Trident II/D5 is the sixth generation of the Navy's Fleet Ballistic Missile (FBM) program, which started in 1955. The D5 is a three-stage, solid propellant, inertial-guided submarine-launched ballistic missile (SLBM) with a range greater than 4,000 nautical miles and accuracy measured in hundreds of feet. The first eight *Ohio*-class submarines were configured

to carry 24 Trident I/C4 missiles submarine-launched ballistic missiles (SLBMs). The ninth ship, the USS Tennessee (SSBN-734) and all later ships were armed with the Trident II/D5 missile system. Conversion of four of the C4 ships to carry the Trident II/D5 missile began in FY 2000 and will be completed in FY 2008. Trident missiles are capable of carrying W76 or W88 Multiple Independently Targeted Reentry Vehicles (MIRVs). In operation, Trident II/D5 missiles have been declared at eight MIRV warheads while Pacific Fleet Trident I/C4 missiles have been declaredat six under the Strategic Arms Reduction Treaty (START). The Navy continues to address future deterrence requirements against weapons of mass destruction and disruption, and the Trident II/D5 will ensure that the United States has a modern, survivable strategic deterrent.

Status
FY 2005 funding will be dedicated to the D5E life extension program. Full missiles procurement begins in FY 2008 ending in FY 2012 with a total acquisition of 108 additional missiles.

Developer
Lockheed Martin; Sunnyvale, California

Stabilized 25-mm Chain Gun

Description
This upgrades the current MK-38 25mm chain gun with stabilization, remote operation, fire control, and EO sensor. The program fills the surface self-defense capability gap for ships that are not CIWS BLK 1B configured, and is designed to engage real-time asymmetric threats at close range to ships in port, at anchor, or while transiting choke points or operating in restricted waters. It provides the capability to bridge current and future targeting and weapons technology in a close range Force Protection environment. Furthermore, a future incremental upgrade to SPS will include remote controlled stabilized guns as a primary lethal engagement portion of the detect-to-engage sequence.

Status
PB 2006 budget funds 139 stabilized mounts, which will be fielded on all ship classes to fill the gap until CIWS BLK 1B can be fully fielded. The FY 2004 contract was awarded in June 2004 and the first two systems were delivered in December 2004.

Developers
United Defense; Louisville, Kentucky
Rafael USA, Inc.; Israel

SENSORS

AIRBORNE

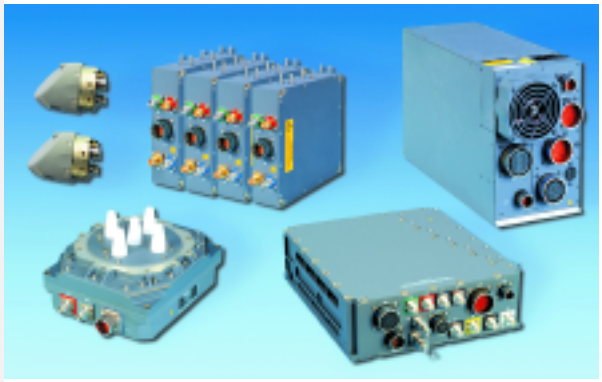
AAR-47 Missile Approach Warning System (MAWS)

Description
The AAR-47 is a passive, MAWS consisting of four sensor assemblies housed in two or more sensor domes, a central processing unit, and a control indicator. Employed on helicopters and transport aircraft across U.S. Armed Services, the AAR-47 MAWS warns of threat missile approach by detecting radiation associated with the rocket motor and automatically initiates flare ejection. The MAWS provides attacking missile declaration and sector direction finding and will be interfaced directly to the ALE-39/47 countermeasures dispenser. The AAR-47(V)2 upgrade which is in full-rate production will improve missile warning performance, add laser warning functionality, and reduce operations and support costs of existing AAR-47 systems. Without the AAR-47, helicopters and fixed-wing aircraft have no infrared missile detection capability.

Status
AAR-47(V)2 is currently in early full-rate production. Work has begun on an advanced two-color IR Missile Warning Sensor and laser-based countermeasure, which were demonstrated by the Tactical Aircraft Directed Infra-Red Counter-Measure (TADIRCM) Advanced Technology Demonstration (ATD). This revolutionary technology will be fielded in a future version of AAR-47. The Navy plans to buy one AAR-47(V)2 for every new assault support aircraft in the FYDP (MV-22, UH-1Y, AH-1W, KC-130J etc). The procurement objective for retrofit kits is 1,090.

Developers
Alliant Defense Electronic Systems; Clearwater, Florida

ALR-67(V)3 Advanced Special Receiver



Description
The ALR-67(V)3 is a Radar Warning Receiver (RWR) designed to meet Navy requirements through the year 2020. It will enable Navy F/A-18E/F aircraft to detect threat radar emissions, enhancing aircrew situational awareness and aircraft survivability.

Status
The ALR-67(V)3 program successfully completed EMD phase and operational testing in 1999 and is in full-rate production. Production quantities will eventually outfit all F/A-18E/F aircraft.

Developers
Raytheon; Goleta, California

ALQ-214 Integrated Defensive Electronic Counter-Measures (IDECM)

Description
Employed on the F/A-18E/F, the ALQ-214 IDECM is used to defend the host aircraft against radar-guided Surface-to-Air Missile (SAM) systems. Either through a towed decoy or several onboard transmitters, the ALQ-214 produces complex waveform radar jamming that defeats even advanced SAM systems.

Status
The ALQ-214 and ALE-50 (towed decoy) combination are currently in full-rate production. The ALE-55 Fiber Optic Towed Decoy is currently in developmental test and is scheduled to begin operational test in FY 2006.

Developers
BAE Systems; Nashua, New Hampshire

Naval Aviation Improved Chemical, Biological, Radiological Nuclear Defense (CBRND)

Description
The Naval Aviation CBRND program is part of a joint-service effort to provide the warfighter with the means to sustain flight operations during the threat or use of Chemical and Biological (CB) weapons of mass destruction. Naval Aviation is the lead service for a chemical/biological protective flight suit. Joint Protective Aircrew Ensemble (JPACE) provides percutaneous protection from CB warfare agents. Additionally, Naval Aviation is participating in several joint CBRND developmental and acquisition programs that will provide the capability for in-flight automated point and standoff detection of chemical agents, as well as fielding solutions and applicators to restore aviation assets by thorough decontamination of aircrew personnel, aircraft, and sensitive equipment. Naval Air Systems Command promulgated the CBRND Naval Aviation Training and Operating Procedures Standardization (NATOPS) Manual in October 2004. Also, Naval Aviation is participating in the drafting and revision of the nine major multi-service CBRN manuals to ensure situational awareness in a CBRN operating environment.

Status
JPACE MS C was approved January 2005 for initial low rate production (LRIP). JPACE was also approved for increment II development to address anti-exposure in cold weather and heat stress in hot weather.

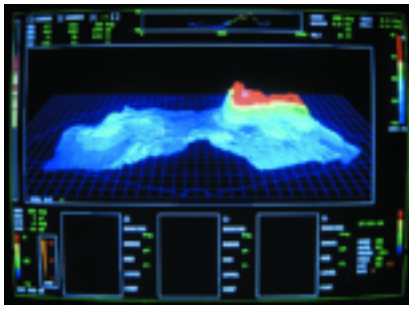
Developers
None available.

SUBSURFACE

BQQ-10 Acoustic Rapid COTS Insertion (ARCI)

Description

ARCI Insertion is a three-phase program that replaces existing legacy submarine sonar systems, including BQQ-5 (SSN-688), BSY-1 (SSN-688I), BSY-2 (SSN-21), and BQQ-6 (SSBN-726) sonar, with a more capable and flexible COTS-based Open Systems Architecture (OSA), and provides the submarine force with a common sonar system. It allows development and use of complex algorithms that were previously well beyond the capability of legacy processors. The use of COTS/OSA technologies and systems will enable frequent periodic updates to both software and hardware with little or no impact on submarine scheduling. COTS-based processors allow computer power growth at a commensurate rate as commercial industry. A key facet of the sonar ARCI program (now designated BQQ-10) includes the Submarine Precision Underwater Mapping and Navigation (PUMA) upgrade. This consists of software processing improvements delivered as part of Advanced Processor Build (APB) 02, to the BQQ-10 High Frequency (HF, ARCI Phase IV) and BQS-15 EC-19/20 sonar systems. This enhancement provides submarines with the capability to map the ocean floor and register geographic features, including mine-like detections, and display the map in a 3-D representation. This capability to precisely map the ocean floor allows submarines to conduct covert battlespace preparation of the sea bottom as well as minefield surveillance and avoidance with impunity. These digital maps can be compressed and transmitted to other naval forces for display on seabased and land-based platforms. Additionally, the open architecture design of the ARCI system allows for the rapid inclusion of advances in sensor systems and processing techniques at minimal cost. New sensor systems, such as the low cost conformal array, large vertical array, and advanced towed arrays currently in development, will be incorporated in the ARCI system through annual advanced processor build (APB) software improvements.



Status

ARCI Phase II (FY 1999) provided substantial towed and hull array software and hardware processing upgrades that significantly improved LF detection capability. Phase III (FY 2001) augments the current Spherical Array DIMUS beam-former with a linear beam-former and enhanced processing that improves MF detection capability. Phase IV (FY 2001) upgrades the HF sonar on late-generation, improved *Los Angeles* (SSN-688I)-class submarines. Each phase installs improved processing and workstations (point click trackballs, Windows environment). Recent, real world encounters have consistently demonstrated overwhelming success of this program to restore U.S. acoustic superiority. ARCI completed OPEVAL in FY 2003. The BQQ-10 sonar system is being installed as rapidly as possible given the available funding.

Additional funding will accelerate vital improvements to towed array processing in support of fleet operations, accelerated delivery of organic Mine Countermeasures capability inherent in ARCI Phase IV and PUMA, and completing Phase III upgrades for all submarines. Navy research, development, test, and evaluation will continue to develop processing algorithms from the surveillance, tactical and advanced R&D communities as well as perform laboratory and at-sea testing, and distribute upgrades periodically.

Developers
Lockheed Martin; Manassas, Virginia
General Dynamics—Advanced Information Systems; Fairfax, Virginia
Advanced Research Laboratory, University of Texas at Austin; Austin, Texas

Fixed Distributed System Commercial Off-The-Shelf (FDS-C)

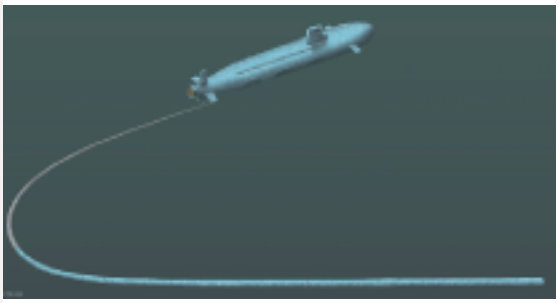
Description
FDS-C is a COTS version of the long-term, passive acoustic fixed surveillance FDS system. FDS-C provides threat location information to tactical forces and contributes to an accurate maritime picture for the Joint Force Commander. Due to its strategic positioning and long lifetime, it provides indication and warning of hostile maritime activity before conflicts begin.

Both FDS and FDS-C comprise a series of arrays deployed on the ocean floor in deep-ocean areas, across straits and other chokepoints, or in strategic shallow water littoral areas. The system is made up of two segments: the Shore Signal and Information Processing Segment (SSIPS), which handles the processing, display, and communication functions, and the Underwater Segment, which consists of a large-area distributed field of acoustic arrays. FDS-C was developed as a less-expensive follow-on version of FDS by converting to COTS equipment. Taking advantage of advances made in the commercial industry provides a much more cost-effective FDS-caliber system to meet the fleet's ongoing needs for long-term undersea surveillance. Additionally, the program is pursuing the development of other technologies, such as an all-fiber-optic hydrophone passive array, to further increase system reliability and performance at reduced cost.

Status
FDS and FDS-C processing are being upgraded with the Integrated Common Processor (ICP) that will result in increased operator proficiency, increased functionality and savings in logistics support and software maintenance.

Developers
Tyco Integrated Cable Systems; Portsmouth, New Hampshire
Northrop Grumman Electronic Systems (Formerly Litton Guidance & Control Systems); Woodland Hills, California

TB-29A Submarine Thin-Line Towed Array



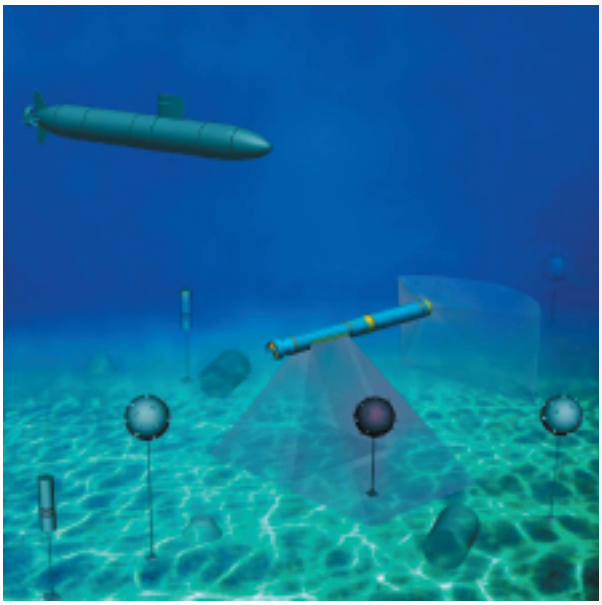
Description
The TB-29A submarine thin-line towed array is a COTS version of the legacy TB-29 towed array. These arrays will be used for back-fit on *Los Angeles* (SSN-688 & SSN 688I) and *Seawolf* (SSN-21)-class submarines and will be forward-fit on the *Virginia* (SSN-774)-class submarine. TB-29A will also be used for the SURTASS twin-line towed array system. It will provide greater capability than the current TB-23 thin-line towed arrays and achieve enhanced supportability through commonality. The TB-29A uses COTS telemetry to reduce significantly unit cost while maintaining superior array performance. These arrays were tested on the SURTASS ships and will begin supporting the IUSS community in FY 2005. Coupled with the submarine ARCI system, TB-29A arrays are expected to provide the same 400-500 percent increase in detection capability against quiet submerged platforms in blue water and shallow water areas, as the current TB-29 has demonstrated.

Status
TECHEVAL and OPEVAL results show the TB-29A performance as superior to the TB-29, giving the *Virginia*-class and the ARCI equipped SSNs a better performing tactical towed array. OPEVAL was conducted during the second quarter of FY 2003. A total of 11 arrays have been procured and delivered under LRIP I & II. Twelve arrays were procured under LRIP III with deliveries starting in FY 2004. Procurement rates to date have been based upon the availability of limited funding. As a result, in FY 2003 the program sponsor determined that there were insufficient funds to support production and procurement of TB-29A arrays beyond FY 2004. These shortfalls in funding, coupled with changes in fleet requirements, led to the recommendation to cancel the program. Therefore, during the first quarter of FY 2004 the MDA granted permission to closeout this ACAT Level III program with a final LRIP buy consisting of nine additional arrays. The delivery of the last TB-29A arrays will be in FY 2005. The total procurement of TB-29A arrays upon completion and delivery of the final LRIP buy will be 32.

Developers
Lockheed Martin; Syracuse, New York
L3 Communications; Sylmar, California

Unmanned Undersea Vehicles (UUV)

Description
Several acquisition programs are ongoing within the Navy to field UUV systems to improve current Navy Sea Shield capabilities in enabling assured access. The 2004 Navy UUV Master Plan pri-



oritizes UUV missions to support *Sea Power 21*, and maps intended missions to four distinct vehicle classes (by size). The three highest priority UUV missions, ISR, MCM, and ASW, are the focus of current R&D efforts.

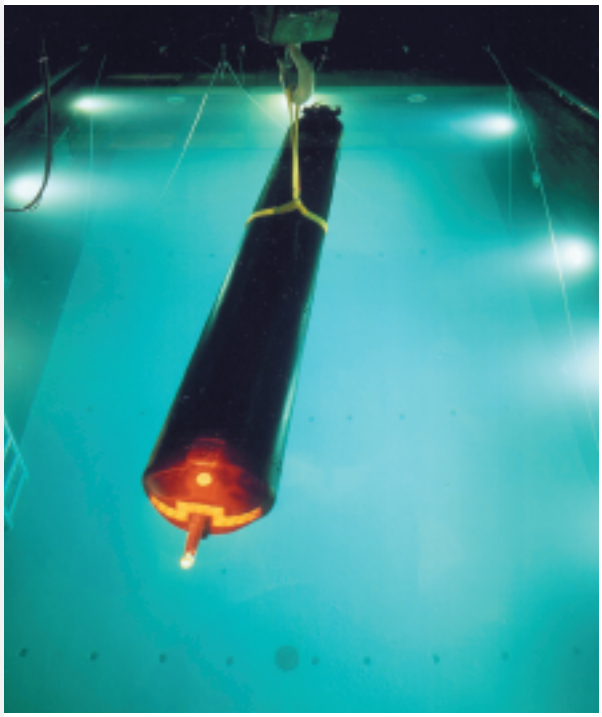
The Long-Term Mine Reconnaissance System (LMRS)—under development—will provide several technologies key to development of a capability to conduct clandestine minefield reconnaissance. In 2005, two LMRS vehicles will prove clandestine launch and recovery, autonomous operation, and provide critical battery technology and integration development to enable up to 40 hours of endurance in the littorals.

The Mission Reconfigurable UUV (MRUUV) began development in FY 2005, and will provide a robust capability to conduct clandestine minefield reconnaissance and Intelligence, Surveillance, and Reconnaissance (electro-magnetic and electro-optical ISR, and Indications and Warning). The MRUUV will include unique capabilities, including submarine launch and recovery and autonomous operation endurance of more than 40 hours. Sensor and system enhancements are being pursued to expand capabilities in the areas of Precision Underwater Mapping and Navigation, Synthetic Aperture Sonar, Acoustic Communications, and high-density renewable energy sources. The 21-inch MRUUV will be of similar size and shape as LMRS and will build upon the LMRS design by sharing certain components and support systems. MRUUV represents an enhanced capability by providing reconfigurable sensor packages for potential missions such as remote ASW tracking, undersea search and survey, communications and navigation aids and monitoring for weapons of mass destruction. A Large Displacement MRUUV will be developed as a follow-on to the 21-inch MRUUV and will bring enhancements in endurance and sensor packages.

The small UUV program is crucial to Explosive Ordnance Disposal (EOD), and Expeditionary Mobile Diving and Salvage mission of enabling access to beaches, harbors, piers, and inland waterways. The small UUV will shorten timelines and increase safety for the clearance of mines and obstacles from these areas. Eventually, small UUVs will assume the roles of EOD divers and Marine Mammal Systems in the location and neutralization of mines. As no single small UUV is capable of addressing the needs of operational units and missions that they support, a system of systems acquisition approach is required.

Naval Special Clearance Team ONE (NSCT-1) UUVs support amphibious and mine warfare forces by deploying from small craft to enable conduct of rapid search, classification, mapping, reacquisition, identification, and neutralization tactical operations near hostile shores in the VSW zone between 10 and 40 feet of sea water.

EOD UUVs will be used to search for and localize Unexploded Ordnance hazards including mines, submerged munitions, weapons of mass destruction, and to conduct ship hull searches in support of Force Protection and other fleet support operations. Surface Mine Countermeasure (SMCM) UUVs will complement existing and future SMCM, reduce platform risk and improve the overall tactical timeline for MCM operations.



Status

Since inception, the EOD and NSCT-1 UUV programs have been on accelerated schedules. NSCT-1 and EOD UUV interim systems have been fielded and engaged in real world operations. During OIF, NSCT-1 UUVs were deployed in the port of Umm Qasr operating in strong currents and low visibility and validated their operational value to fleet operations. EOD UUVs were used to support Space Shuttle *Columbia* underwater search and recovery operations. The use of these UUVs reduced the tactical timeline, minimized risk to man-in-the-minefield systems and improved overall mission effectiveness.

An initial operational capability for the VSW MCM Detachment S-C-M UUV system will occur in FY 2006. Final prototype evaluation is underway and a production baseline will be established early in 2005. The NSCT-1 reacquire and ID UUV program component will reach IOC in FY 2007, with the Neutralization UUV component reaching a production decision in FY 2010. The neutralization component will provide a low-cost mine neutralization capability to the fleet, NSCT-1, and EOD operators.

The LMRS completed detail design in August 1999 and is in the EMD Phase. Submarine launch and recovery test is scheduled for late CY 2005. The 21-inch MRUUV ORD is under review at the joint staff level, with a Milestone B decision expected by June 2006. The SAHRV program recently completed operational evaluation. The FY 2006 request includes funding for development of 21-inch MRUUV and LDUUV, and procurement of two 21-inch MRUUVs in 2011.

Developers

LMRS: Boeing; Anaheim, California
SAHRV: Woods Hole Oceanographic Institution
NSCT-1: Bluefin Robotics and Hydroid
EOD: Lockheed Martin, Perry Technologies, Bluefin Robotics
SMCM: Hydroid

SURFACE AND EXPEDITIONARY

Area Air Defense Commander (AADC)

Description

The AADC Capability provides a maritime and shore-based operational-level planning and execution tool for air defense operations under the Joint Theater Air and Missile Defense (JTAMD) concept. In the early stage of a contingency, the preponderance of forces will likely be seabased. Aircraft carrier strike groups will act as the hub of rapidly expanding joint force structure. A maritime-based or strategically located ashore AADC Capability provides the tools necessary to plan and conduct operations in support of air defense throughout the spectrum of conflict. Current and future JTAMD operations require an advanced common Battle Management/Command, Control, Communications, Computers, Intelligence (BMC4I) architecture. This includes a Single Integrated Air Picture (SIAP) and the capability for centralized planning and decentralized execution. The AADC Capability will permit rapid re-planning and course of action evaluations. With the AADC capability, more of the Air Defense Planner's effort can be spent on analysis instead of data collection and input. The system employs a "six degrees of freedom" modeling capability to optimize force laydown and employment to achieve the desired level of protection.

Situational awareness is provided by a three-dimensional tactical operations display system. The 3-D capability provides the ability to view the battlespace from any direction or altitude. This display capability provides a common picture through fusion of all available tactical data links and sensor information into an easily understood picture that enables the AADC to exercise command by exception. The AADC capability consists of a suite of high-performance computers and displays employing advanced software on a series of state-of-the-art processors. The AADC Capability also provides a distributed collaborative planning feature that permits the AADC staff to interact rapidly with counterparts in other staffs.

Status

There are six fielded, full suite units: Three maritime units are fielded onboard the USS *Shiloh* (CG-67), USS *Blue Ridge* (LCC-19), and USS *Mount Whitney* (LCC-20). One shore facility has been installed at the Joint National Integration Center (JNIC) at Schriever AFB in Colorado. A second shore facility was installed in FY 2004 at the Joint Forces Command Joint Program Office (JFCOM JPO) program facility in Panama City, Fla. The third shore site is Tactical Training Group-Atlantic in Virginia Beach, Va. These shore sites will be used to analyze the capability's relevance to the Ballistic Missile Defense (at JNIC) and Air and Missile Defense (at JFCOM) and demonstrate the system's unique func-

tionality to the joint community. Three deployable clients are also available to support additional capability testing either ashore or afloat.

Developers

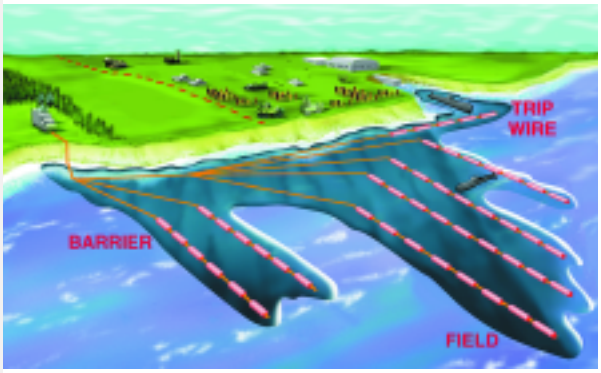
Johns Hopkins University Applied Physics Laboratory (Prototype); Laurel, Maryland

General Dynamics Advanced Information Systems (Production unit); Greensboro, North Carolina

Advanced Deployable System (ADS)

Description

ADS is a rapidly deployable passive acoustic undersea surveillance system designed to detect and track modern diesel-electric submarines and surface craft in littoral regions. At sea demonstrations of ADS have validated the ability of the system to achieve its primary mission, as well as provide a passive acoustic detection capability for tactical users to include small fast boats, air cushion craft, low-flying aircraft. ADS has potential detection capability against mine-laying operations and movement of vehicles ashore in the near-coastal zone. ADS employs distributed battery-powered acoustic arrays linked by small-diameter fiber optic cable over which hydrophone data is optically telemetered. The system is modular and configurable for specific missions and can be deployed from a number of different platforms. ADS is composed of: A Sensor Subsystem (SS) consisting of hydrophone arrays, cabling, and pressure vessels containing supporting electronics and power; an Installation Subsystem (ISS), consisting of the equipment aboard the installation vessel that supports system deployment; a Tactical Interface Subsystem (TIS), consisting of a transmission device to which ADS arrays are terminated and a receiver aboard the monitoring platform; and an Analysis and Reporting Subsystem, consisting of data processors and displays and a communications link aboard the host platform.



ADS processing software leverages the Navy's Advanced Rapid COTS Insertion (ARCI) program and the mission planning software leverages the Navy Mine Warfare community's software planner, the Mine Warfare and Environmental Decision Aids Library (MEDAL).

Status

ADS is in the Technology Development Phase. Development and demonstration phase will begin after a Milestone B decision in the fourth qtr of FY 2005. ADS is an Acquisition Category (ACAT) I (pre-MDAP) program. The program is currently funded and structured to develop ADS as an off-board sensor system installed by the Littoral Combat Ship (LCS). Development of delivery from alternate platforms will begin in FY 2009.

Developers
BBN Technologies; Cambridge, Massachusetts
Raytheon Integrated Defense Systems; Portsmouth, Rhode Island
Ocean Power Technologies; Pennington, New Jersey
Harris Corporation; Melbourne, Florida
ARL:UT; Austin, Texas
JHU/APL; Laurel, Maryland
Orincon Defense; San Diego, California

Airborne Laser Mine Detection System (ALMDS)

Description
The ALMDS is an organic, high-area coverage, electro-optic Airborne Mine Countermeasures (AMCM) laser system that detects, classifies, and localizes floating and near-surface moored sea mines. Deployed from the MH-60S helicopter, ALMDS will satisfy the Navy's need for a quick-response, wide-area, organic MCM reconnaissance system that can rapidly detect and classify mine-like contacts for subsequent prosecution. This capability will be critical in littoral zones, confined straits, choke points, and Amphibious Objective Areas. ALMDS offers a much greater area search rate than other types of AMCM equipment, and it represents a capability that does not exist in the current inventory.

Status
A competitive contract was awarded in April 2000 for development of an integrated ALMDS system for the MH-60S. Milestone C and LRIP I are scheduled for FY 2005. The IOC is scheduled for CY 2008.

Developers
Northrop Grumman; Melbourne, Florida

AQS-20A Mine-Hunting Sonar

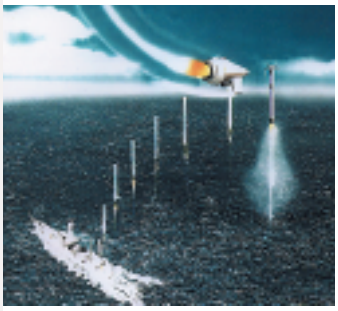
Description
The AQS-20A is an underwater mine-detection sonar that also employs an Electro-Optic Identification (EOID) sensor capable of locating and identifying bottom, close-tethered, and moored sea mines. The AQS-20A mine-hunting system will be deployed and operated from the MH-60S helicopter as one of five organic Airborne Mine Countermeasures (AMCM) weapon systems resident in the carrier battle group. The AQS-20A system will also serve as the mine sensor subsystem of the Remote Mine Hunting System (RMS) hosted onboard Navy surface warships. The operational RMS system will be installed in the *Arleigh Burke* (DDG-51) Flight IIA Aegis guided missile destroyers beginning with DDG-91 (see separate program summaries for the MH-60S, RMS, and DDG-51 programs).

Status
The IOC for program integration and testing with MH-60S helicopters is scheduled for FY 2007. Improvements to Computer

Aided Detection/Computer Aided Classification and Environmental Data Collection capabilities are being implemented via enhanced research and development efforts.

Developers
Raytheon; Portsmouth, Rhode Island

Nulka Radar Decoy System

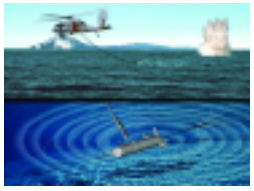


Description
Nulka is an active, off-board, ship-launched decoy developed in cooperation with Australia to counter a wide spectrum of present and future radar-guided anti-ship cruise missiles. The Nulka decoy employs a broadband radio frequency repeater mounted atop a hovering rocket platform. After launch, the Nulka decoy radiates a large, ship-like radar cross-section flying a trajectory that seduces and decoys incoming ASCMs away from their intended targets. Australia developed the hovering rocket, launcher, and launcher interface unit. The U.S. Navy developed the electronic payload and fire control system. The existing MK-36 Decoy Launching System (DLS) has been modified to support Nulka decoys, resulting in the MK-53 DLS.

Status
Nulka received milestone III approval for full-rate production in January 1999; installation began on U.S. and Australian warships in September 1999.

Developers
BAE; Australia
SECHAN Electronics Inc.; Lititz, Pennsylvania
Lockheed Martin Sippican; Marion, Massachusetts

Organic Airborne and Surface Influence Sweep (OASIS)



Description
The OASIS system will provide the strike group with an organic, high-speed, magnetic/acoustic influence minesweeping capability to effectively neutralize sea mine threats in operating areas where mine hunting is not possible due to mine burial or high bottom clutter. The OASIS system is one of five under-development Airborne Mine Countermeasures (AMCM) weapon systems to be deployed and operated from the MH-60S helicopter (see MH-60S program summary).

Status
The OASIS program has been aligned with the MH-60S Organic Airborne Mine Countermeasure (OAMCM) program schedule. IOC is scheduled for 2008.

Developers
EDO Corporation; New York, New York

Shipboard Protection System (SPS)-
Integrated Radar/Optical Sighting and Surveillance System (IROS3)

Description

SPS Increment I is designed to augment current Naval Force Protection Tactics and Doctrine by providing a means to detect, classify, and engage real-time surface threats at close-range to ships in port, at anchor, and while transiting choke points or operating in restricted waters. The system will provide 360-degree Situational Awareness (SA) and will employ COTS integration to support incremental modifications as needed to tailor the system to the mission. It will provide the capability to bridge current and future technology to ships by integrating current Force Protection initiatives and combat system technologies while sustaining mission-capable combatant force levels.

IROS3 is a prototype system installed in the USS *Ramage* (DDG-61) as the functional demonstration of what will become the SPS Increment I. IROS3 employed COTS-based/open architecture products, and its key components include the SPS-73 surface search radar or equivalent electro-optical/infra-red devices, an integrated surveillance system, spotlights, long range acoustic devices, and remotely operated stabilized small arms mounts. The prototype system installed in*Ramage* gained valuable fleet feedback, lessons learned, and integrated logistics support information which helped define requirements for competitive contracting of SPS Increment I.

Status

SPS was approved at Milestone B for system design and development in January 2005. Capabilities development document was approved in January 2005. The CDD will enable competitive procurement by the end of FY 2005.

Developers

To be determined.

Solid-State SPY Radar (SS-SPY) Next-generation S-Band, Theater Air & Missile Defense, Multi-function Advanced Active Phased-Array Radar

Description

The SS-SPY advanced S-Band radar system is being developed as the primary air and surface radar for the Navy's next-generation cruiser CG(X). It is a multi-function, active phased-array radar capable of search, detection, tracking of air and surface targets, and missile engagement support. The advanced functions of this radar include multi-mission performance in a stressing environment that will enable simultaneous defense from all Theater Air and Missile Defense (TAMD) threats. The multi-mission capability

will be effective in both air dominance of the battlespace (Area Air Warfare) and in defense against ballistic missiles.

Status
The SS-SPY Radar is being developed as a competitive program through research and development programs including the S-Band Advanced Radar prototype and the Active S-Band Radar program for the USNS *Observation Island* (T-AGM 23) replacement ship. Down-select for the SS-SPY program is planned for 2008.

Developers
To be determined.

SPQ-9B Radar Anti-Ship Cruise Missile (ASCM) Radar Improvement Program

Description
The SPQ-9B is a slotted, phased-array, rotating radar that significantly improves the ability of ships to detect and track low-altitude ASCMs in a heavy clutter environment. Its high-resolution track-while-scan, X-band, pulse-Doppler radar enables detection and establishment of a firm track at ranges, allowing the combat system to engage subsonic or supersonic sea-skimming missiles at the outer edge of a ship's engagement envelope.

SPQ-9B integrates with SSDS MK-2 on aircraft carriers and amphibious assault ships. Together these systems improve those ships' ASCM defense capabilities to pace the evolving worldwide threat. The SPQ-9B is also an integral part of the Cruiser Modernization program, providing an ASCM cue to the Aegis Combat System.

Status
The SPQ-9B is being fielded in conjunction with SSDS MK-2 and CG Modernization.

Developers
Northrop Grumman; Melville, New York

SPY-1 Aegis Multi-function Phased-Array Radar

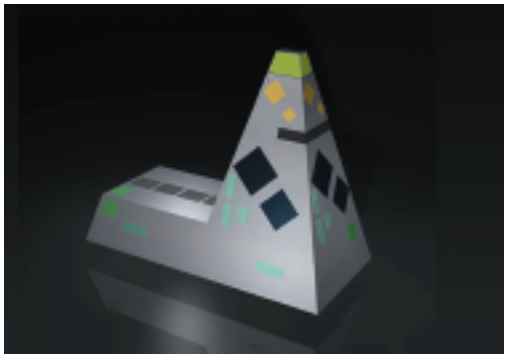
Description
The SPY-1 radar system is the primary air and surface radar for the Aegis Combat System installed in the *Ticonderoga* (CG-47) and *Arleigh Burke* (DDG-51)-class warships. It is a multi-function, passive phased-array radar capable of search, automatic detection, transition to track, tracking of air and surface targets, and missile engagement support. The fifth variant of this radar, SPY-1D(V), improves the radar's capability against low-altitude, reduced radar cross-section targets in heavy clutter environments,

and in the presence of intense electronic countermeasures. The SPY-1 Series radars are also used to detect, track, and engage theater ballistic missiles on select Aegis Cruisers and Destroyers.

Status
The SPY-1D(V) littoral radar upgrade supersedes the SPY-1D in new-construction Flight IIA destroyers that began in FY 1998. Operation evaluation is planned for summer 2005. SPY-1D(V) is installed in DDGs-91 through 98 and planned for installation in DDG-99 through 112.

Developers
Lockheed Martin; Moorestown, New Jersey
Raytheon; Sudbury, Massachusetts

SPY-3 Multi-Function Radar (MFR)



Description
The SPY-3 MFR is an X-band active phased-array radar designed to meet all horizon search and fire control requirements for the 21st century fleet. MFR is designed to detect the most advanced low-observable Anti-Ship Cruise Missile (ASCM) threats and support fire-control illumination requirements for the Evolved Sea Sparrow Missile (ESSM), the Standard Missile II (SM-2) and future missiles required to engage the most stressing ASCMs. The MFR also supports the new ship-design requirement for reduced radar cross-section, significantly reduced manning (no operators), and total ownership cost reduction. The MFR is planned for introduction in DD(X) and the next-generation CVN-21 aircraft carriers.

Status
An engineering and manufacturing development two-faced radar unit is installed at Wallops Island Test Facility and has completed DTA1-410 testing. Follow-on production of the MFR is planned to support equipment delivery schedules for DD(X) and CVN-21. The MFR will be fielded as an integrated radar with the S-Band Volume Search Radar (VSR), together referred to as the Dual-Band Radar Suite (DBRS). The Engineering Development Model is being tested at Wallops Island Test Facility through FY 2006. OPEVAL will occur with DD(X) testing. IOC for the DBRS is expected to be 2013.

Developers
Northrop Grumman Ship Systems (Prime);
Pascagoula, Mississippi
Raytheon Electronic Systems (Subcontractor);
Sudbury, Massachusetts

SQQ-89 Anti-Submarine Warfare (ASW) Combat System

Description

The SQQ-89 ASW combat system suite provides *Oliver Hazard Perry* (FFG-7), *Spruance* (DD-963), *Ticonderoga* (CG-47), and *Arleigh Burke* (DDG-51)-class surface warships with an integrated undersea warfare detection, classification, display, and targeting capability. The system combines and processes all sonar information, and processes and displays all SH-60B Light Airborne Multi-Purpose System (LAMPS) MK III sensor data. The current system comprises the following subsystems:

- ***SQS-53C/D active/passive hull-mounted sonar (SQS-56 in FFGs)***
- ***SQR-19 Tactical Towed Array System (TACTAS)***
- ***MK-116 ASW fire control system***
- ***SQQ-28 sonobuoy processor***
- ***SRQ-4 SH-60B helicopter data link***
- ***UYQ-25B Sonar In-situ Mode Assessment System (SIMAS)***
- ***USQ-132 Tactical Display Support System (TDSS)***
- ***SQQ-89(T) Onboard Trainer (OBT)***

The analog receivers of the SQS-53A/B hull-mounted sonar are being upgraded to digital by the use of COTS processors, and are redesignated SQS-53D. Planned improvements to the SQQ-89(V) include:

- ***MH-60R (LAMPS MK III) integration***
- ***SRQ-4 Data Link Upgrade***
- ***Multi-Function Towed Array (MFTA) that will provide low and mid-frequency bi/multi-static receiver capability between the SQS-53C, the MH-60R Airborne Low-Frequency Active Sonar (ALFS), and off-board systems***
- ***Remote Minehunting System (RMS) processing and display***
- ***Echo Tracker Classifier (ETC) active classification capability***
- ***SIMAS upgrade to updated performance prediction models***
- ***Computer-Aided Dead-Reckoning Table (CADRT)***
- ***Torpedo Recognition and Alertment Functional Segment (TRAFS)***

Status

New system acquisitions are for DDG-51 new-construction. Required modernization of existing systems for the shallow water littoral warfare environment is being accomplished by the use of COTS processors and displays. Starting in FY 2003, SQQ-89(V)15+MFTA systems, designated SQQ-89A(V)15, were being procured for back-fit installations in CG-47 surface warships, with DDG-51 warships beginning back-fit in FY 2008. SQQ-89A(V)15

was accelerated from FY 2009 to FY 2006 . The first system will be purchased in FY 2006 and installed in FY 2008 with 33 follow-on units purchased across the FYDP. Six DDG Scaled Improved Performance Sonar (SIPS) upgrades will begin backfit in FY 2006 with a follow-on of 24 more units across the FYDP.

Developers
Lockheed Martin; Syracuse, New York
Advanced Acoustic Concepts; Hauppauge, New York

Ship-Self Defense System (SSDS)

Description
SSDS provides the integrated combat system for aircraft carriers and amphibious ships, enabling them to keep pace with the anti-ship cruise missile (ASCM) threat. Moving toward an open-architecture distributed-processing system, SSDS integrates the detection and engagement elements of the combat system. With automated weapons control doctrine, Cooperative Engagement Capability (CEC), and enhanced battlespace awareness, SSDS provides these ships with a robust self-defense capability in support of Sea Shield.

Status
SSDS was approved for full-rate production following operational testing in 1997. Initial Operational Capability (IOC) occurred in 1997 with the deployment of SSDS MK-1 in the USS *Ashland* (LSD-48). SSDS MK-1 has subsequently been installed in all 12 *Whidbey Island* (LSD-41)-class ships. A more advanced version, SSDS MK-2, is being fielded in aircraft carriers, the USS *Wasp* (LHD-1) and *San Antonio* (LPD-17) ship classes. By the end of 2011, 21 ships will have received the SSDS MK-2 system, including the Self-Defense Test Ship.

Developers
Raytheon; San Diego, California
Technical support: Johns Hopkins University Applied Physics Laboratory; Laurel, Maryland and Naval Surface Warfare Centers; Port Hueneme, California, Dahlgren and Dam Neck, Virginia

Surface Electronic Warfare Improvement Program (SEWIP) Block 1 Upgrade

Description
SEWIP is a spiral development block upgrade program for the SLQ-32 Electronic Warfare (EW) system, which are installed on all combatants and auxiliaries in the U.S. Navy, with total fleet-wide population of 170 systems.

Block 1A replaces the processor with Electronic Surveillance Enhancement (ESE) and display console with UYQ-70. The ESE and UYQ-70 are integrated with Improved Control and Display (ICAD) software. Block 1A also improves Human Machine Interface of the SLQ-32.

Block 1B adds Specific Emitter Identification (SEI) capability which offers 95 percent platform identification accuracy; it will be deployed initially as a stand-alone SSX-1 systems (Block 1B1) pending integration of SEI with other capabilities (Block 1B2).

Block 1B3, High Gain High Sensitivity (HGHS), receiver functionality provides improved situational awareness through non-cooperative detection and ID of all airborne platforms, beyond radar horizon and overland passive surveillance supporting all mission areas, provides extended Nulka queuing ranges. Additional improvements (e.g. initial Network-Centric Warfare Electronic Support (NCWES) interfaces) and upgraded software and displays provide integration of capabilities.

Block 1C will incorporate Block 1A and 1B upgrades for active ships (CVN, CG, LHD, LHA) and two-way connectivity to Global Command Control System-Maritime netting all Electronic Warfare assets, both local and national.

Status
SEWIP was established as an ACAT II program in July 2002 as a replacement of the cancelled Advanced Integrated Electronic Warfare System (AIEWS). Acquisition Decision Memorandum (ADM) of August 13, 2002 authorized the SEWIP to proceed with Block 1A and initiate development of Blocks 1B and 1C. Block 1A Stand-Alone ESE reached at Milestone C/Low Rate Initial Production (LRIP) decision on January 31,2005. ICAD/UYQ-70 LRIP is currently planned for the third quarter of FY 2005, and Block 1A full-rate production is planned for FY 2006. Block 1B1, SSX-1, has been authorized as a Rapid Deployment Capability (RDC) for fielding stand-alone SEI capability. Development efforts of Blocks 1B2 and 1B3 are progressing toward FY 2006 TECHEVAL/OPEVAL.

Developers
Northrop Grumman PRB; Goleta, California
Lockheed Martin; Eagan, Minnesota
General Dynamics AIS; Fairfax, Virginia

Surface Ship Torpedo Defense (SSTD)

Description
The SSTD project consists of the WSQ-11 Torpedo Defense System, the SLQ-25A Nixie towed torpedo countermeasure, and

surface ship deployed acoustic decoys. The purpose of these systems is to provide underwater torpedo protection for all major surface ship types to include aircraft carriers, surface combatants, logistics ships, and military sealift command (MSC) Ships.

The WSQ-11 Torpedo Defense System includes the functionality of the Nixie Countermeasure as well as a towed Detection, Classification, and Localization (DCL) subsystem comprised of sensors and a processor, and a hard kill Anti-Torpedo Torpedo (ATT). The ATT is a 6.75-inch diameter torpedo sized to approximately match the form factor of submarine launched countermeasures. The DCL component consists of a towed, active/passive sonar to include a high power transmission source and an acoustic intercept receiver. The DCL array is sized to fit on the existing Nixie handling equipment and use the same deck space and electronics cabinets. The DCL subsystem can trigger an ATT engagement in either automatic or semi-automatic modes, a manual ATT launch mode is also available.

The SLQ-25A Nixie is a towed electro-acoustic countermeasure currently in service with the fleet. Performance, reliability, and countermeasure upgrades have been in progress since 2004 and will continue through 2009. In addition to Nixie, over-the-side deployed Acoustic Decoys are being acquired to provide an effective and low cost near term solution to the torpedo defense problem.

Status

The SSTD project is on track to meet the near term objective of concurrently developing and demonstrating the DCL subsystem and the ATT. Contracts have recently been awarded by NAVSEA to two prime contractors for the purpose of developing two independent DCL systems that will be tested side by side at sea in a late FY 2006 demonstration. This demonstration will include the firing of approximately ten torpedo test vehicles simulating threat torpedoes against each of the two systems for evaluating their effectiveness. The ATT is currently in development at the Penn State University Applied Research Laboratory (ARL) and is undergoing an aggressive testing and development phase with a major in water tests in FY 2006 and 2007. The ATT effort and DCL effort will marry up following these demonstrations. The SSTD project is expected to meet a milestone B acquisition program decision in early FY 2007 with delivery to the fleet by late FY 2011.

Developers

Anti-Torpedo Torpedo: Penn State Applied Research Laboratory; State College, Pennsylvania
DCL Systems: Advanced Acoustic Concepts; Long Island, New York, Ultra Electronics; Braintree, Massachusetts
Technical Design Authority: The Naval Undersea Warfare Center; Newport, Rhode Island

Tactical Control System (TCS)

Description

TCS provides interoperability and commonality for mission planning, Command and Control (C2), and C4I interfaces for tactical and medium altitude UAVs. TCS provides a full range of scaleable UAV capability from passive receipt of air vehicle and payload data to full air vehicle and payload C2. TCS offers the warfighter a common core operating environment to receive, process, and disseminate UAV data from two or more different UAV types for reconnaissance, surveillance, and combat assessment. In conjunction with Fire Scout and LCS, TCS is positioned to support Sea Shield/Sea Basing pillars and to operate within the FORCEnet architecture.

Status

TCS restructure was completed in order to comply with FY 2004 congressional language. The program meets congressional direction to achieve standards-based interoperability and support Navy UAV requirements. TCS also supports Joint Operational Test Bed System operations. TCS continues development of an architecture that includes the following capabilities:

- ***Standards based implementation. TCS is incorporating NATO***
- ***STANAG 4586 for interoperability***
- ***VTUAV (Fire Scout) functionality and integration with LCS. TCS will IOC with Fire Scout and LCS Flight 0 in FY 2008***
- ***Plug and play capability***

TCS flight-testing was initiated in FY 2003 and continues in conjunction with the Fire Scout Program. TCS will be integrated, tested, and fielded in accordance with the schedules of future Navy UAV programs.

Developers

System Integrator, Raytheon Systems Inc.; Falls Church, Virginia

UQQ-2 SURTASS/Low Frequency Active (LFA)

Description

The LFA system, the active adjunct to the SURTASS sonar system, is capable of long-range detections of submarine and surface ship contacts. It comprises a low-frequency active sonar transmitter deployed below a SURTASS ship, with the SURTASS passive towed array acting as the receiver. Other Navy ships with towed arrays and compatible processing systems can also process the LFA signal returns in what is known as a "bi-static" mode. As a mobile system, SURTASS/LFA can be employed as a force-protection sensor wherever the force commander directs, including in forward operating areas or in support of battle group activities. A UHF

SATCOM communication system provides direct voice and data connectivity between the SURTASS/LFA ship and tactical platforms.

Two LFA systems exist, installed onboard USNS *Impeccable* (T-23) and the leased R/V *Cory Chouest*. Development continues for future LFA-type active systems employing smaller, lighter sources.

Status
SURTASS LFA was successfully reintroduced to the fleet in January 2003 following a five-year hiatus for completion of the Environmental Impact Statement (EIS) process. Several non-governmental organizations filed suit, alleging violation of various environmental laws. In October 2003 a Federal District Court enjoined testing and training with LFA for violation of the procedural requirements of the Marine Mammal Protection Act, Endangered Species Act, and National Environmental Policy Act, notwithstanding the court's finding that a national security need existed for employment of LFA and commended the Navy for the breadth of scientific research supporting the EIS. Subject to this injunction, LFA may conduct operations in certain areas within the Philippine Sea, East China Sea, South China Sea, and the Sea of Japan. Currently the program consists of the USNS *Impeccable* (T-23) and one leased vessel R/V *Cory Chouest*.

Developers
Alpha Marine; Galliano, Louisiana
Lockheed Sanders; Manchester, New Hampshire
Raytheon Systems; Portsmouth, Rhode Island

UQQ-2 Surface towed Array Sensor System

Description
The SURTASS capability consists of a mobile fleet of five ships that employ the fleet's most capable deep and shallow water (littoral zone) passive-acoustic towed-array sonar systems. These ships provide passive detection of quiet nuclear and diesel submarines and real-time reporting of surveillance information to theater commanders and operational units. SURTASS employs either a long-line passive-sonar acoustic array or a shorter twin-line passive-sonar acoustic array. The twin-line system is the best operational shallow water towed array and the only multi-line towed array in the Navy. It consists of a pair of arrays towed side-by-side from a SURTASS ship and offers significant advantages for undersea surveillance operations in the littoral zone. It can be towed in water as shallow as 180 feet, provides significant directional noise rejection, offers bearing ambiguity solution without turning, allows the ship to tow at higher speed, and results in a shorter time to stabilize the array after a turn.

Status
Five SURTASS vessels are operational in the Pacific Fleet. The first production model TB-29A twin-line SURTASS array is being installed in FY 2005, and four SURTASS vessels will have TB-29A twin line arrays by FY 2006. SURTASS is also being upgraded with the Integrated Common Processor (ICP) that will result in increased operator proficiency, increased functionality and savings in Logistics Support and Software Maintenance.

Developers
Lockheed Martin; Syracuse, New York, Manassas, Virginia, Norfolk, Virginia
General Dynamics—Advanced Information Systems; Anaheim Hills, California
Johns Hopkins University/APL; Laurel, Maryland;
IUSS Operations Support Center, Norfolk, Virginia

S-Band Volume Search Radar (VSR)

Description
The Volume Search Radar (VSR) is an S-band active phased-array radar designed to meet all above-horizon detection and tracking requirements for the 21st-century ships without area air-defense missions, specifically DD(X). VSR will provide long-range situational awareness with above horizon detection and air control (marshalling) functionality, replacing the functionality of today's SPS-48E, SPS-49, and SPN-43 radars. A non-rotating phased array, VSR provides the required track revisit times to deal with fast, low/very low-observable, and high-diving missile threats, providing cueing for the SPY-3 Multi-Function Radar (MFR) to conduct required tracking and fire control functions above the horizon.

Status
Engineering and Manufacturing Development unit build is underway for development, testing, and follow-on production of VSR to support equipment delivery schedules for DD(X) and CVN-21. S-VSR will be fielded as an integrated radar with the SPY-3 MFR, together referred to as the Dual-band Radar Suite (DBRS). The VSR Engineering Development Model will be integrated with MFR and tested at Wallops Island Test Facility in FY 2006. OPEVAL will occur with DD(X) testing. Initial Operational Capability for the DBRS is expected to be 2013.

Developers
Northrop Grumman Ship Systems (Prime); Pascagoula, Mississippi
Raytheon Electronic Systems (Subcontractor—VSR); Sudbury, Massachusetts
Lockheed-Martin Maritime Sensors & Systems (Subcontractor to Raytheon—VSR Antenna System); Moorestown, New Jersey