U.S. NAVY | PROGRAM GUIDE 2015

INTRODUCTION

The U.S. Navy remains the world's preeminent maritime force. Our Sailors and civilian employees operate forward, around the globe, providing American leaders options to safeguard and advance our national security interests. U.S. Navy forces are inherently self-sustaining—we can operate anywhere, independently, at any time.

Six priorities guide today's planning, programming and budgeting decisions: (1) maintain a credible, modern, and survivable sea-based strategic deterrent; (2) sustain forward presence, distributed globally in places that count; (3) preserve the means to win decisively in one multi-phase contingency operation and deny the objectives of another aggressor in a second region; (4) focus on critical afloat and ashore readiness to ensure the Navy is adequately funded and ready; (5) enhance the Navy's asymmetric capabilities in the physical domains as well as in cyberspace and the electromagnetic spectrum; and (6) sustain a relevant industrial base, particularly in shipbuilding.

Our dedication to the mission begins with the people we serve. Ready Sailors, civilians, and families remain the foundation of the Navy's warfighting capability. We will continue to provide services and support to ensure that our people remain resilient and ready. We have a revised framework starting in 2015 called the Optimized Fleet Response Plan that will better prepare our units and crews, while making deployments more predictable. We are rewarding service at sea through increased sea pay and incentive pay. We are investing in higher Quality of Service initiatives such as barracks improvements, expanded use of tactical trainers and schools, and increased funding for spare parts and tools. We will continue robust support for vital programs aimed at the safety, health, and well-being of our Sailors.

We will continue to faithfully serve our Nation along with our primary joint partner, the U.S. Marine Corps. Together, we are America's "force in readiness," prepared to promptly respond to contingencies, crises, and conflicts anywhere around the globe.

In 2014, our Nation's rebalance to the Asia-Pacific continued with the deployment of new platforms and added capabilities. At the end of Fiscal Year 2014, we had 41 ships and submarines based in theater. In 2020, we will have 54 ships and submarines based in theater. We remain on track to add two guided-missile destroyers to Japan (one each in 2015 and 2017), an attack submarine to Guam in 2016, and two littoral combat ships each to Singapore in 2015 and 2017. These are all crucial to maintaining the free flow of goods, services, and ideas across the region on which our Nation, allies, and partners rely. Rotational and forward-deployed forces have also participated in exercises across the Pacific Rim, including Rim of the Pacific 2014, Bold Alligator, and Valiant Shield, maintaining and expanding our Nation's strategic relationships with regional partners.

In the Middle East, our forward-deployed naval forces remain essential to support partners throughout the region to maintain peace, manage change, deter aggression, and address threats to stability in one of the world's key energy-producing regions. In 2014, for example, we maintained one carrier strike group and one amphibious ready group deployed in Middle East regions and forward-deployed four mine countermeasure ships and all ten of the Navy's coastal patrol ships to Bahrain.

Numerous Navy deployments help maintain global stability, providing maritime security and deterrence worldwide. Our naval forces in Europe operate adjacent to strategic maritime crossroads from the Suez Canal in the east to the Strait of Gibraltar in the west. In 2014 we forward-based two guided-missile destroyers to Rota, Spain, the USS Donald Cook and USS Ross, and are on track to forward-base two more destroyers in 2015. We have also begun construction of the Aegis Ashore support infrastructure in Romania. Our fleet continues to contribute to coalition counter-piracy operations around the Horn of Africa. In our own hemisphere, the port and airfield at Guantanamo Bay provide a vital link to Latin America and the maritime crossroads around the Panama Canal. We also continue to maintain a presence in the region to counter illegal trafficking.

This year's *2015 Navy Program Guide* marks a transition to a new two-year (bi-annual) publication schedule. Like previous Navy Program Guides, the *2015 Navy Program Guide* describes the platforms, payloads, systems, and technologies already fielded, and those being developed, to ensure the Navy continues to meet our Nation's enduring maritime needs. These programs will continue to embrace our three fundamental tenets of *Warfighting First, Operate Forward,* and *Be Ready*.

We will continue to balance future investments to ensure we are prepared to execute today's missions. We have aligned strategic and fiscal choices to maximize value without compromising the mission. The *2015 Navy Program Guide* reflects those values. It is our duty to ensure that Tomorrow's Fleet will continue to meet our Nation's needs with platforms, payloads, and people ready for the challenges that lie ahead.

SECTION 1

NAVAL AVIATION

Naval Aviation is a critical component of the Nation's ability to carry out full-spectrum operations in the 21st Century—from delivering humanitarian assistance and disaster relief at home and overseas, to maritime security operations to ensure safe passage of commercial vessels, to high-intensity sea control and power projection in a major contingency. Helicopters and fixed-wing aircraft operating from nuclear aircraft carriers, large-deck amphibious ships and shore stations, and helicopters operating from amphibious ships, cruisers, and destroyers—complemented by advanced unmanned aerial vehicles—are key contributors to the capabilities of the U.S. Navy and Marine Corps.

AIRCRAFT CARRIERS

CVN 68 *Nimitz*-Class and CVN 78 *Ford*-Class Aircraft Carrier Programs

Description

The U.S. Navy's aircraft carriers, in combination with their embarked air wings and strike group warships, provide the proper balance between forward presence and surge capability to conduct warfighting and peacetime operations around the globe in support of national priorities. Sailing the world's oceans, each carrier strike group possesses a versatile, lethal, and independent striking force capable of engaging targets at sea or hundreds of miles inland. The unique mobility and independence of aircraft carriers provide unmatched global access that requires no host-nation support. Nuclear-powered aircraft carriers (CVNs) can remain on-station for months at a time, replenishing ordnance, spare parts, food, consumables, and aircraft fuel while simultaneously conducting air strikes and other critical missions. This capability demonstrates the carrier's remarkable operational flexibility and self-reliance so vital to conducting time-critical strike operations. Aircraft carriers and their strike groups are always ready upon arrival and are either on-station ready to deliver or just a few short days away from where they will be needed.

To meet the demands of 21st-Century warfare, U.S. aircraft carriers will deploy with air wings comprising the newest and most-capable aviation platforms, including the FA-18 *Super Hornet*, EA-18G *Growler*, F-35C *Lightning II*, E-2D *Advanced Hawkeye*, and, in the not-too-distant future, the Unmanned Carrier-Launched Airborne Surveillance and Strike System (UCLASS). Joint concepts of operation, centered on the aircraft carrier, will additionally leverage the military strengths of all the services, bringing cooperative muscle to the fight and a potent synergy across the warfare continuum.

Following the inactivation of the USS Enterprise (CVN 65) in December 2012, after more than 51 years of service, the Navy has been fulfilling its mission with a reduced force structure of ten aircraft carriers, as authorized by the National Defense Authorization Act for Fiscal Year 2010. The force will increase to the statutory requirement of 11 aircraft carriers when Gerald R. Ford (CVN 78) is delivered to the Navy in the second quarter of FY 2016.

The lead ship of the first new class of aircraft carriers, CVN 78 has been under construction since 2008. The *Ford*-class is designed with increased efficiency throughout the ship, aimed at reducing the total operating cost by approximately $4 billion dollars per hull when compared to the *Nimitz* (CVN 68)-class carriers. In converting all auxiliary systems outside the main propulsion plant from steam to electric power, the requirement for costly steam, hydraulic, and pneumatic piping, as well as the repair of those distributed systems, will be significantly reduced. The advanced and more efficient reactor plant provides an electrical generating

capacity nearly three times that of a *Nimitz*-class carrier, enabling such new technologies such as the Electromagnetic Aircraft Launch System (EMALS) and advanced command-and-control systems. The new ship design, which is based on the *Nimitz* hull, also includes the Advanced Arresting Gear system and Dual-Band Radar. The redesigned flight deck, which incorporates a smaller island structure located further aft on the ship, allows greater flexibility during aircraft turnaround and launch-and-recovery cycles, leading to at least a 33 percent increase in daily sortie generation-rate capability. Combined, these new technologies and more efficient systems will enable the *Ford*-class ships to operate with between 500 and 900 fewer Sailors than the *Nimitz* class.

Status

Construction of Gerald R. Ford, the lead ship in the CVN 78 program, was 80 percent complete in October 2014 at Huntington Ingalls Industries/Newport News Shipbuilding. The ship is scheduled for delivery to the Navy in 2016. Keel laying for CVN 79 is planned for 2015.

Developers

Huntington Ingalls Industries Newport News, Virginia

Image courtesy of HII Newport News Shipbuilding.

AIRCRAFT

AH-1Z and UH-1Y Helicopter Upgrades

Description

The H-1 Upgrade Program replaces the UH-1N and AH-1W aircraft with new UH-1Y and AH-1Z four-bladed, all-composite rotor system helicopters. The program will ensure that the Marine Air-Ground Task Forces possess credible rotary-wing attack and utility support platforms for the next 20 years. The H-1 program will reduce life-cycle costs, significantly improve operational capabilities, and extend the service lives of both aircraft. There is 85 percent commonality between the two aircraft. This greatly enhances the maintainability and readiness of the systems by leveraging the ability to support and operate both aircraft within the same squadron structure. The program includes a new, four-bladed, all-composite rotor system, coupled with a sophisticated, fully integrated glass cockpit. It also incorporates a performance-matched transmission, four-bladed tail rotor drive system, and upgraded landing gear. The integrated glass cockpit with modern avionics systems provides a more lethal platform as well as enhanced joint interoperability. Operational enhancements include a dramatic increase in range, speed, survivability, payload, and lethality of both aircraft, with a significant decrease in logistics footprint. The UH-1Y *Huey/Venom* helicopter operates at nearly twice the in-service range, with more than double the payload. The AH-1Z *Super Cobra* helicopter realizes similar performance increases, with the ability to carry twice the in-service load of precision-guided munitions.

Status

Through the end of FY 2014, 208 H-1 aircraft were on contract (132 UH-1Y, 76 AH-1Z), with 102 UH-1Ys and 39 AH-1Zs delivered as of September 2014. AH-1Z full-rate production was achieved on November 28, 2010, and at the same time the H-1 Upgrades program was designated an ACAT-1C program. AH-1Z initial operational capability was reached on February 24, 2011. The UH-1Y made its initial deployment with the 13th MEU from January to June 2009, and the UH-1Y has conducted sustained combat operations in *Operation Enduring Freedom* since November 2009. The Marine Corps fleet of utility aircraft now comprises solely UH-1Ys, as the final UH-1N retired in September 2014. The UH-1Y and AH-1Z have been aggressively deployed ahead of their respective material support dates, in an effort to support our deployed troops with the most capable aircraft available. The H-1 Upgrade program of record is for 160 UH-1Ys and 189 AH-1Zs.

Developers

Bell Helicopter Textron — Fort Worth, Texas; Amarillo, Texas

AV-8B *Harrier II+* Vertical/Short Take-Off and Landing (V/STOL) Aircraft

Description

The AV-8B *Harrier* is a single-seat, light attack aircraft that supports the Marine Air-Ground Task Force (MAGTF) commander by engaging surface targets and escorting friendly aircraft, day or night, under all weather conditions during expeditionary, joint or combined operations. By virtue of its vertical/short takeoff and landing (V/STOL) capability, the AV-8B can operate from a variety of amphibious ships, rapidly constructed expeditionary airfields, forward sites—e.g., roads and forward operating bases—and damaged conventional airfields. Two variants of the aircraft are in service, the AV-8B II *Night-Attack Harrier* and the AV-8B II+ *Radar Harrier*. The *Night-Attack Harrier* improved the original AV-8B design through incorporation of a navigation, forward-looking infrared sensor, a digital color moving map, night-vision goggle compatibility, and a higher performance engine. The in-service *Radar Harrier* has all the improvements of the *Night-Attack Harrier* plus the APG-65 multi-mode radar. The fusion of night and radar capabilities allows the *Harrier II+* to be responsive to the MAGTF's needs for expeditionary, night, and adverse-weather offensive air support.

Status

The Harrier Operational Flight Program H6.0 integrated the digital improved triple-ejector racks for increased carriage capacity for Joint Direct Attack Munition, fully integrated ALE-47 airborne warning hardware and software, adjustments for improving moving-target engagements, improved radar capa-

bility, and safety improvements, as well as AIM-120 A/B flight clearance. In the first half of 2015, the AV-8B will receive the H6.1 Operational Flight Program (OFP), enabling full integration of the Generation 4 LITENING targeting pod, as well as correction of noted software deficiencies to smart weapon employment and targeting. It will also bring a Common OFP for LITENING to the AV-8B, enabling the LITENING pod to be interchanged between F/A-18 *Hornets* and AV-8Bs without any software reloads. Airborne Variable Message Format terminals will be installed in the AV-8B, enabling the AV-8B to have the joint standard digital-aided close air support technology. Other near-term capability upgrades in FY 2015 include the digital video recorder, BRU-70/A digital improved triple ejector rack, and expanded carriage of the AIM-120 missile. The next major step for the aircraft is Link-16 integration into all AV-8B II+ aircraft and continued development of digital interoperability in the future network infrastructure.

Developers

Boeing — St. Louis, Missouri

C-2A(R) *Greyhound* Logistics Support Aircraft

Description

The C-2A *Greyhound* is the Navy's medium-lift/long-range logistics support aircraft. Capable of operational ranges up to 1,000 nautical miles, the C-2A can transport payloads up to 10,000 pounds between aircraft carrier strike groups and forward logistics sites. The Greyhound's cargo bay can be rapidly reconfigured to accommodate passengers, litter patients, or time-critical cargo. The large rear cargo ramp allows direct loading and unloading for fast turnaround and can be operated in flight to airdrop supplies and personnel. Equipped with an auxiliary power unit for unassisted engine starts, the C-2A can operate independently from remote locations. The versatile *Greyhound* can also provide medical evacuation as well as special operations and distinguished visitor transport support.

Status

The aircraft has undergone several modifications and a service life extension program that extended the *Greyhound*'s service life until 2028. The Navy completed an updated study of alternatives to field a new carrier-suitable, manned, aerial logistics aircraft by 2026.

Developers

Northrop Grumman — Bethpage, New York

C-40A *Clipper* Navy Unique Fleet Essential Airlift (NUFEA)

Description

The Naval Air Force Reserve provides 100 percent of the Navy's organic intra-theater logistics airlift capability via its Navy Unique Fleet Essential Airlift community. NUFEA provides Navy component commanders with short-notice, fast response intra-theater logistics support for naval power projection worldwide. The legacy C-9B and C-20G aircraft are being replaced by the C-40A *Clipper*, a modified Boeing 737-700/800 series aircraft. This state-of-the-art aircraft can transport 121 passengers (passenger configuration), 40,000 pounds of cargo (cargo configuration), or a combination of the two (combination configuration), at ranges greater than 3,000 nautical miles at Mach 0.8 cruise speed. The unique ability to carry cargo pallets and passengers simultaneously maximizes the operational capability, safety, and capacity. The C-40A has an electronic flight deck fully compliant with future communications, navigation, and air traffic control mandates; advanced technology Stage III noise-compliant, fuel-efficient engines; and an integral cargo door/cargo handling system. Maximum gross takeoff weight is 171,000 pounds.

Status

Twelve aircraft are in the C-40A inventory in early 2015, with three additional aircraft on contract to replace Navy's last C-9B aircraft. The Navy has purchased the aircraft via commercial-off-the shelf standards using standard best commercial practices. C-40A squadrons are located at Naval Air Station Oceana, Virginia; Naval Base Coronado/Naval Air Station North Island, California; Naval Air Station Jacksonville, Florida; and Naval Air Station/Joint Reserve Base Fort Worth, Texas, with Naval Air Station Whidbey Island to get the C-40A in FY 2015.

Developers

Boeing — Seattle, Washington

C-130T *Hercules* Intra-Theater Airlift Aircraft

Description

The Navy C-130T Hercules—a component of the Navy Unique Fleet Essential Airlift (NUFEA) complement—provides heavy, over-, and outsized-organic airlift capability. These aircraft are deployed worldwide and provide rapid-response direct support to Navy component commanders' theater requirements. This aircraft can be reconfigured within minutes to transport up to 40,000 pounds of cargo or up to 75 passengers.

Status

The Navy has started a program to upgrade its C-130T aircraft to meet all current and future communications navigation surveillance/air traffic management requirements. These NUFEA, heavy-lift aircraft are stationed at Naval Air Station Jacksonville, Florida; Naval Air Station Joint Reserve Base

New Orleans, Louisiana; Joint Base Andrews/Naval Air Facility Washington, DC; Naval Base Ventura County/Naval Air Station Point Mugu, California; and Joint Base McGuire/Dix/Lakehurst, New Jersey.

Developers

Lockheed Martin	Bethesda, Maryland
	Marietta, Georgia

CH-53E *Super Stallion* Helicopter

Description

The CH-53E entered service in 1981 and is the only heavy-lift helicopter in the Department of Defense rotorcraft inventory. The 2015 force construct is eight active component heavy-lift squadrons (HMHs) and one reserve component HMH. The *Super Stallion* fleet has enabled heavy lift assault-support tasks in *Operations Enduring Freedom*, *Iraqi Freedom*, and *Horn of Africa*, and is forward deployed in support of Marine Expeditionary Units, Unit Deployment Program (UDP) Okinawa (Japan), Marine Rotational Force-Darwin (Australia), and Special-Purpose Marine Air-Ground Task Forces (SPMAGTFs). The past decades of combat operations and various humanitarian crises have validated the relevance of vertical heavy lift by both MAGTF and joint force commanders alike. The FY 2015 CH-53E inventory is 149 aircraft. Replacement production capacity does not exist nor are there CH-53Es available in war storage. Low aircraft inventory is accentuated by pipeline aircraft (aircraft receiving modifications, depot-level repairs, and standard depot-level maintenance), which creates a shortfall of physical assets available for tasking on the flight line. This shortfall has created a degraded Primary Mission Aircraft Inventory of 13 aircraft per squadron vice the authorized 16 per squadron. The Department of the Navy is exploring options to bolster the CH/MH-53E inventory by purchasing surplus foreign MH-53Es as well as reactivating MH-53Es from the Aerospace Maintenance and Regeneration Group.

Status

The CH-53E service life has been extended to 10,000 hours. This modification has been completed on two-thirds of the aircraft inventory, with the balance funded and scheduled to be completed by FY 2020. Other sustainment challenges to the CH-53E community include avionics obsolescence and Kapton (DuPont polyimide film) wiring replacement. The CH-53E automatic flight control system computer circuit cards required reverse engineering. Kapton wiring replacement has entered its third and final phase. Management of multiple modifications and upgrades to the *Super Stallion* fleet is essential to the warfighter, aircraft survivability and critical to sustainment while transitioning to the CH-53K *King Stallion*. The CH-53E will continue to support the full spectrum of assigned combat operations and scheduled deployments include the full resumption of UDP to Okinawa, Japan. It is imperative to sustain the current CH-53E fleet throughout the

transition to the CH-53K with the initial operational capability planned for FY 2019 and full operational capability in FY 2028).

Developers
Sikorsky Aircraft Corporation Stratford, Connecticut

CH-53K *King Stallion* Heavy-Lift Replacement (HLR) Helicopter

Description
The CH-53K is the follow-on to the Marine Corps CH-53E *Super Stallion* heavy-lift helicopter. Major systems improvements of the newly manufactured helicopter include more powerful engines, expanded gross weight airframe, drive train, advanced composite rotor blades, glass cockpit, external and internal cargo handling systems, and enhanced survivability. The CH-53K will be capable of externally lifting 27,000 pounds on a standard sea level hot day (103°Fahrenheit) to a range of 110 nautical miles and delivering cargo in a landing zone at a pressure altitude of 3,000 feet and 91.5°F, a capability improvement nearly triple the in-service CH-53E. Additionally, the CH-53K will be capable of transporting 30 combat-loaded troops. The CH-53K's increased capabilities are essential to meeting the USMC's Expeditionary Force 21 Capstone Concept and the requirement for ship-to-objective maneuver. The CH-53K fully supports the joint operational concept of full-spectrum dominance by enabling rapid, decisive operations and the early termination of conflict by projecting and sustaining forces in distant anti-access, area-denial environments. The expeditionary maneuver warfare concept establishes the basis for the organization, deployment, and employment of the Marine Corps to conduct maneuver warfare and provides the doctrine to make effective joint and multinational operations possible.

Status
The Post Milestone B system development and demonstration contract was awarded to Sikorsky Aircraft Corporation on April 5, 2006. The program conducted its preliminary design review during the fourth quarter of FY 2008. The critical design review successfully completed ahead of schedule in the third quarter of FY 2010, and the program has transitioned from the design to the manufacturing phase. In early 2015, the ground test vehicle has been mounted to the test pedestal, has successfully completed bare head light off of all engines, and has completed initial shakedown testing with all engines operating and rotor system turning. The ground test vehicle is executing the ground portion of the flight test program. First flight and the delivery of engineering demonstration models, which will be used for developmental test and evaluation, are scheduled for FY 2015. On May 31, 2013, the Navy awarded the System Demonstration Test Article (SDTA) contract to Sikorsky. The four SDTAs will be the first fleet representative CH-53K helicopters delivered and will be used for operational test and evaluation. The Marine Corps requirement remains 200 aircraft.

Developers

Sikorsky Aircraft Corporation	Stratford, Connecticut

EA-6B *Prowler*
Airborne Electronic Attack (AEA) Aircraft

Description

The EA-6B *Prowler* provides airborne electronic attack capabilities against enemy systems operating within the radio frequency spectrum. EA-6B capabilities traditionally support the strike capabilities of joint force operations, aircraft carrier air wings, and Marine Air-Ground Task Forces (MAGTFs). The need for EW demonstrably increased during numerous joint and allied operations since 1995 against traditional and non-traditional target sets in support of ground forces. The enormous demand for AEA in support of worldwide airborne electronic attack requirements have driven EA-6B and AEA employment rates to record levels.

Status

The EA-6B Improved Capability (ICAP) III upgrade reached initial operational capability in September 2005. This generational leap in AEA capability deployed for the first time in 2006. ICAP III includes a completely redesigned receiver system (ALQ-218), new displays, and MIDS/Link-16, which dramatically improve joint interoperability. The Navy will "sundown" the *Prowler* and transition to an all EA-18G *Growler* force. The Marine Corps will fly the EA-6B ICAP III through 2019. Joint Strike Fighter F-35B *Lightning II* and a series of networked air and ground EW payloads on manned and unmanned platforms, forming a collaborative system of systems labeled "MAGTF EW," will replace and expand upon the capabilities of the *Prowler*, providing increased EW capacity, flexibility, and scalability in direct support of the MAGTF commander and joint forces. The first implementation of MAGTF EW, the Intrepid Tiger II pod carried on the AV-8B *Harrier II+*, made its initial deployment in May 2012 and on a Marine Corps F/A-18 *Hornet* in June 2014.

Developers

Naval Air Warfare Center,	
Weapons Division	Pt. Mugu, California
Northrop Grumman	Bethpage, New York

EA-18G *Growler*
Airborne Electronic Attack (AEA) Aircraft

Description

The EA-18G *Growler* has replaced the Navy's EA-6B *Prowler*. The EA-18G provides full-spectrum airborne electronic attack (AEA) capabilities to counter enemy air defenses and communication networks, most notably anti-radiation missiles. These capabilities

continue to be in high demand in overseas contingency operations, where *Growler* operations protect coalition forces and disrupt critical command and control links. The *Growler* maintains a high degree of commonality with the F/A-18F *Hornet*, retaining a great deal of the latter's inherent strike-fighter and self-protection capabilities while providing air-to-air self-protection, thus freeing other assets for additional strike-fighter tasking.

Status

The EA-18G *Growler* reached initial operational capability in September 2009 and is in full-rate production. In December 2009, the Department of Defense decided to continue the Navy Expeditionary AEA mission and recapitalize the Navy EA-6B expeditionary force with the EA-18G. As a result, 26 additional aircraft were programmed for procurement for three active and one reserve expeditionary squadrons. All three active component expeditionary squadrons have transitioned to the EA-18G. The FY 2014 President's budget requested 21 additional EA-18Gs to stand-up two more expeditionary squadrons, one in FY 2016 and the other in FY 2017. The first EA-18G deployment occurred in November 2010 in an expeditionary role supporting *Operation New Dawn* and redeployed in March 2011 in support of *Operations Odyssey Dawn* and *Unified Protector*, during which the EA-18G conducted combat operations. The first carrier deployment occurred in May 2011 on board the USS George H. W. Bush (CVN 77). As of the end of FY 2014, 90 EA-18G aircraft had been delivered with another 12 aircraft scheduled for delivery in FY 2015. An inventory objective of 135 aircraft is planned to support ten carrier-based squadrons, five active expeditionary squadrons, and one reserve squadron. Full operational capability is planned for FY 2017.

Developers

Boeing	St. Louis, Missouri
Northrop Grumman	Bethpage, New York

F-35 *Lightning II* Joint Strike Fighter (JSF)

Description

The Joint Strike Fighter F-35 *Lightning II* program will deliver a transformational family of next-generation strike aircraft, combining stealth and enhanced sensors to provide lethal, survivable and supportable tactical jet aviation strike fighters. The F-35C Carrier Variant (CV), the F-35B short takeoff and vertical landing (STOVL), and F-35A conventional takeoff and landing (CTOL) "family of aircraft" designs share a high level of commonality and meet U.S. service and allied partner needs. The keystone of this effort is a mission systems avionics suite that delivers unparalleled interoperability among U.S. armed services and coalition partners. Agreements for international participation in the program have been negotiated with Australia, Canada, Denmark, Italy, the Netherlands, Norway, Turkey, and the United Kingdom. Israel, Japan, and the Republic of Korea selected the F-35 through the U.S. Foreign Military Sales program. In U.S.

service, the F-35C will replace F/A-18A-C aircraft and complement the F/A-18E/F *Super Hornet*. The F-35B will replace Marine F/A-18s, AV-8Bs and EA-6Bs.

Status

As of July 2014, the Department of the Navy has taken delivery of 31 F-35Bs and 10 F-35Cs. After successfully completing two amphibious ship developmental test periods, the F-35B variant is scheduled to participate in operational test sea trials in mid-2015 on board the USS Wasp (LHD 1). Initial F-35C aircraft carrier suitability tests were successfully completed in September 2014 at Naval Air Station Patuxent River. The first F-35C at sea test period completed successfully in November 2014. The first operational Marine F-35B squadron began training in early September 2014 in preparation for the aircraft's initial operational capability (IOC) declaration. Marine Corps F-35B IOC is planned in 2015, and the Navy's F-35C IOC is planned in 2018. The first Navy F-35C transition of a legacy F/A-18 squadron is scheduled for 2018. The program of record buy is planned for 340 F-35Bs and 340 F-35Cs (USN-260/USMC-80).

Developers

Lockheed Martin	Fort Worth, Texas
Pratt & Whitney	Hartford, Connecticut

F/A-18A-D *Hornet* Strike-Fighter Aircraft

Description

The F/A-18 *Hornet* is a multi-mission strike fighter that combines the capabilities of a fighter and an attack aircraft. The single-seat F/A-18A and two-seat F/A-18B became operational in 1983. Eventually, the *Hornet* replaced the Navy's A-6 *Intruder*, A-7 *Corsair II*, and F-4 *Phantom II* and the Marine Corps F-4 aircraft. Reliability and ease of maintenance were emphasized in the *Hornet*'s design, and F/A-18s have consistently flown three times as many hours without failure as other Navy tactical aircraft, while requiring half the maintenance time. The F/A-18 is equipped with a digital fly-by-wire flight control system that provides exceptional maneuverability and allows the pilot to concentrate on operating the aircraft's weapons system. A solid thrust-to-weight ratio and superior turn characteristics, combined with energy sustainability, enable the *Hornet* to hold its own against any adversary. The ability to sustain evasive action is what many pilots consider to be the *Hornet*'s finest trait. The F/A-18 is the Navy's first tactical jet to incorporate digital-bus architecture for the entire avionics suite, making this component of the aircraft relatively easy to upgrade on a regular and affordable basis.

Following a production run of more than 400 F/A-18A/Bs, deliveries of the single-seat F/A-18C and two-seat F/A-18D began in September 1987. The F/A-18C/D models incorporated upgrades for employing updated missiles and jamming devices. These versions are armed with the AIM-120 Advanced Medium-Range Air-to-Air Missile and the infrared-imaging version of the AGM-65

Maverick. The *Hornet* has been battle tested and proved to be a highly reliable and versatile strike fighter. Navy and Marine Corps Hornets were in the forefront of strikes in Afghanistan in 2001 during *Operation Enduring Freedom*, where they continue to serve, and in Iraq in 2003 during *Operations Iraqi Freedom/New Dawn*. The latest lot of F/A-18C/D *Hornets* is far more capable than the first F/A-18A/Bs. Although the F/A-18C/D's growth is limited, the *Hornet* will continue to fill carrier air wings for years to come, before gradually giving way to the larger, longer-range and more capable F/A-18E/F *Super Hornet* and the F-35 *Lightning II* Joint Strike Fighter. The last *Hornet*, an F/A-18D, rolled off the Boeing production line in August 2000.

Status

As of September 2014, the Navy and Marine Corps had 95 F/A-18A, 21 F/A-18B, 371 F/A-18C and 131 F/A-18D aircraft in service and test roles, and two NF/A-18C and two NF/A-18D versions in permanent test roles. *Hornets* equip 18 active Navy and Marine Corps and three Navy and Marine Corps Reserve strike fighter squadrons, two fleet readiness squadrons, three air-test and evaluation squadrons, the Navy's Flight Demonstration Squadron (Blue Angels), and the Naval Strike and Air Warfare Center.

Developers

Boeing	St. Louis, Missouri
General Electric	Lynn, Massachusetts

F/A-18E/F *Super Hornet* Strike-Fighter Aircraft

Description

The multi-mission F/A-18E/F *Super Hornet* strike fighter is an evolutionary upgrade of the F/A-18C/D *Hornet*. The F/A-18E/F is able to conduct unescorted strikes against highly defended targets early in a conflict. The *Super Hornet* provides the carrier strike group with a strike fighter that has significant growth potential, more than adequate carrier-based landing weight, range, endurance, and ordnance-carrying capabilities comparable to those of the F-14 *Tomcat* and F/A-18A/C *Hornet* it replaces. The single-seat F/A-18E and the two-seat F/A-18F have a 25 percent larger wing area and a 33 percent higher internal fuel capacity that effectively increases endurance by 50 percent and mission range by 41 percent. It has five "wet" stations that give the *Super Hornet* in-flight tanker capability.

The *Super Hornet* incorporates two additional wing stations that allow for increased payload flexibility in the mix of air-to-air and air-to-ground ordnance. The F/A-18E/F can carry a full array of the newest joint "smart" weapons such as the Joint Direct-Attack Munition (JDAM) and the Joint Standoff Weapon (JSOW). The *Super Hornet* has the ability to recover aboard a carrier with optimum reserve fuel while carrying a load of precision-strike weapons; its carrier-recovery payload is more than 9,000 pounds. The *Super Hornet* also has the space, power, and cooling capability needed to accommodate valuable but instal-

lation-sensitive avionics when they become available, including the Active Electronically Scanned-Array (AESA) radar that in early 2015 is installed on approximately 75 percent of the *Super Hornets*. Sophisticated systems such as the Integrated Defensive Electronic Countermeasures System Advanced Targeting Forward Looking Infrared, Joint Helmet-Mounted Cueing System, JDAM and JSOW, AIM-9X Sidewinder Short-Range Air-to-Air Missile and AIM-120 Advanced Medium-Range Air-to-Air Missile, APG-79 AESA radar system, and advanced mission computers and displays make the F/A-18E/F an extremely capable and lethal strike platform.

Future planned upgrades include the AIM-120D, the AGM-88E Advanced Anti-Radiation Guided Missile and various cockpit and display improvements. The first operational F/A-18E *Super Hornet* squadron (VFA-115) deployed on board the USS Abraham Lincoln (CVN 72) on July 24, 2002, for a ten-month initial deployment that included the initial operations in support of *Operation Iraqi Freedom*. F/A-18E/F *Super Hornets* remain at the forefront of combat operations. *Super Hornet* squadrons have been integrated into all ten Navy air wings, and with future capability upgrades, are well suited to complement the arrival of the F-35 *Lightning II* Joint Strike Fighter.

Status

As of September 2014, there were 255 F/A-18E models and 259 F/A- 18F models in U.S. Navy inventory. The F/A-18E/F serves as a replacement for both older model F/A-18 A/C aircraft and the retired F-14 *Tomcat*. The F/A-18E/F program of record completed at 563 aircraft with the last aircraft procured in FY 2013.

Developers

Boeing	St. Louis, Missouri
General Electric	Lynn, Massachusetts

KC-130J *Hercules* Tactical Tanker and Transport

Description

The KC-130J is a four-engine turbo-prop, multi-role, multi-mission tactical aerial refueler and tactical transport aircraft that supports all six functions of Marine Aviation and is well suited to meet the mission needs of forward-deployed Marine Air Ground Task Forces (MAGTFs). The Hercules provides the following functions: fixed-wing, rotary- wing, and tilt-rotor tactical air-to-air refueling; rapid ground refueling of aircraft and tactical vehicles; assault air transport of air-landed or air-delivered personnel, supplies, and equipment; command-and-control augmentation; battlefield illumination; tactical aero medical evacuation; combat search and rescue support. When equipped with the Harvest HAWK Intelligence Surveillance Reconnaissance Weapon Mission kit, the aircraft can perform multi-sensor image reconnaissance and provide close air support. With its increase in speed, altitude, range, performance, state-of-the-art flight station that includes

two heads-up displays, night vision lighting, an augmented crew station, fully integrated digital avionics, enhanced air-to-air refueling capability, and aircraft survivability enhancements, the KC-130J will provide the MAGTF commander with multi-mission capabilities well into the 21st Century.

Status

The USMC requirement is 79 KC-130Js. Twenty-eight KC-130T model aircraft operated by the Reserves are yet to be replaced. As of October 2014, the USMC KC-130J inventory totaled 47 aircraft.

Developers

Lockheed Martin Marietta, Georgia

MH-60R/S *Seahawk* Multi-Mission Combat Helicopter

Description

The MH-60R and MH-60S multi-mission combat helicopters are the two pillars of the Chief of Naval Operations' Naval Helicopter Master Plan for the 21st Century. The complementary capabilities of these two helicopters are ideally suited to "hunter-killer" teams, leveraging MH-60R sensors and MH-60S weapons systems to neutralize surface and subsurface threats rapidly. As the Helicopter Master Plan is implemented, *Seahawks* are deploying in companion squadrons as part of carrier air wings embarked in the Navy's aircraft carriers and as detachments on surface warships, logistics ships, amphibious ships, and at overseas stations.

The MH-60R provides anti-submarine and surface warfare capability with a suite of sensors and weapons that includes dipping sonar, surface search radar, electronic support measures, advanced forward looking infrared (FLIR) sensors, precision air-to-surface missiles, and torpedoes.

The MH-60S provides surface and mine countermeasure warfare capabilities, as well as robust Naval Special Warfare, search and rescue, combat search and rescue, and logistics capability, with air-to-ground weapons and the same FLIR and Link16 capability as the MH-60R. Airborne mine countermeasure operations will be accomplished using advanced sensor and weapons packages to provide detection, localization, and neutralization of these anti-access threats. 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 operational evaluation in the third quarter of FY 2005. It was authorized to enter full rate production in March 2006. The Navy plans to acquire 280 MH-60Rs. The MH-60S was approved for full-rate production in August 2002 and is undergoing scheduled block upgrades for armed helicopter and airborne mine countermeasures missions. The Navy plans to acquire 275 MH-60S helicopters. At the end of FY 2014, there were 186 MH-60R and 237 MH-60S helicopters in the inventory.

Developers

Lockheed Martin	Owego, New York
Sikorsky Aircraft Corporation	Stratford, Connecticut

MH-53E *Sea Dragon* Airborne Mine Countermeasures (AMCM) Helicopter

Description

The MH-53E provides AMCM capability to naval forces through various mine-hunting and mine-sweeping systems. The MH-53E supports undersea warfare by defending the fleet from surface and sub-surface mine threats and ensuring sea lines of communication remain passable for not only carrier and expeditionary strike groups, but also for vital commercial shipping. The MH-53E provides the Navy's only heavy-lift rotary-wing capability enabling over-the-horizon combat logistics support. Secondary missions include vertical onboard delivery, tactical aircraft recovery, humanitarian assistance and disaster relief, and naval special warfare support.

Status

The MH-53E program is executing an in-service sustainment strategy to ensure continued AMCM and heavy-lift support to the sea base until the transition to the Littoral Combat Ship mine countermeasures mission package is complete. The sustainment strategy addresses fatigue, obsolescence, readiness, and safety issues. A fatigue life extension program has been completed, which extended the aircraft service life to 10,000 hours, enabling the Navy to maintain a dedicated AMCM capability through the 2025 timeframe. The USS Ponce (AFSBI 15) has been designated as an interim afloat forward-staging base to provide staging for the MH-53E and associated airborne mine-hunting and minesweeping systems, enabling a more rapid and sustained deployment of AMCM forces.

Developers

General Electric	Lynn, Massachusetts
Sikorsky Aircraft Corporation	Stratford, Connecticut

MV-22B *Osprey* Tilt-Rotor Aircraft

Description

The MV-22 *Osprey* is the world's first production tilt-rotor aircraft and blends the vertical flight capabilities of helicopters with the speed, range, altitude, and endurance of fixed-wing transport aircraft. This combat multiplier represents a quantum improvement in strategic mobility and tactical flexibility for the Marine Corps, Navy, and Air Force. The *Osprey* has a 370-nautical mile combat radius, can cruise at 260 knots, and can carry 24 combat-equipped Marines or a 12,500-pound external load. With a 2,200 nautical-mile single-aerial refueling range, the aircraft also has a strategic self-deployment capability. Specific missions for the MV-22 include medium-lift expeditionary assault support,

aerial delivery, tactical recovery of aircraft and personnel, casualty and humanitarian evacuation, rapid insertion and extraction, and airborne resupply/logistics support to the seabase. The MV-22 is the cornerstone of Marine Corps assault support capability, with the speed, endurance, and survivability needed to fight and win on tomorrow's battlefields.

Status

The Marine Corps transition from the CH-46E and CH-53D to the MV-22 is 65 percent complete as of early 2015: more than 240 of 360 aircraft have been delivered to 13 of 16 operational squadrons. In the years ahead, the MV-22 will remain the Nation's crisis-response platform of choice. Additional future MV-22 mission sets will include aerial refueling of F/A-18 and F-35 aircraft and launching standoff precision-guided munitions. The *Osprey*, through Link-16 and software reprogrammable radios, is digitally linked to the Marine Air-Ground Task Force, enhancing interoperability of ground and air forces during long-range operations. Finally, the program is targeting 2035 to commence the first delivery of a major MV-22 capability upgrade (beyond simple platform evolution). This improvement will leverage technologies from joint multi-role, future vertical lift, and other emerging-technology initiatives: a capability leap to ensure relevance and improved readiness at a lower cost for decades.

Developers

Bell Helicopter Textron	Fort Worth, Texas
Boeing Defense and Space Group, Helicopter Division	Philadelphia, Pennsylvania
Rolls Royce	Indianapolis, Indiana

P-3C *Orion* Modification, Improvement, and Sustainment

Description

The legacy P-3C *Orion* maritime patrol aircraft provides anti-submarine warfare (ASW), anti-surface warfare (ASUW), and intelligence, surveillance and reconnaissance (ISR) capabilities to naval and joint task force commanders and contributes directly to maritime domain awareness across the globe. Squadrons are based in Jacksonville, Florida, Whidbey Island, Washington, and Kaneohe Bay, Hawaii. Because of the P-3's range, endurance, and multi-mission capability, the aircraft have been in high demand for the past five decades and are nearing the ends of their service lives.

The Navy's P-3 roadmap focuses on three areas: airframe sustainment; mission systems obsolescence; and re-capitalization to the P-8A Poseidon Multi-mission Maritime Aircraft. Regarding airframe sustainment, 39 aircraft were grounded in 27 December 2007, a result of on-going Fatigue Life Management Program analysis that revealed the aft lower surface of the outerwing (Zone 5) experienced fatigue at higher levels than previously estimated. Subsequently, the Chief of Naval Operations approved a P-3

Recovery Plan that included a dual-path approach encompassing Zone 5 modifications to replace outer-wing components and manufacture new outer-wing assemblies where needed. The mission system sustainment program improves aircraft availability through replacement and upgrades to obsolete systems with modern hardware systems and software. These programs ensure the P-3C continues to meet Navy's ASW, ASUW, and ISR requirements through completion of the transition to the P-8A in FY 2019.

Status

The Navy has successfully implemented its P-3C Fatigue Life Management Program. Through FY 2014, 87 Special Structural Inspections, 39 Enhanced Special Structural Inspections, 61 Special Structural Inspection-Kit, and 79 Zone 5 modifications have been completed. Procurement of outer wing assemblies began in 2008, and installs commenced in 2011. By the end of FY 2014, 18 outer wing assemblies have been completed, with 11 aircraft in rework.

Developers

Lockheed Martin	Marietta, Georgia
	Eagan, Minnesota
	Greenville, South Carolina
	Manassas, Virginia

P-8A *Poseidon* Multi-mission Maritime Aircraft (MMA)

Description

The P-8A *Poseidon* recapitalizes and improves the broad-area anti-submarine warfare (ASW), anti-surface warfare (ASUW), and armed intelligence, surveillance, and reconnaissance (ISR) capability resident in the legacy P-3C *Orion*. The P-8A combines the proven reliability of the commercial 737 airframe, powerplants, and avionics with an open architecture that enables integration of modern sensors and communications networks. P-8A will leverage global logistics support infrastructure and commercial training applications to provide both higher operational availability and improved warfighting readiness. The P-8A program invested in high-fidelity simulation to attain a 70/30-percent simulator/aircraft training ratio, significantly reducing life cycle costs for the life of the platform. The P-8A will be built with three incremental upgrades that include improved ASW sensors, network-enabled ASW and ASUW weapons, sensor and targeting enhancements, and improved communications capability.

Status

The P-8A *Poseidon* is meeting all cost, schedule, and performance parameters in accordance with the acquisition program baseline. In August 2010, the program successfully passed Milestone C and received permission to buy three low rate initial production (LRIP) lots. The first LRIP aircraft delivered to Patrol Squadron Thirty (VP-30) at Naval Air Station Jacksonville, Florida in March 2012. The first operational VP squadron commenced transition

from P-3C to P-8A in July 2012. The program achieved initial operational capability (IOC) in December 2013, when the first P-8A squadron (VP-16) deployed to Kadena, Japan. The program was approved for full-rate production (FRP) in January 2014, and the Navy awarded the FRP Lot I contract for 16 aircraft in February 2014. By the end of 2014, five lots of LRIP/FRP aircraft, including 53 aircraft and associated trainers, spares and support equipment, were on contract with Boeing Defense Space and Security. Three fleet squadrons had by then completed transition to P-8A, with 17 aircraft delivered on or ahead of schedule.

The P-8A program continues to execute its evolutionary acquisition strategy. Increment 2 will deliver improved ASW capabilities as a series of three engineering change proposals (ECPs): multi-static active coherent high-altitude anti-submarine warfare sensors; network-enabled high-altitude ASW weapon capability; and targeting enhancements. These ECPs will be incorporated in-line with production or via retrofit. Increment 3 remains a separate program and is scheduled for a Milestone B decision in FY 2017, with IOC in early FY-2021. Increment 3 improves the warfighting capability of baseline P-8A to pace future threats and integrates a network-enabled ASUW weapon, advanced ASW and ISR sensors, precision targeting, and architecture upgrades to satisfy the Net-Ready Key Performance Parameter. The P-8A program of record is 117 aircraft.

Developers
Boeing — Renton, Washington

Naval Aviation Training Aircraft

Description
Commander, Naval Air Training Command's (CNATRA) mission is to train and produce safely the world's finest combat aviation professionals—Naval Aviators and Naval Flight Officers—and deliver them at the right time, in the right numbers, and at the right cost to the Fleet for follow-on tasking. This mission is essential in order to generate the readiness the Fleet requires. CNATRA's training aircraft inventory includes the T-34 *Turbo Mentor,* T-6 *Texan II*, T-45 *Goshawk*, TH-57 *Sea Ranger*, T-44 *Pegasus*, and the TC-12 *Huron*.

All student naval aviators begin primary flight training in either the T-34C *Turbo Mentor* or the T-6B *Texan II*. The T-6B is replacing CNATRA's venerable workhorse, the T-34C, after 30 years of service. Built by Beechcraft Defense Corporation, the T-6B features a Pratt & Whitney PT-6A-68 engine with twice the horsepower of the T-34C, ejection seats for increased safety, cockpit pressurization, onboard oxygen-generating systems, and a completely digital "glass" cockpit. Training Air Wing Five at Naval Air Station (NAS) Whiting Field completed its transition to the T-6B in 2012, and Training Air Wing Four at NAS Corpus Christi is following suit with its transition scheduled to be complete by spring of 2015.

The T-45 *Goshawk*, a carrier-capable derivative of the British Aerospace Hawk, is used for intermediate and advanced training in the strike syllabus for jet pilots. The conversion from analog (T-45A) to digital cockpits (T-45C) is complete at NAS Meridian in early 2015 and almost complete at NAS Kingsville. Future upgrades include resolution of an engine-surge issue to enhance fuel efficiency and safety, and preservation of current aircraft through service life assessment and service life extension programs.

The TH-57 *Sea Ranger*, the Navy version of the commercial Bell Jet Ranger, is used for advanced training in the rotary-wing (helicopter) pilot syllabus. The TH-57B (visual flight) and the TH-57C (instrument flight) will be receiving minor avionics upgrades that will allow continued operation past 2020.

The T-44 *Pegasus* and the TC-12 *Huron* are twin turboprop, pressurized, fixed-wing aircraft that are used for intermediate and advanced training for multi-engine and tilt-rotor pilots. The TC-12 will be phased out of advanced training by 2016. Continued improvements to the T-44 include the replacement of wing wiring, simulator upgrades, and the conversion from analog (T-44A) to digital cockpits (T-44C). Additionally, the T-44 is receiving new simulators to replace the obsolete legacy instrument flight trainers.

All undergraduate military flight officer (UMFO) primary training begins in the T-6A *Texan II*. VFA (attack) and VAQ (electronic warfare) advanced UMFO training is conducted in the T-45C. The T-45 is used for the tactical maneuvering portion of the VFA and VAQ UMFO syllabus and replaced the T-39 as the advanced phase radar trainer with the integration of the Virtual Mission Training System (VMTS), an embedded synthetic radar training system. CNATRA has charted a course to revolutionize UMFO training by employing the T-6A, the T-45C with VMTS, and high-fidelity simulators to train future UMFOs. This new training program capitalizes on cutting-edge technologies while allowing the Navy to divest of the aging T-39 platform. The new training syllabus achieved initial operating capability at NAS Pensacola in FY 2013 and became fully operational at the end of FY 2014. VP, VQ and VAW advanced UMFO training will be conducted in the multi-crew simulator (MCS). The MCS will focus on crew resource management, communications, and sensor integration and will provide intermediate and advanced training for all NFOs. With MCS, NFOs will receive all undergraduate training as well as pinning on their Wings of Gold while at Training Air Wing Six.

Status

The T-6 is in production with a planned inventory objective of 295 aircraft, with the final lot of aircraft ordered in FY 2014 for delivery in 2015.

Developers

Boeing (T-45)	St. Louis, Missouri
Hawker Beechcraft (T-6)	Wichita, Kansas

Service Secretary Controlled Aircraft/ Executive Airlift (SSCA/EA)

Description

The Department of the Navy maintains Service Secretary Controlled Aircraft/Executive Airlift in accordance with the Department of Defense Directive 4500.56. The SSCA aircraft are designated by the Secretaries of the Military Departments for transportation of their senior Service officials. The offices of the Secretary of the Navy, Chief of Naval Operations, and Commandant of the Marine Corps coordinate with Fleet Logistics Support Squadron One (VR-1) for scheduling of Navy and Marine Corps senior leader travel. At the discretion of the Secretary of the Navy, other SSCA/ EA aircraft are stationed outside of the continental United States to support Navy senior leader travel. In 2015 three C-37Bs (Gulfstream-550), one C-37A (Gulfstream-V), two C-20Ds (Gulfstream-III), and one additional C-20 provide executive transport services. The C-37A/B aircraft replaced the SSCA/EA-configured VP-3A *Orion*, substantially lowering operating costs. The C-37A/B meets all international-imposed air traffic management communications, navigation, and surveillance requirements.

Status

The first C-37 aircraft was delivered in 2002, a second aircraft in 2005, and two more in 2006. The first and the Navy's only C-37A, is based at Hickam Air Force Base, Hawaii. The C-37Bs and C-20Ds are based at Joint Base Andrews/Naval Air Facility Washington, D.C., and are assigned to Fleet Logistics Support Squadron One. Additionally, the Navy retains a C-20 based at Naval Air Station Sigonella, Italy.

Developers

Gulfstream (General Dynamics) Savannah, Georgia

VH-92A Presidential Replacement Helicopter

Description

A replacement is required for the 41-year-old VH-3D *Sea King* and 25-year old VH-60N *WhiteHawk* helicopters that provide transportation for the President of the United States, foreign heads of state, and other dignitaries as directed by the White House Military Office. The Replacement Presidential Helicopter will provide a survivable, mobile command-and-control "VIP" transportation capability and a system-of-integrated-systems necessary to meet presidential transport mission requirements, including the ability to be globally transportable via Air Force Strategic Lift.

Status

The Presidential Helicopter Fleet Replacement Program became a formal ACAT-1D acquisition program in March 2014 when it successfully completed a Milestone B and the Defense Acquisition Board approved the program to enter the engineering manufacturing and development (EMD) phase. In May 2014, the Navy

awarded an EMD contract with production options to Sikorsky Aircraft Corporation. Under the contract, Sikorsky will use its in-production S-92A medium-lift helicopter to integrate government-defined mission systems and install an executive interior. VH-92A initial operational capability is planned for 2020.

Developers

General Electric	Lynn, Massachusetts
Lockheed Martin Mission Systems and Training	Owego, New York
Sikorsky Aircraft Corporation	Stratford, Connecticut

AVIATION WEAPONS

AGM-88E Advanced Anti-Radiation Guided Missile (AARGM)

Description

The U.S. Navy's AGM-88E AARGM is the latest evolution of the High-Speed Anti-Radiation Mission (HARM) weapon system. Prior to AARGM, HARM was the Navy's only anti-radiation, defense-suppression, air-to-surface missile. Employed successfully in naval operations for decades, HARM can destroy or suppress broadcasting enemy electronic emitters, especially those associated with radar sites used to direct anti-aircraft guns and surface-to-air missiles. Fielded configurations of HARM include AGM-88B (Block IIIA), AGM-88C (Block V), and AGM-88C (Block VA). The HARM program is a Navy-led joint-service (Navy, Air Force, and Marine Corps) program.

The AGM-88E program upgrades some of the existing HARM missile inventory with a new guidance section and a modified control section to incorporate multi-sensor, multi-spectral, digital anti-radiation homing detection capability, global positioning system/inertial navigation system guidance, and a millimeter-wave terminal seeker. AARGM also includes a netted situation awareness/targeting capability and weapon impact assessment reporting via direct connectivity with national technical means.

The U.S. Department of Defense and the Ministry of Defense of the Republic of Italy have signed an international memorandum of agreement for cooperative development of AGM-88E. The AARGM system is a transformational and affordable upgrade to the legacy HARM.

Status

The AGM-88E program completed initial operational testing and evaluation and reached initial operational capability during the third quarter of FY 2012. The full-rate production (FRP) decision was approved and first FRP contract was awarded in the fourth quarter of FY 2012. AARGM is integrated on F/A-18C/D/E/F *Hornet/Super Hornet* and EA-18G *Growler* aircraft. The Italian air force will integrate AARGM on the *Tornado* ECR aircraft in accor-

dance with the international cooperative development program agreements. The Navy is investigating increasing the range of AARGM (AARGM-ER) to pace the threat.

Developers
ATK Woodland Hills, California

AGM-154 Joint Standoff Weapon (JSOW)

Description
The JSOW is a family of weapons that permits naval aircraft to attack targets at increased standoff distances using global positioning system/inertial navigation system for guidance. All JSOW variants share a common body, but can be configured for use against area targets, bunker penetration, and ship attack. Defeating emergent, time-critical threats, whether in close-in proximity or over the horizon, requires an all-weather weapon capable of penetrating defended sanctuaries and destroying hostile targets while minimizing the danger of collateral damage to friendly and neutral shipping as well as friendly/neutral assets and personnel ashore. The JSOW Unitary (JSOW-C) variant adds an imaging infrared seeker and autonomous target acquisition to attack point targets with precision accuracy. The JSOW-C-1 will incorporate new target-tracking algorithms into the seeker for moving targets, giving the joint force commanders an affordable, air-delivered, standoff weapon that is effective against fixed and re-locatable land and maritime targets. Used in conjunction with accurate targeting information and anti-radiation weapons, JSOW-C-1 will provide the capability to defeat enemy air defenses while creating sanctuaries that permit the rapid transition to low-cost, direct-attack ordnance.

Status
AGM-154A reached initial operational capability (IOC) in 1999, and the AGM-154C variant achieved IOC in FY 2005. JSOW C-1 began procurement in FY 2011 and will reach IOC in FY 2016. JSOW C-1 will be procured through FY 2016.

Developers
Raytheon Tucson, Arizona

AIM-9X Sidewinder Short-Range Air-to-Air Missile (SRAAM)

Description
The AIM-9X Sidewinder is a fifth-generation all-aspect infrared (IR) day and night, beyond visual range, lock-on-after-launch missile with superior detection and tracking capability, high off-bore sight capability, robust IR counter-countermeasures, enhanced maneuverability, and growth potential via software improvements. The AIM-9X development leveraged existing AIM-9M components to minimize development risk and cost. Obsolescence and pre-planned product improvements efforts have been ongoing since initial operational capability in 2003.

A series of independent engineering change proposals provided improved performance in the way of faster processors in the guidance control unit an improved fuze/target detector (DSU-41) and data link component. These improvements led to the AIM-9X Block II missile program in FY 2011.

Status
The AIM-9X Block II procurement began in FY 2011. The AIM-9X Block II is scheduled to complete Operational Testing in FY 2015. As of early 2015, more than 900 AIM-9X Block I All-Up Rounds and 350 Block I Captive Air Training Missiles have been delivered to the Department of the Navy.

Developers
Raytheon Tucson, Arizona

AIM-120 Advanced Medium-Range Air-to-Air Missile (AMRAAM)

Description
The AIM-120 AMRAAM is an all-weather, all-environment, radar-guided missile developed by the Air Force and Navy. The missile is deployed on the F/A-18A+/C/D *Hornet*, F/A-18E/F *Super Hornet*, and EA-18G *Growler* and will be deployed on F-35 *Lightning II* Joint Strike Fighter aircraft. Entering service in September 1993, AMRAAM has evolved to maintain air superiority through pre-planned product improvement programs. This modernization plan includes clipped wings for internal carriage, a propulsion-enhancement program, increased warhead lethality, and enhanced electronic counter-countermeasures capabilities through hardware and software upgrades. Additionally, the missile has improved capabilities against low- and high-altitude targets in an advancing threat environment. AIM-120C7 completed production and AIM-120D production began in FY 2008. With the "sundown" of the AIM-7 Sparrow missile, AMRAAM will be the Services' sole medium/beyond visual-range missile.

Status
The AIM-120C7 missile variant reached initial operational capability (IOC) in FY 2008. The AIM-120D completed operational test in fourth quarter of FY 2014. AIM-120D IOC is scheduled for early FY 2015.

Developers
Raytheon Tucson, Arizona

Joint Direct-Attack Munition (JDAM, GBU-31/32/38) / Laser JDAM (GBU-54)

Description

The JDAM is an Air Force-led joint program for a global positioning system (GPS)-aided, inertial navigation system (INS) guidance kit to improve the precision of existing 500-pound, 1,000-pound, and 2,000-pound general-purpose and penetrator bombs in all weather conditions. JDAM addresses a broad spectrum of fixed and re-locatable targets at medium-range and releasing aircraft at high altitudes. The weapon is autonomous, all weather, and able to be employed against pre-planned targets or targets of opportunity. This weapon system has proven to be a true force multiplier, allowing a single aircraft to attack multiple targets from a single release point, and has proven its value during operations in Kosovo, Iraq, and Afghanistan.

In September 2006, the Departments of Navy and Air Force put in place a low-cost, non-developmental enhancement to the GBU-38 (500-pound) JDAM to address moving targets. Open competition and source selection completed in February 2010, and the Service awarded a contract to Boeing for a version of Laser JDAM (LJDAM) that provides a direct-attack moving target capability. LJDAM (GBU-54) is a 500-pound dual-mode weapon that couples the GPS/INS precision of the JDAM and laser-designated accuracy of the laser-guided bomb into a single weapon. LJDAM also provides added capability and flexibility to the Fleet's existing inventory of precision-guided munitions to satisfy the ground moving-target capability gap.

Status

LRIP for the 2,000-pound kits began in FY 1997, and Milestone III was reached in FY 2001. The 1,000-pound JDAM kit reached initial operational capability (IOC) in FY 2002, and IOC for the 500-pound weapon occurred during the second quarter of FY 2005. LJDAM reached IOC in FY 2012.

Developers

Boeing	St. Louis, Missouri
Lockheed Martin	Bethesda, Maryland

Paveway II Laser-Guided Bomb (LGB) / Dual-Mode LGB (GBU-10/12/16) and Paveway III (GBU-24) LGB

Description

The Paveway II/III laser-guided bomb program is an Air Force-led joint effort with the Navy. LGBs include GBU-10, -12, and -16, using Mk 80/Bomb-Live Unit (BLU) series general-purpose bomb bodies, and GBU-24, which uses the BLU-109 bomb body with state-of-the-art guidance and control features. GBU-12 is a 500-pound class weapon; GBU-16 is a 1,000-pound class weapon; and GBU-10 is a 2,000-pound class weapon. An LGB has a Mk 80/BLU-series warhead fitted with a laser-guidance kit and computer control group mounted on the bomb nose. Legacy LGBs will remain in the inventory until at least FY 2020. The Dual-Mode LGB (DMLGB) retrofits legacy LGBs to a dual-mode configuration using common components. This provides increased flexibility to the warfighter by combining proven laser terminal guidance technology with the all-weather, fire-and-forget capability of inertial navigation system/global positioning system. The DMLGB reached initial operational capability in September 2007 on the AV-8B *Harrier II+* and F/A-18 *Hornet/Super Hornet* aircraft.

Status

Approximately 7,000 DMLGB kits have been procured. No future funding for DMLGB is planned, given the development of the dual-mode Laser Joint Direct Attack Munition.

Developers

Lockheed Martin	Bethesda, Maryland
Raytheon	Tucson, Arizona

AVIATION SENSORS AND SYSTEMS

ALQ-214 Integrated Defensive Electronic Countermeasures (IDECM)

Description

The IDECM system is employed on the F/A-18 series *Hornets* and used to defend the host aircraft against radar-guided surface-to-air and air-to-air missile systems. Through either a towed decoy or onboard transmitters, the ALQ-214 produces complex waveform radar jamming that defeats advanced threat systems.

Status

IDECM has been developed in three phases: (1) ALQ-165 On Board Jammer and ALE-50 towed decoy (initial operational capability, IOC, in FY 2002); (2) ALQ-214 On-Board Jammer and ALE-50 towed decoy (IOC FY 2004); and (3) ALQ-214 On Board Jammer and ALE-55 Fiber-Optic Towed Decoy (IOC FY 2011). The ALE-55 Fiber-Optic Towed Decoy will replace the ALE-50 towed decoy. IDECM is entering a fourth phase with development of the production Block 4 ALQ-214 On-Board Jammer for the F/A-18C/D/E/F *Hornet/Super Hornet* aircraft and will reach IOC in FY 2015.

Developers

BAE Systems	Nashua, New Hampshire
Excelis, Inc.	Clifton, New Jersey

ALR-67(V)3 Advanced Special Receiver (RWR)

Description

The ALR-67(V)3 will meet Navy requirements through the year 2020. It enables the Navy F/A-18 family of aircraft to detect threat radar emissions, enhancing aircrew situational awareness and aircraft survivability.

Status

The ALR-67(V)3 program successfully completed the engineering and manufacturing development phase and operational testing in 1999 and entered full-rate production in FY 2013. Production quantities will eventually outfit all F/A-18 *Hornet/Super Hornet* aircraft.

Developers

Arete Associates	Tucson, Arizona
Raytheon	Goleta, California

APG-79 Active Electronically Scanned Array (AESA) Radar System

Description

The APG-79 AESA Phase I upgrade provides multi-mode function flexibility while enhancing performance in the air-to-air arena (including cruise missile defense) as well as the air-to-ground arena. The Phase II upgrade provides enhanced performance in hostile electronic countermeasure environments and provides significant electronic warfare improvements. Growth provisions will allow for future reconnaissance capability through the use of synthetic aperture radar technology and improved hardware and software. The APG-79 AESA radar is installed on Block II F/A-18E/F *Super Hornet* and all EA-18G *Growler* aircraft.

Status

The APG-79 completed subcontractor competition in November 1999, the Navy awarded the engineering and manufacturing development contract in February 2001, and the radar achieved initial operational capability in 2007. AESA Milestone C and low-rate initial production approvals were received in January 2004, for initial delivery with Lot 27 Super Hornets in FY 2005. Full-rate production was achieved in June 2007, following completion of the initial operational test and evaluation in December 2006. The first deployment of the AESA system was with VFA-22 "Fighting Redcocks" in 2008. Retrofit installations into Block II Lot 26-29 F/A-18E/Fs began in 2013. All Block II F/A-18E/F and EA-18G aircraft will be equipped with the APG-79 AESA radar by 2019.

Developers

Boeing	St. Louis, Missouri
Raytheon	El Segundo, California

AAQ-24 Department of the Navy Large Aircraft Infrared Countermeasures (DoN LAIRCM)

Description

The AAQ-24(V)25, DoN LAIRCM System uses advanced, two-color infrared (IR) missile warning to cue directed laser countermeasures and ALE-47 expendables to defeat shoulder-launched missiles. The system is being deployed on Marine Corps CH-53E *Super Stallion* helicopters to meet the Marine Corps urgent need for a state-of-the-art, reliable, aircraft carrier and land-based missile-warning system (MWS) and IR countermeasure. It is being installed in other aircraft as well. The DoN LAIRCM system consists of five major components: IR MWS sensors; a dedicated processor; a control indicator unit for cockpit display; and guardian laser tracker assemblies consisting of a four-axis stabilized gimbaled system, a fine track sensor, and a Viper TM laser.

The Naval Air Systems Command began DoN LAIRCM integration on Navy C-40 *Clipper* and Marine Corps KC-130J *Hercules* platforms in FY 2012. In FY 2014 Marine Corps Headquarters identified the urgent requirement to outfit MV-22 *Osprey* aircraft supporting Special Purpose Marine Air-Ground Task Force operations with DoN LAIRCM. The program will complete operational test of the advanced threat warning upgrade in FY 2015, providing increased MWS performance and adding laser warning and hostile-fire indication to address high priority threats and enhance overall survivability. The DoN LAIRCM Program Office works closely with its counterpart Air Force program to leverage contracts, test and evaluation, and sustainment efforts.

Status

DoN LAIRCM initial operational capability was achieved in May 2009, and a full-rate production decision was approved in January 2010. Advanced threat warning operational test and evaluation began in FY 2013, with fleet delivery to begin in FY 2015.

Developers

Northrop Grumman	Rolling Meadows, Illinois

ASQ-228 Advanced Targeting Forward-Looking Infra-Red (ATFLIR) Sensor

Description

The ATFLIR provides the F/A-18A+/C/E/F *Hornet* and *Super Hornet* aircraft with a significantly enhanced capability to detect, track, and attack air and ground targets, compared to the legacy AAS-38/46 NITEHAWK Targeting Forward-Looking Infrared (FLIR) system. Laser-guided and global positioning system standoff weapons systems and higher-altitude attack profiles require improved performance. The ATFLIR provides a significant improvement in operational effectiveness to support precision-strike mission requirements. Improved reliability and maintainability increase operational availability while reducing total ownership costs. The ATFLIR consists of a mid-wave FLIR and electro-optical sensor, laser spot tracker, and a tactical laser for designation and ranging. Improvements to the ATFLIR include the addition of an infrared marker, ROVER data link, and moving-target track improvements.

Status

ATFLIR completed Phase I operational test and evaluation in September 2003 and was determined to be operationally suitable and effective; it was recommended for further fleet introduction and achieved initial operational capability in September 2003. It has demonstrated its combat capability during *Operations Iraqi Freedom* and *Enduring Freedom*. The ATFLIR production contract is complete with a total procurement of 410 pods.

Developers

Boeing	St. Louis, Missouri
Raytheon	El Segundo, California

Joint Mission Planning Systems (JMPS)

Description

JMPS is the core of the Naval Mission Planning Systems (NavMPS) portfolio. JMPS enables weapon system employment by providing the information, automated tools, and decision aids needed to plan missions; to load mission data into aircraft, weapons, sensors, and avionics systems; and to conduct post-mission analysis. Navy and Marine Corps aircrews use JMPS for mission planning at different classification levels for a variety of Navy/Marine Corps aviation platforms and air-launched weapons. JMPS software is fielded to the Fleet as a platform-tailored mission planning environment (MPE) that combines a common JMPS framework with NavMPS applications (e.g., WASP and TOPSCENE) and components that support platform-specific capabilities and tactical missions. JMPS replaces and improves upon legacy mission planning system (MPS) capabilities, increases commonality among platforms, and integrates new technologies to support evolving platform capabilities and interoperability requirements.

Status

JMPS is fielded directly to squadrons and supports approximately 40 aircraft type/model/series. These include:

- All F/A-18 *Hornet/Super Hornet* variants, EA-18G *Growler*, EA-6B *Prowler*, AV-8B *Harrier II*, MV-22B *Osprey*, C-2A *Greyhound*, E-2C/D *Hawkeye*, P-3C *Orion*, and EP-3E *ARIES II*
- Navy helicopters—MH-53E *Sea Dragon*, and SH-60B/F and MH-60R/S *Seahawk*
- Marine helicopters—AH-1W/Z *Super Cobra*, UH-1N/Y *Huey/Venom*, CH-46E *Sea Knight*, CH-53E *Super Stallion*, VH-3D *Sea King*, and VH-60N *WhiteHawk*; and
- Naval Aviation training aircraft

Future JMPS platforms include the CH-53K *King Stallion* helicopter and MQ-4C Triton Unmanned Aerial System. JMPS was designated the single MPS for Naval Aviation in 2006, replacing legacy, platform-unique MPS. In 2014, JMPS began fielding platform-tailored MPEs upgrades with a new JMPS framework and Windows 7 operating system to comply with Department of Defense Information Assurance mandates. In 2015, JMPS begins transitioning from a 32-bit to a 64-bit architecture, increasing memory and processing capabilities to meet Fleet requirements. The JMPS program is also fielding Electronic Kneeboard devices to aircrew for in-flight planning and mission execution of warfighting requirements, as well as to meet paperless cockpit initiatives.

Developers

BAE Systems	Rancho Bernardo, California
DCS Corporation	Lexington Park, Maryland
Northrop Grumman	San Pedro, California

Military Flight Operations Quality Assurance (MFOQA)

Description

MFOQA is knowledge-management process using data collected during flight to conduct post-flight analysis of aircrew and aircraft systems performance. MFOQA requires no additional equipment to be mounted on the aircraft platform and no additional tasking is added to the aircrew during flight. After each flight event, the aircrew can remove the data-collection card, take it to the squadron ready room, and load the data into squadron computers. Applying MFOQA software already loaded in the computer, the aircrew can replay the flight in animation, noting geographic position, instrument readings, and aircraft performance parameters. In addition, maintenance personnel can perform diagnostic analysis of the aircraft systems, aircrews can self-evaluate their performance, and squadron leadership can review and counsel on flight procedures and safety and training issues. The ultimate payoff is increased readiness through improved safety, better training, and faster main-

tenance troubleshooting. Flight operations quality assurance has been used in the commercial aviation industry for years. Surveys from the airline industry have yielded high praise for the process and have identified benefits to the Navy's maintenance, operations, safety, and training paradigm.

Status

MFOQA achieved initial operational capability in third quarter FY 2014. The Navy plan will implement MFOQA capability for 22 type/model/series aircraft over a phased approach. The lead platforms are the F/A-18C/D/E/F *Hornet/Super Hornet* and the EA-18G *Growler* aircraft. Follow-on phases will provide MFOQA capability to the MH-60R/S *Seahawk*, MH/CH-53E/K heavy-lift helicopters, AH-1Z *Super Cobra*, and UH-1Y *Huey/Venom* helicopters; the T-45 *Goshawk* jet trainer; and MV-22B *Osprey* tilt-rotor aircraft, with additional platforms to follow. Platform priorities are driven by several factors, including mishap rates, system architecture to support data collection, and fleet concerns.

Developers

Expected to be multiple sources following competition. Partnering developers include Rockwell Collins, Northrop Grumman, and SAIC.

SECTION 2

SURFACE WARFARE

The U.S. Navy surface force accomplishes a range of missions that contribute to each of the Navy's core capabilities. Today's mix of surface combatants include fully integrated multi-mission guided missile cruisers and destroyers, modular multi-role littoral combat ships, and patrol coastal ships. Together, these ships ensure the Navy can meet demands for high-and low-end surface warfare missions and tasks. Operating forward, these ships provide credible presence to stabilize key regions, conduct maritime security operations, and respond to man-made and natural disasters. If necessary, they can also provide offensive and defensive capabilities to help ensure U.S. joint forces can gain and sustain access to critical theaters to deter and defeat aggression and project power.

SURFACE WARSHIPS

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

Description

Ticonderoga-class guided-missile cruisers (CGs) provide multi-mission offensive and defensive capabilities and can operate independently or as part of aircraft carrier strike groups and surface action groups in support of global operations. *Ticonderoga*-class cruisers have a combat system centered on the Aegis Weapon System and the SPY-1B/(B)V multi-function, phased-array radar. The combat system includes the Mk 41 Vertical Launching System that employs Standard Missile surface-to-air missiles, Tomahawk land-attack cruise missiles, advanced undersea and surface warfare systems, embarked sea-control helicopters, and robust command, control, and communications systems in a potent, multi-mission warship. The oldest 11 cruisers have been extensively modernized, including hull, mechanical, and electrical (HM&E) upgrades as well as improved quality of life, mission-life extension, integrated ship's control, all-electric auxiliaries, and weight and moment modifications. Combat systems upgrades include an open-architecture computing environment. Specific improvements to Cooperative Engagement Capability and SPY radar, maritime force-protection with the Mk 15 Close-In Weapon System Block 1B, Evolved Seasparrow Missile, Nulka decoy, and SPQ-9B radar, and the SQQ-89A(V)15 anti-submarine warfare suite address capability upgrades. Open architecture cruiser modernization warfighting improvements will extend the Aegis Weapon System's capabilities against projected threats well into the 21st Century. The Navy has commenced a modernization plan of the fleet's 11 newest cruisers, which will update the ships' combat systems and HM&E systems. This updated modernization plan provides the added benefit of extending the service lives of these ships from 35 to 40 years, ensuring a minimum of 11 relevant and capable purpose-built Air Defense Commander platforms for carrier strike groups into the mid-2030s.

Status

Combat systems modernization commenced in FY 2008 with the USS Bunker Hill (CG 52). As of early FY 2015, seven ships have completed Advanced Capability Build (ACB) 08 combat systems modernization, and three have completed ACB-12 combat systems modernization. Aegis CGs 52–62 have completed extensive HM&E upgrades, and in 2015 the USS Gettysburg (CG 64) is undergoing modernization.

Developers

Huntington Ingalls Industries	Pascagoula, Mississippi
Lockheed Martin Mission Systems and Training	Moorestown, New Jersey

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

Description

Arleigh Burke-class guided-missile destroyer combat system is centered on the Aegis Weapon System and the SPY-1D(V) multi-function, phased-array radar. The combat system includes the Mk 41 Vertical Launching System, an advanced anti-submarine warfare system, advanced anti-air warfare missiles, and Tomahawk land-attack cruise missiles. Incorporating all-steel construction and gas-turbine propulsion, DDG 51 destroyers provide multi-mission offensive and defensive capability, operating independently or as part of an aircraft carrier strike group or surface action group. Flight IIA variants incorporate facilities to support two embarked helicopters, significantly enhancing the ship's sea-control capability. A Flight III variant, which will incorporate the advanced Air and Missile Defense Radar (AMDR), is in development. Studies are ongoing to identify additional technology insertions to improve capability in other warfare area missions for Flight III.

Status

The USS Michael Murphy (DDG 112), commissioned in October 2012, completed the original DDG 51 acquisition program. DDG 112 is fitted with Aegis Weapon System Baseline 7 Phase 1R, which incorporates Cooperative Engagement Capability, Evolved Seasparrow Missile, improved SPY-1D(V) radar, and an open-architecture combat system using commercially developed processors and display equipment. The DDG 51 line was restarted in FY 2010 to continue production of this highly capable platform. Contracts for four Flight IIA ships were awarded from FY 2010 through FY 2012. In June 2013, the Navy awarded a multi-year contract for Flight IIA DDG 51s in FY 2013 through FY 2017. In late 2014, the Navy was modifying these contracts via Engineering Change Proposals to the DDG Flight III configuration starting with the second ship procured in FY 2016. The Flight III configuration will include the AMDR, power and cooling enhancements to support AMDR, and additional technology insertions to improve capability and life cycle costs in other warfare area missions. Initial operational capability is scheduled for FY 2023 after delivery of the first ship in FY 2021.

Developers

General Dynamics Bath Iron Works	Bath, Maine, USA
Huntington Ingalls Industries	Pascagoula, Mississippi
Lockheed Martin Mission Systems and Training	Moorestown, New Jersey

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

Description

Arleigh Burke-class guided-missile destroyers commenced mid-life modernization in FY 2010 with DDGs 51 and 53. The program was originally accomplished in two phases. The first phase concentrated on hull, mechanical, and electrical (HM&E) systems and included new gigabit Ethernet connectivity in the engineering plant, a Digital Video Surveillance System, an Integrated Bridge system, an advanced galley, and other habitability and manpower-reduction modifications. A complete open-architecture computing environment is the foundation for warfighting improvements in the second phase of the modernization for each ship. The upgrade plan consists of an improved Multi-Mission Signal Processor, which integrates air and ballistic missile defense capabilities, and enhancements improving radar performance in the littoral regions. Upon the completion of the modernization program, the ships will have the following weapons and sensors: Cooperative Engagement Capability; Evolved Seasparrow Missile; Mk 15 Close-In Weapon System Block 1B; Surface Electronic Warfare Improvement Program; and Nulka decoys. The Mk 41 Vertical Launching System is upgraded to support SM-3 and newer variants of the Standard Missile family. These two phases are accomplished on each ship approximately two years apart. Modernized DDG 51-class guided-missile destroyers will continue to provide multi-mission offensive and defensive capabilities with the added benefit of sea-based ballistic missile defense (BMD).

Status

The HM&E modernization modifications have been designed into the most recent new-construction *Arleigh Burke*-class destroyers. Incorporating modernization design in new construction optimizes risk reduction and proof of alteration in the builder's yard, reducing overall risk in the modernization program. Three Flight I DDGs have completed the Advanced Capability Build (ACB-12/BMD 5.0) process of providing software upgrades for combat systems modernization. DDG modernization initially concentrates on the Flight I and II ships (hulls 51-78), but is intended as a modernization program for the entire class. The Flight IIA modernization as a single combined HM&E and combat system modernization is scheduled to begin in FY 2017.

Developers

General Dynamics Bath Iron Works	Bath, Maine
Lockheed Martin Mission Systems and Training	Moorestown, New Jersey

DDG 1000 *Zumwalt*-Class 21st Century Destroyer

Description

The *Zumwalt*-class guided-missile destroyer is an optimally crewed, multi-mission surface combatant tailored for land attack and littoral dominance. This advanced warship will provide offensive, distributed, and precision fires in support of forces ashore and will provide a credible forward naval presence while operating independently or as an integral part of naval, joint or combined strike forces. To ensure effective operations in the littoral, it will incorporate signature reduction, active and passive self-defense systems, and enhanced survivability features. It will field an undersea warfare suite capable of in-stride mine avoidance, as well as robust self-defense systems to defeat littoral submarine threats, anti-ship cruise missiles, and small boats. Additionally, it will provide valuable lessons in advanced technology, such as the integrated power system and advanced survivability features, which can be incorporated into other ship classes.

Status

Zumwalt (DDG 1000) fabrication commenced in February 2009, and the ship is scheduled to deliver in FY 2016 and reach initial operational capability in FY 2016. Zumwalt was christened in FY 2014. Michael Monsoor (DDG 1001) fabrication commenced in February 2010, and the ship is scheduled to deliver in FY 2017. Fabrication of Lyndon B. Johnson (DDG 1002) commenced in April 2012, and the ship is scheduled to deliver in FY 2019. General Dynamics and Huntington Ingalls Industries are building the three-ship DDG 1000 class, with final assembly conducted at General Dynamics Bath Iron Works.

Developers

BAE Systems	Minneapolis, Minnesota
General Dynamics Bath Iron Works	Bath, Maine
Huntington Ingalls Industries	Pascagoula, Mississippi
Raytheon Systems	Sudbury, Massachusetts

Littoral Combat Ship (LCS)

Description

The Littoral Combat Ship is a modular, reconfigurable ship designed to meet validated fleet requirements in the littoral region. The LCS addresses warfighting capability gaps against asymmetric anti-access threats and will play a vital role in American maritime security, eventually comprising a significant portion of Navy's future surface combatant fleet. Through its innovative modular design, LCS can be reconfigured for surface warfare (SUW), anti-submarine warfare (ASW), and mine countermeasures (MCM) missions. This versatility enables the Navy to provide warfighters with the most capable, cost-effective solution to counter anti-access threats in the littoral region.

There are two variants of LCS, the *Freedom* variant (all odd-numbered ships) and *Independence* variant (all even-numbered

ships). The *Freedom* variant is a steel semi-planing monohull with an aluminum superstructure, constructed by Lockheed Martin in Marinette Marine Corporation's shipyard in Marinette, Wisconsin. The *Independence* variant is an all-aluminum, stabilized monohull constructed by Austal USA (formerly teamed with General Dynamics) in Mobile, Alabama.

Both ship variants have an open architecture design and embark one of three interchangeable mission packages (MP) to execute SUW, ASW, and MCM core missions, in addition to numerous secondary missions. The LCS open architecture enables the rapid upgrade of weapon systems and sensors without requiring expensive time-consuming shipyard periods to install modifications. The ships operate on a 3:2:1 rotational crewing concept, in which three crews rotate between two ships, one of which will be deployed at any given time, thus providing continuous presence in important world regions. This innovative crewing concept provides approximately two times the on-station presence compared to other, single-crewed ships, resulting in a significant cost savings to the Navy.

Status

The LCS program began in February 2002, and in May 2004 the Navy awarded two contract options to Lockheed Martin and General Dynamics/Austal USA to build the first research-and-development ships. Through highly effective competition between industry bidders in 2010, the LCS program achieved significant savings with a fixed-price dual-block buy of 20 LCS (ten of each variant) through FY 2015. In early FY 2015, the Navy has 20 LCS (ten of each variant) either at sea, under construction, or under contract. LCS 1-4 have been commissioned and are home-ported in San Diego, California. LCS 5-8 have been launched and will deliver to the Navy in 2015. LCS 9-20 are under construction or contract.

In 2013, the USS Freedom (LCS 1) executed her first overseas deployment to the Western Pacific. Operating from Singapore's Changi Naval Base, Freedom participated in maritime security exercises with regional partners (Brunei, Cambodia, Indonesia, Malaysia, the Philippines, Singapore, and Thailand). In 2014, Freedom conducted developmental testing with an embarked ASW MP. This first LCS deployment provided an opportunity to evaluate LCS manning, training, maintenance, and logistics concepts in a real-world overseas operational environment. The Navy has incorporated lessons learned from the deployment to improve production and deliver increased capabilities and cost-efficiencies on future ships. In summer 2014, the USS Independence (LCS 2) with an embarked SUW MP and the USS Coronado (LCS 4) with an embarked MCM MP participated in the Rim of the Pacific (RIMPAC) 2014 exercise with 22 partner navies. Independence also conducted developmental testing with the MCM MP, in preparation for initial operational test and evaluation in 2015. In addition, Coronado conducted testing with the SUW MP, including a long-range surface-to-surface missile demonstration.

In November 2014, the USS Fort Worth (LCS 3) commenced a 16-month deployment to Singapore, beginning continuous LCS presence in the Western Pacific and the implementation of the 3:2:1 crewing concept.

Developers

General Dynamics /Austal USA	Mobile, Alabama
Lockheed Martin and Marinette Marine	Marinette, Wisconsin

PC 1 *Cyclone*-Class Patrol Coastal Modernization Program

Description

The *Cyclone*-class Patrol Coastal (PC) ships are essential for conducting theater security cooperation tasks, maritime security operations, and intelligence, surveillance, and reconnaissance missions. The PCs are uniquely suited to operating with maritime partner navies and coastguards, particularly in the green-water/brown-water "seam." Fourteen *Cyclone*-class ships were built, 13 are operating in the Navy, and one was transferred to the Philippine navy in 2004.

The PC Modernization improvements correct the most significant maintenance and obsolescence issues and will extend the life of the class by 15 years, to a 30-year expected service life. The program supports significant alterations, such as a main propulsion diesel engine pool and upgrading diesel generators and reverse-osmosis units. Additional hull, mechanical, and electrical modifications and updates to the weapons systems and C4ISR (command, control, communications, computers, intelligence, surveillance, and reconnaissance) suite are also included. As part of the Navy's counter-swarm strategy, for example, a 7.62mm coaxial mount Gatling gun is integrated into the forward and aft Mk 38 Mod 2 25mm electro-optical/infrared machine gun system to augment the PC's surface warfare capabilities for layered self-defense. In addition to the Mk 38 Mod 2 upgrade, the Mk 60 Griffin missile system installation is planned for all ten PCs to be deployed to Bahrain.

Status

The 13-ship *Cyclone*-class modernization program commenced in FY 2008 and is scheduled for completion by FY 2017. Ten PCs are forward deployed to Bahrain; the remaining three PCs are home-ported in Mayport, Florida. The forward and aft Mk 38 Mod 2 upgrade has been completed on all ten Bahrain PCs.

Developers

Bollinger Shipyards	Lockport, Louisiana

SURFACE WEAPONS

Long-Range Land-Attack Projectile (LRLAP)

Description

The Long-Range Land-Attack Projectile is a 155mm (6-inch) gun-launched, rocket-assisted, guided projectile developed for the Mk 51 Gun Weapon System on the three *Zumwalt* (DDG 1000)-class warships. Its primary mission is naval surface fire support and land attack. The LRLAP is an advanced round that uses a global positioning system-based guidance system and a unitary warhead to hit land-based targets at long ranges.

Status

LRLAP is completing the engineering, manufacturing, and development phase, with initial production in FY 2015. Development efforts are funded under the DDG 1000 research, development, test, and evaluation budget.

Developers

Lockheed Martin Missile and Fire Control — Orlando, Florida

Mk 15 Phalanx Close-In Weapon System (CIWS)

Description

The Mk 15 Mod 21-28 Phalanx Close-In Weapon System is an autonomous combat system that searches, detects, tracks (radar and electro-optic), and engages threats with a 20mm Gatling gun capable of firing 4,500 tungsten penetrator rounds per minute. Integral to ship self-defense and the anti-air warfare defense-in-depth concept, CIWS provides terminal defense against anti-ship missiles and high-speed aircraft penetrating other fleet defenses. Phalanx CIWS can operate autonomously or be integrated with a ship's combat system. The Block 1B configuration provides expanded defense against asymmetric threats such as small, fast surface craft, slow-flying aircraft, and unmanned aerial vehicles through the addition of an integrated forward-looking infrared system. Block 1B also incorporates an optimized gun barrel (OGB) for tighter ordnance dispersion. Enhanced-lethality cartridges can be used with the OGB for improved target penetration. Mk 15 Mod 31 is the SeaRAM CIWS system. SeaRAM also is based on the Block 1B Phalanx configuration, with the gun subsystem replaced by an 11-round Rolling Airframe Missile (RAM) launcher. SeaRAM can be integrated with ships combat system, but is capable of autonomously searching, detecting, tracking, and engaging threats with the RAM.

Status

More than 250 Mk 15 Phalanx CIWS systems are deployed in the Navy. By the end of FY 2016, all ships are scheduled to have Block 1B, and all ships are scheduled to complete an upgrade to Baseline 2 by the end of FY 2019. The Army has procured 45 LPWS systems for forward operating base defense under the C-RAM program. SeaRAM systems are employed on the *Independence* (LCS 2) variant Littoral Combat Ships.

Developers

Raytheon (Production/Depot)	Louisville, Kentucky
Raytheon (Engineering)	Tucson, Arizona

Mk 38 Mod 2 Stabilized 25mm Chain Gun

Description

The Mod 2 program upgrades the Mk 38 Mod 1 25mm chain gun by adding stabilization, remote operation, fire control, and an electro-optical sensor. These additions significantly expand the effective range, lethality, and nighttime capability of the weapon. The program reduces risk for surface ship self-defense by engaging asymmetric threats to ships at close range. It provides the capability to bridge current and future targeting and weapons technology in a close-range force protection environment, including protection in port, at anchor, transiting choke points, or while operating in restricted waters.

Status

The Navy initiated the Mk 38 Mod 2 program in 2003 to improve ship self-defense by developing and fielding a mid-term capability for surface ships that is simple, stabilized, and affordable. By early FY 2014, the program fielded 61 percent of the planned total of gun upgrades. The Mk 38 Mod 2 machine gun system is being permanently installed on aircraft carriers, guided-missile cruisers and destroyers, amphibious warfare ships, patrol coastal ships, command ships, and riverine squadron patrol boats. An ordnance alteration is under development to implement a 7.62mm coaxially mounted automatic gun.

Developers

BAE	Louisville, Kentucky
Rafael USA, Inc.	Bethesda, Maryland

Mk 45 Mod 4 5-Inch/62-Caliber Gun System Upgrade

Description

The Mk 45 Mod 4 5-inch/62-caliber gun is a modification of the 5-inch/54-caliber gun with higher firing energies to support long-range munitions. The gun retains the functionality of the 5-inch guns, including ability to fire all existing 5-inch rounds. The modified design also improves maintenance procedures and provides enhanced anti-surface and anti-air warfare performance. Modifications include a longer (62-caliber) barrel, an ammunition recognition system, and a digital control system.

Status

The Mk 45 Mod 4 gun was added to the *Arleigh Burke* (DDG 51)-class of destroyers, starting with the USS Winston S. Churchill (DDG 81).

Developers

BAE Systems	Minneapolis, Minnesota

Mk 46 Mod 2 Gun Weapon System (GWS)

Description

The Mk 46 Mod 2 is a 30mm GWS with a two-axis stabilized gun that can fire up to 200 rounds per minute. The system uses a forward-looking infrared sensor, a low-light television camera, and laser range finder with a closed-loop tracking system to optimize accuracy against small, high-speed surface targets. Adapted from the Marine Corps Expeditionary Fighting Vehicle gun, the Mk 46 Mod 2 GWS is an upgrade to the Mk 46 Mod 1 GWS. Both systems build upon commercial off-the-shelf /non-development items (COTS/NDI) technology using open-system architecture to allow for rapid and cost-effective use of COTS/NDI components and software.

Status

The Mk 46 Mod 2 GWS will be installed on the *San Antonio* (LPD 17)-class amphibious transport dock ships and the *Zumwalt* (DDG 1000)-class destroyers as well as the Littoral Combat Ship surface warfare mission package.

Developers

General Dynamics Land Systems — Sterling Heights, Michigan

Mk 51 Gun Weapon System (GWS)

Description

The Mk 51 GWS is a 155mm (6-inch) advanced gun system (AGS) to be installed in the three *Zumwalt* (DDG 1000)-class destroyers to provide precision, volume, and sustained fires in support of distributed joint and coalition forces ashore. The MK 51 GWS is a fully integrated, automatic gun and magazine weapon system that will support the *Zumwalt*-class naval surface fire support mission. Each system will be capable of independently firing up to ten rounds per minute. The program includes development of the global positioning system (GPS)-guided 155mm Long-Range Land-Attack Projectile, the first of a family of AGS munitions. The MK 51 GWS was designed to meet DDG 1000 optimal manning and radar-signature requirements.

Status

Mk 51 manufacturing is underway at two facilities—Cordova, Alabama, and Louisville, Kentucky—and is meeting ship-production schedules. Mk 51 magazines and guns have been installed on DDG 1000. For DDG 1001, two magazines have been delivered to General Dynamics Bath Iron Works and in late 2014 were being installed; the first and second guns are in storage and will be delivered and installed in FY 2015. DDG 1002's magazine and gun production is in progress to meet in-shipyard need dates: FY 2015 (magazines) and FY 2017 and FY 2018 (guns).

Developers

BAE Systems — Minneapolis, Minnesota

Mk 54 Lightweight Torpedo (LWT)

Description

The Mk 54 Lightweight Torpedo is a modular upgrade to the lightweight torpedo inventory and adds the capability to counter quiet diesel-electric submarines operating in the littoral. Mk 54 LWT combines existing torpedo hardware and software from Mk 46, Mk 50, and Mk 48 Advanced Capability (ADCAP) programs, with advanced digital commercial off-the-shelf electronics. The resulting Mk 54 LWT offers significantly improved shallow-water capability at reduced life-cycle costs. The Mk 54 LWT modernization plan will introduce new hardware and software updates providing stepped increases in probability of kill, while reducing life-cycle cost and allowing the torpedo to remain ahead of the evolving littoral submarine threat. Mk 54 is also replacing the Mk 46 as the payload in the Vertical-Launch Anti-Submarine Rocket (VLA).

Status

Mk 54 torpedoes are being delivered for fleet use to meet the total munitions requirement. Mk 46 torpedo maintenance has been augmented to supplement LWT inventory while Mk 54 inventory is built up. The Mk 54 Block Upgrade was approved for fielding in June 2014 and is being delivered throughout the Fleet. The Mk 54 VLA achieved initial operational capability in March 2010.

Developers

Raytheon — Mukilteo, Washington

Mk 60 Griffin Missile System (GMS)

Description

The Griffin Missile System combines a lightweight laser and global positioning system/inertial navigation system (GPS/INS) in an integrated guided-missile system that has been adapted for use on forward-deployed *Cyclone* (PC 1)-class Patrol Coastal ships. The GMS was originally designed as an air-to-ground precision-engagement missile for U.S. Air Force MC-130 gunships. The Navy modified the GMS as a rapid deployment capability in support of fleet operational needs to improve small-vessel engagement capacity. The Griffin Block II is a 5.5-inch missile with a 13-pound blast-fragmentation warhead and semi-active laser seeker. The GMS uses the Brite Star II Electro-Optic Infrared Laser Designator sensor ball mounted on the PC's mast to provide target identification and illumination.

Status

At-sea testing completed in July 2013, and GMS proved to be effective against small-vessel threats. The first four operational systems were installed on PCs in 2013. The remaining forward-deployed PCs will have the GMS installed by 2017.

Developers

Naval Surface Warfare Center — Dahlgren, Virginia
Raytheon Missile Systems — Tucson, Arizona

RGM/UGM-109E Tomahawk Land-Attack Missile (TLAM)

Description

Deployed on surface warships and attack- and guided-missile submarines, the Tomahawk Land-Attack Missile is the Department of Defense's premier, all-weather, long-range, subsonic land-attack cruise missile. The Block IV Tactical Tomahawk (TACTOM, RGM-109E/UGM-109E) preserves Tomahawk's long-range precision-strike capability while significantly increasing responsiveness and flexibility. TACTOM improvements include in-flight retargeting, the ability to loiter over the battlefield, in-flight missile health and status monitoring, and battle damage indication imagery providing a digital look-down snapshot of the battlefield via a satellite data link. TACTOM also facilitates rapid mission planning and execution via global positioning system (GPS) onboard the launch platform and features an improved anti-jam GPS. Future payloads could include smart sub-munitions, a penetrator warhead, and a multiple-response warhead. Plans call for the Navy to procure more than 3,000 TACTOM missiles prior to program termination. TLAM Block III missiles will be retired from service by 2020.

Status

A full-rate production contract was signed in August 2004. It was Navy's first multi-year contract for TACTOM procurement, producing more than 1,500 missiles. This contract ended in FY 2008, and all missiles have been delivered. Tomahawk Block IV procurement in FY 2009 to FY 2011 was executed via firm, fixed-price contracts. The Navy will continue to procure TACTOM.

Developers

Raytheon Missile Systems — Tucson, Arizona

RIM-7, Mk 57 NATO Seasparrow Surface Missile System (NSSMS) and RIM-162 Evolved Seasparrow Missile (ESSM)

Description

The Mk 57 NATO Seasparrow Surface Missile System and its associated RIM-7P NSSM or RIM-162 Evolved Seasparrow Missile serve as the Navy's primary surface-to-air ship self-defense missile system. NSSMS is deployed on aircraft carriers, surface warships, and landing helicopter dock amphibious assault ships, and is being installed on the newest class of landing helicopter assault ships. The Mk 57 Target Acquisition System is a combined volume-search radar and control element that determines threat evaluation and weapon assignment. A kinematic upgrade to the RIM-7P missile, the ESSM is the next-generation Seasparrow Missile that serves as a primary self-defense weapon on aircraft carriers and large-deck amphibious warships and provides layered-defense for cruisers and destroyers. ESSM Block 1 upgrades include a more powerful rocket motor, tail control section for quick response on vertical-launch system ships, upgraded warhead, and a quick-reaction electronic upgrade. Enhanced ESSM kinematics and warhead lethality leverage the robust RIM-7P guidance capability to provide

increased operational effectiveness against high-speed, maneuvering, hardened anti-ship cruise missiles at greater intercept ranges than the RIM-7P. Operational in FY 2004, ESSM continues to be procured as part of the NATO Seasparrow Consortium involving ten NATO countries. In order to pace evolving threats, the next-generation ESSM Block 2 is being developed cooperatively by seven countries, replacing the missile guidance section with an active/semi-active dual-mode seeker.

Status

ESSM Block 1 is fielded on *Ticonderoga* (CG 47)-class cruisers, Flight IIA *Arleigh Burke* (DDG 51)-class destroyers, and in-service aircraft carriers (CVNs). It will be deployed on the three *Zumwalt* (DDG 1000) destroyers and selected *Wasp*-class amphibious assault ships (LHDs 6, 7, and 8), to be followed by the remaining cruisers, destroyers, and amphibious assault ships through planned modernization programs. By 2025, 114 Navy ships will be armed with ESSM. ESSM joint universal weapon link (JUWL) development is on track, and interrupted continuous wave illumination (ICWI) has already been incorporated. DDG 1000 and CVN 78 will require a unique variant of ESSM, incorporating both ICWI and JUWL. ESSM Block 2 development is in risk-reduction phase and commences engineering and manufacturing development in FY 2015. ESSM Block 2 is anticipated to reach Milestone B in FY 2015 and achieve initial operational capability in 2020.

Developers

Raytheon Missile Systems — Tucson, Arizona

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

Description

The RIM-66C Standard Missile 2 (SM-2) is the Navy's primary air-defense weapon. SM-2 Block III/IIIA/IIIB configurations are all-weather, ship-launched, medium-range, surface-to-air missiles in service with the Navy and 15 allied navies. SM-2 enables forward naval presence, littoral operations, and projecting and sustaining U.S. forces in anti-access and area-denied environments. SM-2 Block III/IIIA/IIIB missiles are launched from the Mk 41 Vertical Launching System installed in Aegis cruisers and destroyers. Block III features improved performance against low-altitude threats and optimizes the trajectory-shaping within the Aegis command guidance system by implementing shaping and fuse altimeter improvements. Block IIIA features improved performance and lethality against sea-skimming threats due to a new directional warhead and the addition of a moving-target-indicator fuse design. Block IIIB adds an infrared-guidance mode capability developed in the Missile Homing Improvement Program to improve performance in a stressing electronic countermeasure environment. Blocks IIIA/IIIB will be the heart of the SM-2 inventory for the next 20 years. The latest generation of Block IIIB missiles includes a maneuverability upgrade (SM-2 Block IIIBw/MU2) to enhance Block IIIB performance against low-altitude, supersonic maneuvering threats.

Status

The SM-2 program is in the sustainment phase. The Navy has established a limited depot (FY 2013) and rocket motor regrain program (FY 2014) to maintain the inventory out to the 2030 timeframe. This will allow the SM-2 inventory to keep pace with Navy's 30-year shipbuilding plan, keep infrastructure in place to convert SM-2 Block IIIA missiles to the unique interrupted continuous wave illumination/joint universal weapon link variant for the three *Zumwalt* (DDG 1000)-class warships and *Gerald R. Ford* (CVN 78)-class carriers, and support projected increases in fleet proficiency firings.

Developers

Raytheon Missile Systems — Tucson, Arizona

RIM-116A Rolling Airframe Missile (RAM)

Description

The RIM-116A Rolling Airframe Missile is a high rate-of-fire, low-cost system, based on the AIM-9 Sidewinder, designed to engage anti-ship cruise missiles (ASCMs). 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 is autonomous after launch. Effective against a wide spectrum of existing threats, RAM Block 1 IR upgrade incorporates IR all-the-way-homing to improve performance against evolving passive and active ASCMs. Plans are for RAM to evolve and keep pace with emerging threats. RAM Block 2, in the demonstration and production phase, will provide increased kinematic capability against highly maneuvering threats and improved RF detection against low probability of intercept threats. The RAM program is a cooperative partnership with Germany, and the Block 2 missile is being developed jointly (50/50) with Germany.

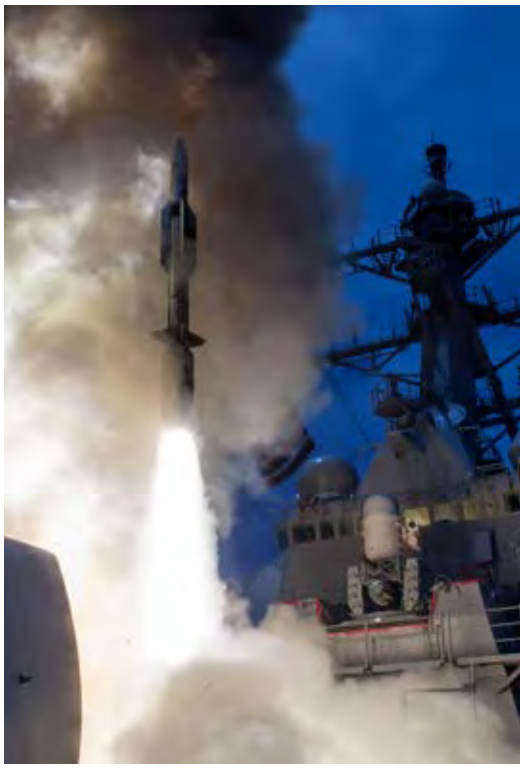
Status

RAM is installed in the *Tarawa* (LHA 1)- and *Wasp* (LHD 1)-class amphibious assault ships, *Whidbey Island* (LSD 41)- and *Harpers Ferry* (LSD 49)-class dock landing ships, aircraft carriers, and *San Antonio* (LPD 17)-class landing platform dock ships. RAM is also installed on the USS Freedom (LCS 1), the Lockheed Martin variant of the Littoral Combat Ship (LCS). In 2001, the Navy submitted an engineering change proposal to develop a SeaRAM configuration. SeaRAM removed the Phalanx Gun System from the Close-In Weapon System and incorporated an 11-round RAM missile launcher system. Modifying the Phalanx radar to detect low-elevation, low-radar cross-section threats at an increased range increased the battlespace. No missile modifications were required. General Dynamics selected SeaRAM as part of the combat system for the *Independence* (LCS 2) warships. The Block 2 missile is in the third year of low-rate initial production and is scheduled to achieve initial operational capability in FY 2015.

Developers

RAMSYS GmbH — Ottobrunn, Germany
Raytheon Missile Systems — Tucson, Arizona

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



Description

The Standard Missile 6 (SM-6) Extended-Range Active Missile (ERAM) is the U.S. Navy's next-generation extended-range anti-air warfare interceptor. The introduction of active-seeker technology to air defense in the Surface Force reduces the Aegis Weapon System's reliance on illuminators. It also provides improved performance against stream raids and targets employing advanced characteristics such as enhanced maneuverability, low-radar cross-section, improved kinematics, and advanced electronic countermeasures. The SM-6 acquisition strategy is characterized as a low-risk development approach that leverages SM-2 Block IV/IVA program non-developmental items and Raytheon's Advanced Medium Range Air-to-Air Missile Phase 3 active seeker program from Naval Air Systems Command. The SM-6 missile will be fielded on in-service *Arleigh Burke* (DDG 51)-class destroyers and *Ticonderoga* (CG 47)-class cruisers.

Status

The Navy established the SM-6 Extended-Range Air Defense program in FY 2004. In March 2013, the Resources and Requirements Review Board directed a program of record increase from 1,200 missiles to 1,800. The SM-6 program inventory objective increase results from fleet threat analysis and evolving mission sets, as well as anticipated new threats. The program improves fleet defense and ensures sufficient missile inventory is available. The SM-6 was authorized to enter into full rate production in July 2013 and achieved initial operational capability in November 2013.

Developers

Raytheon — Tucson, Arizona

U.S. Coast Guard Navy-Type / Navy-Owned (NTNO) Program

Description

The Navy-Type/Navy-Owned Program provides legacy and new Coast Guard cutters with sensors, weapons, and communications capabilities needed to execute assigned naval warfare tasks and ensure interoperability with the Navy. Examples include the Mk 110 57mm naval gun system, the Mk 38 25mm machine gun system, and the SLQ-32 Surface Electronic Warfare Improvement Program, to name just a few of the more than 20 systems that comprise the NTNO program.

Status

In addition to supporting the Coast Guard's legacy fleet of more than 80 in-service platforms ranging from high- and medium-endurance cutters to its patrol boat fleet, the NTNO program is an integral part of the Coast Guard's ongoing modernization efforts. As the Coast Guard fields the *Legend* (WMSL 750)-class National Security Cutters, Fast Response Cutters, and Offshore Patrol Cutters, the NTNO program continues to provide the systems

necessary to help ensure the interoperability and naval warfare mission readiness of the Coast Guard cutter fleet.

Developers
Multiple sources.

SURFACE SENSORS AND COMBAT SYSTEMS

Aegis Ashore

Description
On September 17, 2009, the President announced the plan to provide regional missile defense to U.S. deployed forces and allies called a Phased Adaptive Approach (PAA). The PAA tailors U.S. ballistic missile defense (BMD) capabilities to specific theater needs to enhance integrated regional missile defenses against short-, medium-, and intermediate-range ballistic missiles. Aegis Ashore is an adaptation of Navy's proven Aegis BMD capability and uses components of the Aegis Weapon System that are installed in modular containers and deployed to prepared sites of host nations to provide a shore-based BMD capability. The Department of Defense Missile Defense Agency (MDA) is the Aegis Ashore material developer and funds development, procurement, and installation of BMD systems, peripherals, and Standard Missile (SM-3) missiles. The Director, MDA is designated the Acquisition Executive for the U.S. Ballistic Missile Defense System, and in this capacity MDA exercises all source-selection and milestone decision authorities for all elements of the BMDS up to, but not including, production issues.

Status
The first Aegis Ashore site, Aegis Ashore Missile Defense Test Complex at Pacific Missile Range Facility, Kauai, Hawaii, was completed in FY 2014. The first forward operating site in Romania will be operational in late 2015 with a second site in Poland operational by late 2018. The Naval Sea Systems Command and MDA established an Aegis Ashore Hybrid Program Office within the Aegis BMD Directorate, which is closely coordinating the efforts with Program Executive Office for Integrated Warfare Systems, which oversees Aegis Ashore development and deployment.

Developers

Black & Veatch Corporation	Overland Park, Kansas
Carlson Technology	Livonia, Michigan
Gibbs & Cox	Arlington, Virginia, USA
Lockheed Martin Mission Systems and Training	Moorestown, New Jersey

Aegis Combat System (ACS)

Description

The Aegis Combat System is a centralized, automated, command-and-control, and weapons control system. ACS integrates combat capabilities, developed in other Navy programs, into the *Ticonderoga* (CG 47)-class and *Arleigh Burke* (DDG 51)-class warships, providing effective capability to counter current and future air, surface, and sub-surface threats. ACS is an element of the Aegis Shipbuilding Acquisition Category (ACAT) I program of record.

Status

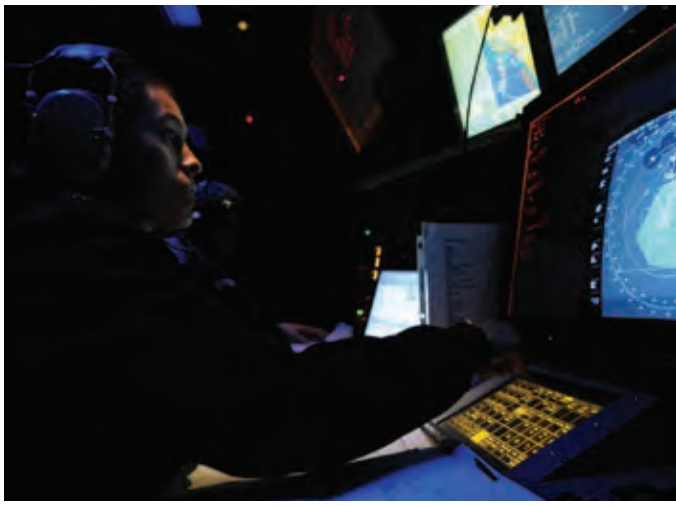
ACS was introduced to the Fleet in 1983 and continues to serve as the foundation platform for new capabilities, weapons, and sensor systems. The Aegis Modernization (AMOD) program is producing system upgrades via the Advanced Capability Build (ACB) process being implemented as part of the Cruiser and Destroyer Modernization, DDG 51 Restart, and DDG 51 Flight III programs to keep pace with evolving threats and challenging littoral environments. The first iteration of this process, ACB-08/Technology Insertion (TI) 08, brought CGs 52 through 58 increased warfighting capabilities during modernizations that began in 2009. ACB-08 separated hardware from software, allowing for commercial-off-the-shelf computer processors, and re-uses elements of the Aegis Baseline 7.1R computer program code, while integrating improved system capabilities.

The ongoing ACB-12 has transitioned to Aegis Baseline 9 and brings increased warfighting capability with regard to Integrated Air and Missile Defense (IAMD), Naval Integrated Fire Control-Counter Air (NIFC-CA), the SM-6 Extended-Range Active Missile, the Evolved Sea Sparrow Missile (ESSM), Close-In Weapon System Block 1B, and Multi-Mission Signal Processor.

The follow-on to ACB-12 is ACB-16, which will integrate the following additional capabilities: Improved IAMD capability with new Standard Missiles; SPQ-9B radar; MH-60R helicopter; Surface Electronic Warfare Improvement Program Block II with radar-designated decoy launch; and updates to Total Ship Training Capability (TSTC) training, interoperability, and C4I (command, control, communications, computers, and intelligence) capabilities.

Baseline 9 initiated a Common Source Library (CSL) program for Aegis and brought in the first third-party developed software element, the Track Manager/Track Server, as well as the competitively awarded Common Display System and Common Processor System. The CSL enables software reuse and commonality across all modernized and new-construction Aegis Combat System configurations. Specifically, the Aegis CSL allows for the use of common tactical software across four different Aegis configurations: (1) air-defense cruisers; (2) IAMD destroyers with integrated air and ballistic missile defense (BMD) capabilities; (3) new-construction IAMD destroyers; and (4) Aegis Ashore with integrated BMD capability.

ACBs are bringing new capabilities to existing ships in single packages vice the legacy method of installing capability improvements through individual deliveries.



The Navy awarded a contract in March 2013 for an Aegis Combat System Engineering Agent, which will fully integrate these capabilities into the Aegis Combat System for maximum effectiveness. In addition, there will be greater commonality across ACBs, which will ultimately result in improved capability deliveries at a reduced cost.

Developers

Lockheed Martin Mission Systems and Training	Moorestown, New Jersey
Naval Surface Warfare Center	Dahlgren, Virginia
	Port Hueneme, California

Image courtesy of Raytheon.

Air and Missile Defense Radar (AMDR)

Description

The advanced Air and Missile Defense Radar system is being developed to fill capability gaps identified by the Maritime Air and Missile Defense of Joint Forces Initial Capabilities Document. AMDR is a multi-function, active-phased array radar capable of simultaneous search, detection, and tracking of airborne missile targets and ballistic missile targets for engagement support. The AMDR suite consists of an S-band radar (AMDR-S), an X-band radar (SPQ-9B for the first 12 shipsets), and a Radar Suite Controller (RSC). The radar will be developed to support multiple ship classes, the first being the Arleigh Burke (DDG 51) Flight III warships. The multi-mission capability will be effective in air dominance of the battle space (area air defense) and defense against ballistic missiles. In addition to its integrated air and missile defense capability, AMDR will support requirements for surface warfare, anti-submarine warfare, and electronic warfare.

Status

AMDR is an ACAT 1D program with Milestone B approval and in FY 2015 is in the engineering and manufacturing development (EMD) phase. The Navy awarded the AMDR contract to Raytheon on October 10, 2013 and after a protest and withdrawal, the EMD phase began on January 9, 2014. AMDR successfully completed the hardware delta preliminary design review (PDR) on May 21, 2014 and the systems delta PDR on August 27, 2014. Upcoming milestones are the hardware Critical Design Review (CDR) and the systems CDR. The program remains on track to receive Milestone C approval in FY 2017 and achieve initial operational capability on the first DDG 51 Flight III warship in FY 2023.

Developers

Raytheon	Waltham, Massachusetts

Littoral Combat Ship (LCS) Mission Packages (MPs)

Description

The Littoral Combat Ships have an innovative design with interchangeable mission systems, allowing for rapid mission reconfiguration and modernization. The LCS design is configured

to fill three anti-access capability gaps: surface warfare (SUW); mine countermeasures (MCM); and anti-submarine warfare (ASW). This versatility gives the Navy the operational flexibility to meet changing warfighting requirements, as well as rapidly field upgrades or incorporate new technology to meet emerging threats. A mission package consists of mission modules (MM), which include the vehicles, sensors, communications, and weapons; a Mission Package Detachment, which consists of 15-19 Sailors specializing in the MP; and an Aviation Detachment (AVDET), which includes pilots, aircrew, maintainers, helicopters, and drones.

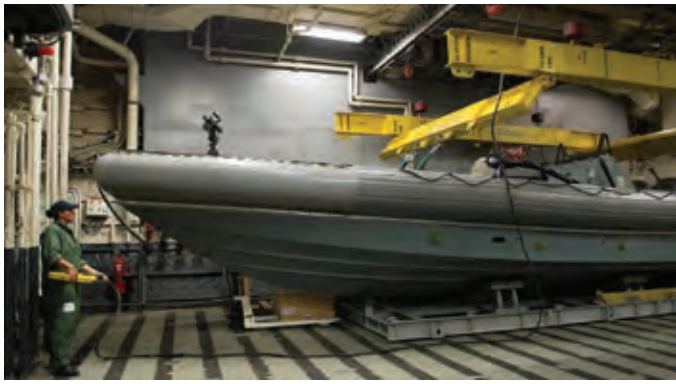
The SUW MP provides the ability to perform maritime security operations while delivering effective firepower, including offensive and defensive capabilities against multiple groups of fast-attack-craft and fast-inshore-attack craft. The SUW MP consists of the Maritime Security Module (two 11m rigid-hull inflatable boats for visit, board, search, and seizure operations), the Gun Mission Module (two Mk 46 30mm gun systems), an MH-60R *Seahawk* helicopter armed with Hellfire missiles, and a vertical-takeoff and landing tactical unmanned aerial vehicle (VTUAV). In the future, a Surface-to-Surface Missile Module (Longbow Hellfire missiles) will be added.

The MCM MP provides the capability to detect and neutralize mines throughout the water column using off-board manned and unmanned vehicles. The MCM MP consists of Remote Multi-Mission Vehicles equipped with the AQS-20A mine hunting sonar, an MH-60S helicopter equipped with ASQ-235 Airborne Mine Neutralization System (AMNS) or the AES Airborne Laser Mine Detection System, and a VTUAV with the Coastal Battlefield Reconnaissance and Analysis mine-detection system. In the future, the MCM MP will include an Unmanned Influence Sweep System and Knife Fish Unmanned Underwater Vehicle. By using off-board assets, the MCM MP dramatically improves the speed an area can be searched and cleared of mines, while keeping the ship and crew out of the mine danger area—a major improvement over existing capabilities in the fleet.

The ASW MP enables the LCS to detect and engage modern submarine threats. The ASW MP includes active and passive detection systems to conduct area search and high-value unit escort missions, and a torpedo countermeasure system to enhance survivability in an ASW environment. ASW MP systems include: the MH-60R helicopter with airborne low-frequency sonar, sonobuoys, and Mk 54 Lightweight Torpedo; the Lightweight Towed Torpedo Defense and Countermeasures Module; the SQR-20 Multi-Function Towed Array; and a variable-depth sonar.

Status

The Phase II SUW MP completed initial operational test and evaluation (IOT&E) on the USS Fort Worth (LCS 3) in April 2014. As of late FY 2014, four SUW MPs, one MCM MP, and the advanced development model ASW MP have been delivered. Delivery of the initial production model ASW MP will occur in FY 2016. Three



phases of MCM MP developmental testing have been completed, and IOT&E will begin in FY 2015.

Developers

Northrop Grumman Integrated Systems
Mission Package Development and Integration — Falls Church, Virginia

Maritime Integrated Air and Missile Defense Planning System (MIPS)

Description

MIPS is a software and hardware display tool that supports operational-level integrated air and missile defense (IAMD) planning and asset allocation, assessments of alternative courses of action and near real-time monitoring during IAMD mission execution. In a complex joint warfighting environment, MIPS provides the joint force maritime component commander staff with a planning tool for allocating resources and assessing operational risks in a rapidly developing deployment of Navy air and missile defense assets. The MIPS output is an operational-level plan detailing optimized use of forces developed with the warfighter's knowledge and judgment. MIPS is deployed in the numbered fleet maritime operations centers and on selected command ships.

Status

MIPS is undergoing technical refresh to replace legacy and obsolete hardware. The technical refresh will be followed by two software capability development efforts, MIPS Increment 1 and Increment 2. Both increments will include enhanced planning capabilities and capacity for IAMD as well as an improved interface between the Aegis Ballistic Missile Defense Mission Planner and the Command, Control, Battle Management, and Communications System. MIPS Increment 1 will achieve initial operational capability in FY 2015. The MIPS program was designated a Navy ACAT III acquisition program on February 11, 2011.

Developers

General Dynamics Advanced Information Systems — Fairfax, Virginia

Naval Integrated Fire Control–Counter Air (NIFC–CA) From the Sea (FTS)

Description

Naval Integrated Fire Control–Counter Air From the Sea kill chain provides both an engage on remote (EOR) and over the horizon (OTH) air defense capability, taking advantage of the full kinematic range of the Navy's missiles engage manned aircraft and cruise missiles. NIFC-CA is a non-ACAT project established to ensure the alignment of Navy pillar programs—SM-6 missile, Cooperative Engagement Capability (CEC), E-2D Advanced Hawkeye, and Aegis Weapon System. The NIFC-CA System of

Systems project overcomes traditional radar horizon limitations and expands on CEC sensor netting capability to provide an EOR capability to kill targets OTH at greater ranges than conventional organic fire-control systems.

Status
The NIFC-CA project has conducted more than 200 live-tracking events. All seven live-fire tests have successfully verified NIFC-CA capability. One of these tests, conducted in June 2014, was the longest Standard Missile engagement in history. The first deployment of initial project capability is on track for FY 2015.

Developers
Multiple sources.

Navigation Systems

Description
Navigation systems provide position, altitude, and timing information for all surface ships, aircraft carriers, and amphibious ships. The program consists of inertial navigators, gyrocompasses, speed logs, fathometers and Electronic Chart Display and Information System-Navy (ECDIS-N). In addition to supporting safety of navigation, shipboard navigation systems provide altitude information to Tomahawk Land-Attack Missiles and ballistic missile defense systems.

Status
Modernization efforts are ongoing across the portfolio of navigation equipment. Legacy inertial navigators are being upgraded to the WSN-7/7B standard, while development of the next generation of inertial navigation system is beginning. ECDIS-N systems are being fielded across the fleet and throughout the Navy.

Developers
Northrop Grumman
Sperry Marine — Charlottesville, Virginia

Navy Aegis Ballistic Missile Defense (ABMD)

Description
Aegis ballistic missile defense includes modifications to the Aegis Weapons System and integration of the Standard Missile (SM-3) with its hit-to-kill kinetic warhead. This combination gives select Aegis cruisers and destroyers the capability to intercept short-, medium-, and some intermediate-range ballistic missiles in the midcourse phase of exo-atmospheric trajectories. Additionally, Aegis BMD provides surveillance and tracking capability against longer-range intermediate- and intercontinental-range ballistic missile threats. Together, these capabilities contribute to robust defense-in-depth for U.S. and allied forces, critical political and military assets, population centers, and large geographic regions against the threat of ballistic missile attack. The Missile Defense

Agency (MDA) and the Navy initially deployed the Aegis BMD long-range surveillance and tracking capability as an element of the U.S. Ballistic Missile Defense System in October 2004. The Aegis BMD engagement capability was certified for operational use in August 2006.

Status

As of early FY 2014, 31 cruisers and destroyers had been modified to conduct BMD, with additional warships to be modified in the future. The Aegis BMD 3.6 program capability has been installed on 25 Aegis warships, and BMD 4.0 has been installed on five others. The first true IAMD Aegis Baseline, Baseline 9C, includes Aegis BMD 5.0. Baseline 9C has been installed and is undergoing testing on the IAMD test ship, the USS John Paul Jones (DDG 53). This most advanced baseline is scheduled for seven Flight I and II destroyers and all Flight IIA destroyers as part of the Aegis Modernization program. BMD ships also have long-range surveillance and tracking capability to provide cueing in defense of the homeland, and a BMD engagement capability using the SM-3 missile to conduct active defense against short-to-intermediate-range ballistic missiles. The SM-2 Block IV inventory has been modified for the terminal ballistic-missile defense mission. This capability provides an endo-atmospheric, lower-tier capability, resulting in a layered defense against enemy ballistic missiles. The Navy and MDA are collaborating to provide a more advanced sea-based terminal-defense capability using the advanced Standard Missile 6 interceptor.

Developers

Lockheed Martin Mission Systems and Training	Moorestown, New Jersey
Raytheon	Tucson, Arizona

Ship Self-Defense System (SSDS)

Description

The Ship Self-Defense System is a centralized, automated, command-and-control system for non-Aegis warships. An upgrade of the Advanced Combat Direction System, SSDS provides an integrated combat direction system for aircraft carriers and all amphibious ships, enabling them to keep pace with evolving anti-ship cruise missile (ASCM) threats. The SSDS open architecture system integrates detection and engagement elements of the combat system with automated weapons control doctrine, Cooperative Engagement Capability (CEC), and tactical data links for enhanced battle space awareness. SSDS provides a robust self-defense capability to warships not configured with the Aegis Combat System.

Status

SSDS Mk 1 began full-rate production following operational testing in 1997 and is fielded in all *Whidbey Island* and *Harpers Ferry* (LSD 41/49)-class ships. SSDS Mk 2, which provides strike group interoperability via CEC and Tactical Data Information

Link Joint (TADIL-J), achieved initial operational capability in 2005 and continues fleet installation. The Navy plans to upgrade periodically the SSDS federated and technically decoupled architecture via commercial-off-the-shelf technology insertion and preplanned product improvement. SSDS Mk 2 is programmed for all aircraft carriers, amphibious assault ships, and *San Antonio* (LPD 17)-class ships. SSDS Mk 2 began replacing SSDS Mk 1 on LSD 41/49-class ships in FY 2014 and is scheduled for complete fielding by 2021. Advanced Capability Build (ACB) 12 is in development, with Gerald R. Ford (CVN 78) as the lead ship. Follow-on ACB development will integrate into SSDS the Surface Electronic Warfare Improvement Program Block 2, MH-60R, Seahawk helicopters, Mk 15 Close-In Weapon System, and Identification Friend or Foe Mode 5/S.

Developers
Raytheon — San Diego, California

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

Description
The SPQ-9B Anti-Ship Cruise Missile Radar is a phased-array, rotating radar that significantly improves a ship's ability to detect and track low-altitude anti-ship cruise missiles in a heavy-clutter environment. This capability is in addition to and improves upon the surface search and gunfire control capability retained from previous versions of the SPQ-9 radar. It is a high-resolution track-while-scan, X-band, pulse-doppler radar that enables track detection at ranges that allow combat systems to engage subsonic or supersonic sea-skimming missiles at the outer edge of a ship's engagement envelope. Additional modifications are in developmental testing to add a periscope-detection and discrimination capability to the radar's surface-search capability.

Status
The SPQ-9B is an integral part of the Cruiser Modernization Program, providing an ASCM cue to the Aegis Combat System. The SPQ-9B integrates with Ship Self Defense Surface Mk 2 on aircraft carriers and amphibious assault ships, enabling those ships' ASCM defense capabilities to pace the evolving worldwide threat. The radar is Navy Type/Navy Owned equipment on the U.S. Coast Guard's new-construction *Legend* (WMSL 750)-class National Security Cutters. The SPQ-9B is planned for deployment in conjunction with future guided-missile destroyer modernizations and the initial DDG 51 Flight III destroyers.

Developers
Northrop Grumman — Baltimore, Maryland

SPY-1 (Series) Aegis Multi-Function Phased-Array Radar

Description

The SPY-1 S-Band 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. The SPY-1 is a multi-function, passive phased-array radar capable of search, automatic detection, tracking of air and surface targets, and missile-guidance support. The SPY-1A, SPY-1B, and SPY-1B(V) variants are fielded in cruisers, and the SPY-1D and SPY-1D(V) variants are fielded in destroyers. The latest variant of this radar, SPY-1D(V), improves the radar's capability against low-altitude and reduced radar cross-section targets in littoral clutter environments and in the presence of intense electronic countermeasures. Radars in selected Aegis cruisers and destroyers can also detect, track, discriminate, and support engagement of ballistic missile threats.

Status

The SPY-1D(V) littoral radar upgrade superseded the SPY-1D in new-construction Flight IIA destroyers. Initial operational testing and evaluation were completed in the fall 2005. Full rate production decision occurred in 2012. SPY-1D (V) is, or will be, installed in DDGs 91 through 122. A new Multi-Mission Signal Processor (MMSP) was developed to deliver SPY-1D(V) equivalent capability to SPY-1D radars in support of integrated air and missile defense tasks, including ballistic-missile defense requirements. The MMSP upgrades are installed during Destroyer Modernization program combat system upgrade availabilities. The MMSP upgrade is likewise integrated with the SPY-1D(V) radar in new-construction destroyers, starting with DDG 113, and in Aegis Ashore ballistic-missile defense systems. Outfitted with the MMSP upgrade to the AN/SPY-1D Radar in 2013, the USS John Paul Jones (DDG 53) was the first destroyer to complete the combat system radar modernization upgrade. DDG 53 will complete testing and certification in 2015.

Developers

Lockheed Martin Mission Systems and Training	Moorestown, New Jersey
Raytheon Electronic Systems	Sudbury, Massachusetts

SPY-3 Advanced Multi-Function Radar (MFR)

Description

The SPY-3 Advanced Multi-Function Radar is an X-band active phased-array radar designed to meet all horizon-search and fire-control requirements for the 21st-Century Surface Fleet. The SPY-3 is designed to detect the most advanced anti-ship cruise missile threats and support fire-control illumination requirements for the Evolved Sea Sparrow Missile (ESSM), the Standard Missile (SM-2), and future missiles. SPY-3 also supports the new

ship-design requirement for reduced radar cross-section, significantly reduced manning (no operators), and total ownership cost reduction. SPY-3 is planned for introduction on board the *Zumwalt* (DDG 1000)-class destroyers and as a component of the Dual-Band Radar on the next-generation Gerald R. Ford (CVN 78)-class aircraft carriers. For DDG 1000, SPY-3 will be modified to provide above horizon and volume search capability.

Status

In 2006, SPY-3 engineering development model radar arrays were installed and tested at the Wallops Island Engineering Test Center, Wallops Island, Virginia, and on board the Navy's Self-Defense Test Ship. The SPY-4 Volume Search Radar was also installed at the Wallops Island facility for radar test and SPY-3 integration events that completed at the end of FY 2010. SPY-3 development, testing, and production schedules are planned to support equipment delivery schedules for DDG 1000 and CVN 78-class ships.

Developers

Raytheon Electronic Systems	Sudbury, Massachusetts

SPY-4 Volume Search Radar (VSR)

Description

The SPY-4 Volume Search Radar is an S-band active phased-array radar designed to meet all above-horizon detection and tracking requirements for 21st-Century ships without area air-defense missions, specifically the *Gerald R. Ford* (CVN 78)-class aircraft carriers. SPY-4 VSR will provide long-range situational awareness with above-horizon detection and air control functionality, replacing in-service SPS-48E and SPS-49 radars. With three fixed phased-array radar faces, SPY-4 VSR provides the requisite track revisit times to address fast, low/small, and high-diving missile threats, and provides cueing for the SPY-3 Multi-Function Radar (MFR) to execute tracking and fire control functions above the horizon.

Status

Along with the SPY-3 MFR, SPY-4 VSR underwent radar test and integration events that completed at the end of FY 2010. VSR production arrays are in construction and testing at Lockheed Martin facilities in Moorestown, New Jersey. VSR will be deployed with SPY-3 MFR as an integrated radar suite, referred to as the Dual-Band Radar, on CVN 78, which is scheduled to deliver in FY 2015.

Developers

Lockheed Martin Mission Systems and Training	Moorestown, New Jersey
Raytheon Electronic Systems	Sudbury, Massachusetts

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

Description

The SQQ-89 Anti-Submarine Warfare Combat System suite provides cruisers and destroyers with an integrated undersea warfare detection, classification, display, and targeting capability. SQQ-89 is the Surface ASW system of systems that integrates sensors, weapons, and underwater self-defense capabilities. The latest variant, the A(V)15, is planned for all guided-missile destroyers (DDGs) and forward-deployed Aegis Baseline 3 and 4 cruisers. A(V)15 will be installed as part of the Aegis Modernization Program or as part of the A(V)15 program of record. The A(V)15 program will install Multi-Function Towed Arrays (MFTAs) on all DDGs, including new-construction warships. The SQQ-89 A(V)15 is a modularized, open-architecture system using commercial off-the shelf (COTS) technology processing to provide revolutionary ASW warfighting improvements, and continuous upgrades to the following subsystems of the ASW detect-to-engage sequence: MFTA; Mk 54 Lightweight Torpedo; Mk 54 Vertical Launch Anti-Submarine Rocket; and fire-control algorithms. These include the Echo tracker classifier and active classification algorithms, sonar performance and prediction algorithms, environmental models, computer-aided dead-reckoning table interfaces, and torpedo detection, classification, and localization. The integrated high-fidelity Surface ASW Synthetic Trainer (SAST) provides revolutionary ASW warfighting improvements for deep-water as well as shallow-water littoral environments.

Status

The first A(V)15 installation was completed on the USS Mason (DDG 87) in September 2009. It included the addition of the MFTA and marked the first towed-array installation in a DDG Flight IIA warship. By the end of FY 2014, the Navy had installed 29 production A(V)15 systems. The Advanced Capability Build (ACB) process of providing software upgrades every two years and technology inserts on a four-year cycle will mitigate COTS obsolescence and facilitate future capability upgrades. The first ASW advanced capability build (ACB) 11 was installed on the USS Bulkeley (DDG 84) in FY 2012. It included SAST and major upgrades that improve surface ships ability to detect threat torpedoes. SAST is also installed as part of the ACB 11 trainers at the Fleet ASW Training Center in San Diego, California, and is planned for incorporation into the future design of the shore-based ASW trainers. ACB 13 is under development and planned for certification in 2015 and the first installation in 2016.

Developers

Adaptive Methods	Centerville, Virginia
Advanced Acoustic Concepts	Hauppauge, New York
Alion Sciences	Fairfax, Virginia
Lockheed Martin	Syracuse, New York

Surface Ship Torpedo Defense (SSTD)

Description

The Surface Ship Torpedo Defense system comprises a layered approach and a family-of-systems acquisition strategy to provide anti-torpedo soft-kill and hard-kill capability. Soft-kill capability resides in the SLQ-25 Nixie towed system and Acoustic Device Countermeasure (ADC) Mk 2 Mod 4 that are deployed on board aircraft carriers, cruisers, destroyers, frigates, amphibious ships, and combat logistics force (CLF) ships. The Nixie system is a towed acoustic and non-acoustic persistent countermeasure system. ADC Mk 2 Mod 4 is a hand-deployed acoustic countermeasure system. Hard-kill capability is achieved with the Torpedo Warning System (TWS) that provides torpedo detection, classification, and localization (TDCL) capability on aircraft carriers and CLF ships. TWS prepares launch solutions, presets, and operator interfaces to launch anti-torpedo torpedoes (ATTs) to deliver a hard-kill capability. The countermeasure anti-torpedo (CAT) integrates the ATT with self-contained launch energetics in all-up-round equipment to defeat primary stern-sector threat salvoes. Both TWS and CAT will facilitate future software upgrades.

Status

SLQ-25C Nixie system is installed on all in-service aircraft carriers, cruisers, destroyers, frigates, amphibious ships, CLF ships and will be installed on *Zumwalt* (DDG 1000)-class ships. The SLQ-25C (equivalent to 25A with engineering changes through EC-16) installations will be completed to improve reliability and acoustic countermeasure capability, provide a new littoral tow cable, and add enhanced non-acoustic improvements to counter threat torpedoes. SLQ-25C EC-2 is under development and will provide a technology refresh of the in-service SLQ-25 architecture and an interface to the TWS for system interoperability. EC-2 upgrades will be completed by FY 2024. TWS/CAT is being developed for high-value units and will achieve initial operational capability in FY 2019.

A hybrid-prototype system was installed on CVN 77 in March 2013, and an at-sea demonstration conducted on CVN 77 in May 2013 validated TWS/CAT ability to launch against enemy torpedoes. During that test, TWS was used to launch seven ATTs against surrogate threat torpedoes. One Roll-On/Roll-Off (RORO) system was delivered to CVN 71 in FY 2014.

One RORO system and three engineering development model systems are programmed with two CVN installations per year during FY 2015 and FY 2016. TWS prototype systems will be installed with eight CATs each. TWS achieved provisional Milestone B in September 2011. Milestone C and low-rate initial production for TWS and CAT are planned for FY 2016. CAT will seek Milestone C approval to enter the system development and demonstration phase in FY 2015.

Developers

Penn State Applied Research Laboratory	State College, Pennsylvania
Science Applications International Corporation	Arlington, Virginia

Tactical Tomahawk Weapon Control System (TTWCS)

Description

The Tactical Tomahawk Weapon Control System initializes, prepares, and launches Block III and Block IV Tomahawk Land-Attack Missiles. TTWCS also provides capability for firing units to plan Block III and Block IV global positioning system-only missions, retarget Block IV missiles to alternate targets, and monitor missiles in flight. The initial release of TTWCS reduced equipment racks required on board surface ships, introduced common software for the various TLAM-capable platforms (U.S. Navy guided-missile cruisers and destroyers, attack submarines, and guided-missile submarines, and Royal Navy attack submarines), and reduced overall reaction and engagement planning timelines. The TTWCS Viability Build, Version 5.4.0.2, improves the TTWCS system architecture to maintain existing Tomahawk Weapons System functionality, provides for future growth, and enhances command-and-control interoperability. Version 5.4.0.2 maintains interoperability with evolving systems and modernizes interfaces in accordance with joint mandates (e.g., Internet Protocol Version 6). Version 5.4.0.2 also improves operator interaction with the system, reduces system complexity, and provides an integrated training capability at all levels.

Status

TTWCS V5 incorporates Tomahawk Integrated Training Architecture, changes for Aegis Cruiser Modernization, and the addition of *Ohio* (SSGN 726), *Seawolf* (SSN 21), and *Virginia* (SSN 774) -class guided-missile/attack submarines to the common weapon control system build. The initial operational capability of v5.4.0 was the first step toward TTWCS viability, refreshing hardware and porting resource-intensive software executing on x86 processors with a Linux operating system. The next software version of the weapons control system, v5.4.0.2, will improve C4I (command, control, communications, computer, and intelligence) interoperability, refresh the hardware and software to improve performance, introduce a new human-computer interface, and align TTWCS with Department of Defense mandates.

Developers

Lockheed Martin	Valley Forge, Pennsylvania
Naval Surface Warfare Center	Dahlgren, Virginia
Naval Undersea Warfare Center	Newport, Rhode Island
Southeastern Computers Consultants	Austin, Texas

Tomahawk Command and Control System (TC2S)

Description

Under the umbrella of the Theater Mission Planning Center (TMPC), the Tomahawk Command and Control System provides subsystems for precision targeting, route planning, mission distribution, and strike management for Tomahawk Land-Attack Missile (TLAM) missions. The TMPC is the mission-planning and execution segment of the Tomahawk Weapon System (TWS) and optimizes all aspects of the TLAM mission to engage a target. TC2S develops and distributes missions for the Tomahawk missile; provides command information services for TWS; provides strike planning, execution, coordination, control, and reporting; and provides maritime component commanders the capability to plan or modify TLAM missions. TC2S has evolved into scalable configurations deployed in five configurations at 177 sites: three Cruise Missile Support Activities; three Tomahawk Strike Mission Planning Cells with Fifth, Sixth and Seventh Fleets; 133 carrier strike groups and firing units; 11 command and control nodes; five laboratories; and six training classrooms. TC2S or its components are employed by the United Kingdom under two separate Foreign Military Sales cases (TLAM and Storm Shadow). TC2S allows planners to exploit the full capabilities of the Tomahawk in either deliberate planning conditions or for battlefield time-sensitive planning operations, including executing all post-launch missile-control operations.

Status

TC2S version 4.3, which achieved initial operational capability on May 26, 2012, featured improved system usability and complete the migration of the precision targeting workstation (PTW) functionality to the service oriented architecture-based targeting and navigation toolset, permitting the retirement of the PTW. In addition, TC2S 4.3 includes more than 1,000 modifications proposed by users. In October 2011, the last TC2S 4.2.2 was installed in Seventh Fleet. The next version of TC2S 5.0.1 reached IOC in FY 2014, with primary focus on human-computer interface updates for improved usability. All Tomahawk missiles fired operationally from Operation Desert Storm through Operation Odyssey Dawn have been planned and executed with TC2S components.

Developers

BAE Systems	San Diego, California
Boeing	St. Louis, Missouri
COMGLOBAL	San Jose, California
Science Applications International Corporation	McLean, Virginia

SURFACE EQUIPMENT AND SYSTEMS

Authorized Equipage Lists (AEL) and Naval Security Forces Vest (NSFV)

Description

The visit, board, search, and seizure (VBSS) authorized equipage list provides equipment to perform compliant and non-compliant vessel VBSS missions integral to expanded maritime interception operations, maritime counter-proliferation interdiction, and maritime domain awareness. The anti-terrorism/force protection physical security equipment AEL provides individual personal protection, training and entry control point equipment for use by the ships' self-defense forces while in port, transiting the littorals and operating in restricted maneuverability environments. The AEL includes the enhanced body armor Naval Security Forces Vest (NSFV) providing improved protection against ballistic and fragmentation hazards. The NSFV also uses the enhanced small-arms protective inserts for increased protection.

Status

NSFV will replace both the concealable tactical response carrier and legacy Navy flak vest for consolidation and uniformity among fleet AELs. The new vests have undergone rigid government testing, with first article testing completed in December 2013. In early 2015, lot acceptance testing is in progress, and the Navy has awarded a production contract for a total of 13,000 units to be fielded to all afloat assets. Initial fielding on 32 ships commenced in September 2014, with full fielding anticipated by June 2015.

Developers

Naval Surface Warfare Center — Crane, Indiana

Biometrics / Identity Dominance System (IDS)

Description

The Personnel Identification Version One (PIv1), also known as the PX-1 Identity Dominance System (IDS), provides enhanced biometric and limited forensic collection capabilities for Navy visit, board, search, and seizure (VBSS) teams conducting maritime interception operations. The program provides VBSS teams with the means to rapidly capture, store, and share trusted information related to the identity of unknown individuals between the enterprise, inter-agencies and international partners. PIv1 collects facial images ("mugshots"), iris images, fingerprints, contextual data, and cell phone media for exploitation, and conducts match/no-match searches against an onboard biometrics-enabled watch-list of known or suspected terrorists and/or persons of interest.

Status

Fleet VBSS teams use commercial-off-the-shelf biometric collection devices to collect and transmit biometric information to the DoD's authoritative biometric database for intelligence analysis, and "match/no-match" analysis. Approximately 200 of these kits

were procured in FY 2006-2007 and fielded to VBSS-capable ships. Initial fielding provided stopgap biometrics capability to the naval force. Advanced research and development efforts continue to deliver next-generation capabilities, including robust multi-modal biometric, and enhanced document and media exploitation functionality through the Personnel Identification Version One (PIv1) program of record. The Joint Requirements Oversight Council approved the IDS Capabilities Development Document in September 2008 and IDS achieved Milestone B in the fourth quarter of FY 2010. The Navy approved the PIv1 Capabilities Production Document in November 2012, and PIv1 achieved Milestone C in FY 2013. Initial operational capability was achieved in FY 2013, with full operational capability programmed for FY 2017.

Developers

Aware Incorporated	Bedford, Massachusetts
Naval Surface Warfare Center	Dahlgren, Virginia

Chemical, Biological, Radiological and Nuclear Defense Dismounted Reconnaissance, Sets, Kits and Outfits (CBRN DR SKO)

Description

Chemical, biological, radiological, and nuclear dismounted reconnaissance sets, kits, and outfits comprise an organic suite of specialized CBRN detection and protection equipment. The equipment provides Navy boarding teams with additional CBRN capability to conduct efficient and thorough CBRN reconnaissance survey and monitoring missions on vessels of interest. It provides visit, board, search, and seizure (VBSS) teams with the capability to detect the presence of weapons of mass destruction (WMD) in support of WMD interdiction missions. In addition to personnel protective equipment and integrated radio/wireless communications, the DR SKO program provides detection and identification capability for radiological and nuclear material, chemical biological warfare agents, toxic industrial chemicals/toxic industrial materials (TIC/TIM), oxygen levels and combustible gases, and some explosives and drugs.

Status

The Navy's participation in this program responds to Commander, U.S. Naval Forces Central Command's urgent operational need to provide VBSS teams with enhanced capabilities to identify and detect CBRN/WMD material. A "stop-gap" capability was initially deployed in response to this request. Approximately 163 radiation detection/hazardous atmospheric kits were procured in FY 2007-2008 with each kit consisting of six UDR-15 personal radiation detectors, six handheld radiation monitors, one Thermo IdentiFinder Ultra NGM (used to identify isotopes), one Chameleon TIC vapor and gas detector, one GAMIC 4 gas analyzer, and one NIK drug testing kit. Recognizing the enduring nature of the request, Navy in FY 2015 is transiting the full-spectrum CBRN/WMD detection requirement into the DR SKO a joint program of record for its

proper resourcing and long-term sustainment. Initial operational capability (11 kits) for the DR SKO end items was achieved in September 2014; a full operational capability is planned for FY2021.

Developers

FLIR Systems ICx	Elridge, Maryland
Joint Program Manager Nuclear, Biological and Chemical Contamination Avoidance	Aberdeen Proving Ground, Maryland

Chemical, Biological, Radiological and Nuclear Defense–Individual Protection Equipment–Readiness Improvement Program (CBRND–IPE–RIP)

Description

The Individual Protective Equipment-Readiness Improvement Program for forces afloat manages millions of individual pieces of equipment for Sailors deploying into potential chemical, biological, radiological, and nuclear (CBRN) threat environments. Through centralized management, this program ensures that afloat and deployed expeditionary Sailors are provided with correctly maintained and properly fitted individual protection ensembles and a chemical protective mask, ready for immediate retrieval in response to the dictated mission-oriented protective-posture condition. Historically, maintenance and logistics functions required to maintain the material readiness of this equipment required an extraordinary number of organizational man-hours that could be better used supporting operations and training. Ninety-day pre-deployment readiness visits by the Naval Sea Systems Command (NAVSEA) RIP Team relieve the ships of this burden. The cornerstone of the RIP is the NAVSEA Consolidated Storage Facility located at Ft. Worth, Texas.

Status

This program continues to improve fleet CBR readiness. In addition to IPE and gas masks, the RIP manages interceptor body armor, dorsal auxiliary protective systems, and lightweight helmets for expeditionary forces; provides protective CBRN equipment to Navy individual augmentees as they process through designated Army training centers; and manages CBR and nuclear defense IPE for the Military Sealift Command. In addition, the Navy has shifted from its traditional lifecycle replacement program and has implemented a condition-based obsolescence program to better sustain fleet CBRN-defense equipment. The Joint Program Executive Office for Chemical and Biological Defense Programs (CBDP) has adopted this efficiency plan for implementation across the entire CBDP enterprise.

Developers

Battelle Memorial Institute	Columbus, Ohio
General Dynamics Information Technology	Fairfax, Virginia
Gryphon Technologies	Washington, DC
Naval Surface Warfare Center	Panama City, Florida

Improved (Chemical Agent) Point Detection System (IPDS)–Lifecycle Replacement

Description

The Improved (Chemical Agent) Point Detection System–Lifecycle Replacement is a fit, form, and function life-cycle replacement for legacy IPDS systems providing naval ships an automated chemical (vapor) point-detection capability afloat with enhanced detection and reliability. The system is designed to automatically detect and identify chemical vapors by agent class (nerve, blister, and blood) and type agent within a specified concentration level and time period. Successful detection of a chemical vapor at the required threshold concentration warns a ship of an imminent chemical attack to provide sufficient time for the crew to seek shelter inside a collective protected zone or don personal protective equipment, including a filtered mask, before the concentration reaches a critical level.

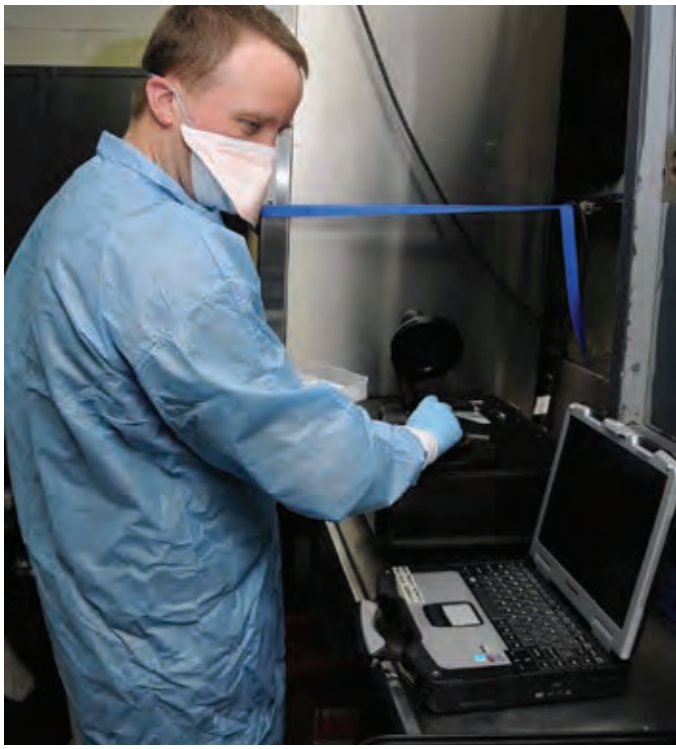
Status

IPDS-LR achieved initial operational capability in March 2013 with more than 30 systems fielded, to include shipboard installations, training facilities, and spares. IPDS-LR installation schedule achieved 23 installs for FY 2014 and 22 installs are scheduled for completion in FY 2015.

Developers

Bruker — Billerica, Massachusetts

Joint Biological Tactical Detection System (JBTDS)



Description

The Joint Biological Tactical Detection System Acquisition Category III program will be a lightweight biological agent system that will detect, warn, and provide presumptive identification and samples for follow on confirmatory analysis. JBTDS will provide a local alarm and when networked provide cooperative capability with reduced probability of false alarms. JBTDS will provide a biological detection capability to detect, collect, and identify biological aerosol hazards to support mission-oriented protective-posture decisions and downwind hazard warning at the tactical and operational levels. JBTDS will be operable across the full spectrum of operations in multiple environments. The system will support naval forces during periods of increased biological threat, as well as during routine biological surveillance operations by providing near real-time detection of biological attacks and notification to personnel in the potential hazard area. JBTDS will ultimately support force protection and survivability and maximize combat effectiveness by enhancing medical response decision making.

Status

JBTDS Milestone B was achieved May 2014 and will reach Milestone C in FY 2016 with fielding planned for multiple ship

classes (e.g., aircraft carriers, cruisers, destroyers, small combatants, amphibious ships, mine countermeasures ships, command ships, and combat logistics force vessels).

Developers
Multiple sources.

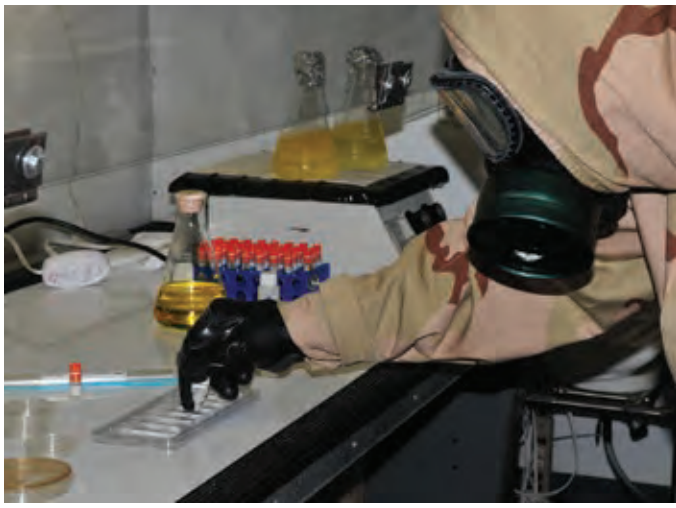
Next-Generation Chemical Detection (NGCD)

Description
The Next-Generation Chemical Detector comprises several detection systems for multi-phase of matter sampling, location of liquid and solids on surfaces, and vapor and aerosol monitoring. NGCD will detect and identify nontraditional agents (NTAs), chemical warfare agents (CWAs), toxic industrial chemicals (TICs) in the air and on surfaces. NGCD will provide improved CWA/TIC selectivity and sensitivity on multiple platforms as well as multiple environments. These sensors will improve detection, consequence management and reconnaissance, and weapons of mass destruction (WMD) interdiction capabilities. The three detectors are as follows: (1) Detector Alarm provides NTA aerosol detection, (e.g., chemical event warning) and improved CWA and TIC vapor detection (e.g., naval ship contamination survey); (2) Survey Detector provides rapid interrogation of NTA and CWA liquid and solid detection on surfaces, (e.g. dismounted reconnaissance/VBSS Operations); and (3) Sample Analysis provides analytical identifier of solids, liquids, aerosols and vapors, (e.g., to support characterization of the residual hazard after a chemical event to inform protection decisions).

Status
The acquisition strategy for this program is technology driven. The Joint Project Manager for Nuclear, Biological and Chemical Contamination Avoidance (JPM NBC CA) is procuring prototypes for the program's technical development (TD) phase. The TD phase will consist of a breadboard test event (experimental test model) followed by a brassboard test (demonstration test model in a field setting) and ultimately a final prototype test. The Joint Project Manager NBC CA will use the results of brassboard testing and final prototype testing to determine if the program is sufficiently mature for its Milestone B decision.

Developers
Multiple sources.

Next-Generation Diagnostics System (NGDS)



Description

The Next Generation Diagnostics System family of systems will provide incremental chemical biological radiological and nuclear (CBRN) diagnostic capabilities across echelons of naval health care and provide common biological identification materiel solutions across DoD. The NGDS Increment 1 (Inc. 1) Deployable Component is a U.S. Food and Drug Administration cleared reusable, portable biological pathogen diagnostic and identification system capable of rapidly analyzing clinical and environmental samples. NGDS diagnostic capabilities will be employed in Navy (Role 2 and 3) Fleet Deployable Combat Health Support units for the identification and diagnosis of biological warfare agents and other pathogens of operational concern in support of individual patient treatment decision making, force health protection decision making, and CBRN situational awareness. NGDS Inc. 1 will be capable of connecting to CBRN defense, medical and biosurveillance network applications (e.g., Joint Warning and Reporting Network, and Composite Health Care System), if required. The NGDS Inc. 1 technology will be adapted for environmental sample analysis applications through collaboration with the Common Analytical Laboratory System (CALS) and the Joint Biological Tactical Detection System program offices. In collaboration with the CALS program for environmental capability requirements, the NGDS Inc. 1 will replace the Joint Biological Agent Identification and Diagnostic System.

Status

NGDS is currently in its technology development phase with an initial operational capability for fielding in FY 2017.

Developers

BioFire Diagnostics — Salt Lake City, Utah

Total Ship Training Capability (TSTC)

Description

Total Ship Training Capability consists of the Battle Force Tactical Trainer (BFTT), Aegis Combat Training System (ACTS) and Battle Force Electronic Warfare Trainer scenario generators and numerous Aegis and Ship Self Defense System (SSDS) interfaces and display systems. Together, the capability provides realistic combat systems tactical scenario training supporting both unit level and strike group integrated training and certification.

Status

Training systems are installed on 127 in-service systems on Aegis and SSDS warships. Established in 2012, the TSTC program of record was created to address reliability, simplicity, functionally and fidelity shortfalls within these systems, to include the supporting ships weapon systems. To maintain constant alignment

between tactical modernization, warfare training capabilities and operator and crew weapon system proficiency, a continual TSTC investment is required. Additionally, TSTC has demonstrated through pier-side integrated training events an achieved savings compared to at-sea live exercises.

Developers

Lockheed Martin	Chesapeake, Virginia
Naval Surface Warfare Center	Dam Neck, Virginia
NOVONICS	Arlington, Virginia
SYS Technologies	San Diego, California

SECTION 3

SUBMARINE FORCE

The submarine force, the Navy's "silent service," contributes significantly to many of the Navy's core capabilities. The concealment provided by the sea enables U.S. submarines to conduct undetected and non-provocative operations, to be survivable, and to attack both land and sea targets. Nuclear-powered attack submarines enable sea control, providing unseen surveillance of far-flung regions of ocean along with the ability to attack and sink hostile surface ships and submarines. The power-projection capabilities of nuclear-powered guided-missile submarines include precision strike from land-attack cruise missiles and insertion of Special Operations Forces to conduct reconnaissance and direct-action missions in hostile environments. The Navy's fleet of nuclear-powered ballistic-missile submarines provides the ability to conduct nuclear offensive strike, contributing to the core capability of deterrence at the national strategic level.

SUBMARINES AND UNDERSEA VEHICLES

SSBN 726 *Ohio*-Class Replacement (OR) Fleet Ballistic-Missile Submarine (SSBN)

Description

The fleet ballistic-missile submarine supports the Nation's strategic nuclear triad—long-range strategic bombers, land-based intercontinental ballistic missiles, and SSBNs armed with long-range submarine-launched ballistic missiles (SLBMs)—by providing a flexible and survivable deterrent with an assured-response capability. Starting in 2027, the oldest *Ohio*-class SSBN will reach the end of its service life, with the remaining SSBNs retiring at a rate of approximately one per year thereafter. The highest priority is to ensure a seamless and successful transition to the *Ohio* Replacement SSBN to fulfill our national imperative of strategic deterrence. The 12 OR SSBNs will provide strategic deterrent capabilities, well into the 2080s, at a responsible cost. The class will be designed to ensure survivability against expected threats into the late 21st Century. Concurrent with the *Ohio* Replacement, the United Kingdom will recapitalize its sea-based strategic deterrent platforms, the *Vanguard*-class SSBNs, which also host the Trident II (D5) submarine-launched ballistic missile in U.S. service.

The *Ohio* Replacement SSBN includes the Common Missile Compartment (CMC), which is under joint development with the United Kingdom to reduce design and construction costs, thus continuing the long-standing SSBN partnership between the U.S. Navy and the Royal Navy. Additional ownership and production cost-reduction initiatives include a life-of-ship reactor core, modular construction techniques, and the re-use/re-hosting of selective in-service submarine systems.

Status

In January 2011 Milestone A was approved and the program entered the technology development phase. The Department of Defense approved the *Ohio* Replacement Capabilities Development Document in August 2012, which guides technology development efforts. Early research and design efforts include prototyping and construction-technique demonstration for the first new-design SLBM tubes since the delivery of the USS Louisiana (SSBN 743) in 1997. Specifications for the U.S. and U.K. CMC quad pack were approved in August 2012, and U.S. and U.K. efforts to design and construct a CMC remain synchronized. Design progress remains on track to support lead-ship construction start in FY 2021.

Developers

General Dynamics Electric Boat Corporation	Groton, Connecticut
Huntington Ingalls Industries Newport News	Newport News, Virginia

SSN 774 *Virginia*-Class Nuclear-Powered Attack Submarine (SSN)

Description

The *Virginia*-class submarine is specifically built for multi-mission operations in the littoral while retaining the Submarine Force's strength in traditional open-ocean anti-submarine and anti-surface missions. These submarines have advanced acoustic stealth technology that allows unimpeded operation within an adversary's defensive perimeter, defeating his anti-access/area-denial strategies. Using these asymmetric advantages, *Virginia*-class submarines are configured to conduct sea control, land attack, mine reconnaissance, Special Operations Forces (SOF) insertion/extraction, intelligence collection, and surveillance missions that enable successful access and follow-on operations by larger general-purpose forces. The *Virginia* class can serve as host for various SOF delivery methods, including mini-submersibles and raiding craft via an embarked dry-deck shelter, or directly to sea via integral lockout chambers.

Virginia-class submarines are built under an innovative teaming arrangement between General Dynamics Electric Boat and Huntington Ingalls Industries-Newport News using a modular construction process in which each shipyard builds portions of each ship, with integration and delivery of completed submarines alternating between the shipyards. Modular construction also allows for assembly and testing of systems prior to installation in the hull, thereby reducing costs, minimizing rework, and simplifying system integration. The modular design and extensive use of open-architecture electronics systems facilitate technology insertion in future submarines during new construction and those already in the fleet, enabling each *Virginia*-class submarine to keep pace with emerging threat capabilities throughout its 33-year service life.

Status

In 2008, the Navy negotiated a multi-year procurement contract for a total of eight submarines between 2009 and 2013. In 2010, the *Virginia*-class program completed Milestone C review, receiving full-rate production authority and achieving full operational capability. In 2011, the Navy increased the procurement rate to two submarines per year, the first time the Navy has procured two submarines in the same year since 1991.

The USS Mississippi (SSN 782), the ninth *Virginia*-class submarine, delivered one year early in May 2012, and the USS Minnesota (SSN 783), the tenth ship of the class, also delivered ahead of schedule in June 2013, continuing the positive trend of constructing submarines ahead of schedule and within budget. SSN 784 through SSN 791 comprise the third block of *Virginia*-class submarines and began construction in 2009. *Virginia* Block III captures learning-curve efficiency initiatives that will help lower production costs even more. The first Block III ship, the PCU North Dakota (SSN 784), delivered early on August 29, 2014. On April 28, 2014, the Navy awarded the contract for ten *Virginia* Block IV submarines (SSN 792 through SSN 801) that will include improvements to reduce total ownership costs. The Navy also received funds from Office of the Secretary of Defense for research, development, and design efforts for *Virginia* Block V, which will incorporate the Virginia Payload Module (VPM). VPM will increase Tactical

Tomahawk land-attack cruise missile strike capacity and provides improved capability to support follow-on payloads. The *Virginia*-class submarine inventory objective is 48 SSNs.

Developers

General Dynamics Electric Boat Corporation — Groton, Connecticut

Huntington Ingalls Industries-Newport News — Newport News, Virginia

Submarine Rescue Systems

Description

The Navy's submarine rescue capability is provided by two systems: the Submarine Rescue Chambers Fly-away System (SRCFS) and the more capable Submarine Rescue Diving and Recompression System (SRDRS). Both are ground-, sea-, and air-transportable for rapid worldwide strategic airlift and deployment on vessels of opportunity in the event of a submarine accident.

The SRCFS provides non-pressurized shallow-water rescue to a depth of 850 feet. The SRDRS consists of three distinct systems: (1) Assessment Underwater Work System (AUWS); (2) Pressurized Rescue Module System (PRMS); and (3) Surface Decompression System (SDS).

The AUWS includes the Atmospheric Diving System (ADS2000), a one-atmosphere, no-decompression manned diving system capable of depths to 2,000 feet for clearing and preparing a submarine hatch for seating a rescue platform.

The PRMS is a manned, tethered, remotely piloted vehicle capable of rescuing personnel from a stricken submarine to depths of 2,000 feet. With the Surface Decompression System (SDS), SRDRS will enable transfer of personnel rescued from a pressurized submarine environment, in a procedure known as Transfer Under Pressure (TUP), from the PRM for surface decompression in onboard recompression/decompression chambers. The SRDRS is a government-owned, contractor-operated system, maintained at the Navy's Undersea Rescue Command (URC).

Status

The manned AUWS was introduced to the Fleet in 2007, and URC continues to maintain four ADS2000 suites. Replacement of ADS2000 with two remotely operated vehicles has been approved, with phased-replacement beginning in FY 2015. The PRMS element of the SRDRS became operational in 2008, replacing the Navy's aging and cost-prohibitive Deep-Submergence Rescue Vehicle capability. The PRMS has been undergoing repair since a February 2013 accident and conducted sea trials late 2014. The complete SRDRS, including TUP capability, is expected to reach initial operational capability in FY 2016 and full operational capability and delivery to the Fleet in FY 2017. The legacy SRCFS will continue in service.

Developers

Environmental Tectonics Corporation	Southampton, Pennsylvania
Oceaneering International	Upper Marlboro, Maryland
OceanWorks International	Vancouver, California
Southwest Research Institute	San Antonio, Texas

SUBMARINE WEAPONS

Mk 48 Advanced Capability (ADCAP) Common Broadband Advanced Sonar System (CBASS) Torpedo

Description

The Mk 48 Advanced Capability heavyweight torpedo is the Navy's sole submarine-launched weapon for anti-submarine and anti-surface warfare. The ADCAP torpedo was authorized for full-rate production in 1990, and the final production all-up-round torpedo was delivered to the Navy in 1996. Since then, the Navy has employed an open-architecture model to provide software and hardware improvements to the ADCAP torpedo inventory. The ADCAP torpedo features sophisticated sonar, all-digital guidance and control systems, digital fuzing systems, and improved torpedo acoustic stealth compared to the legacy Mk 48 torpedo. The Mod 7 Common Broadband Advanced Sonar System is a two-phase incremental improvement that includes a new broadband sonar system for shallow-water performance enhancement. The CBASS upgrade to the ADCAP torpedo is part of an ongoing Armaments Cooperative Program with the Royal Australian Navy (RAN). In addition to the RAN, the Brazilian, Canadian, and The Netherlands navies also acquired versions of the Mk 48 torpedo through the Navy's Foreign Military Sales program.

Status

Phase I of the CBASS program, with the new broadband sonar analog receiver, achieved initial operational capability and was introduced to the Fleet in 2006. Phase II of the CBASS program, with Advanced Processor Build (APB) Spiral 4 software improvements and common sonar upgrades leveraged from the Mk 54 Lightweight Torpedo program, achieved full operational capability in May 2013. The Navy continues to procure CBASS hardware for eventual conversion of all ADCAP torpedoes through the life of the program. In parallel, the APB program continues to improve torpedo performance through software upgrades and technology insertions (TIs) in challenging areas, such as the shallow-water diesel submarine threat. A 2012 approved Capabilities Development Document established requirements for follow-on APB 5 and APB 6/TI-1 software and hardware upgrades.

Developers

Lockheed Martin Sippican	Marion, Massachusetts

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 with a range greater than 4,000 nautical miles and accuracy measured in hundreds of feet. Trident II missiles are carried by all 14 *Ohio*-class nuclear-powered ballistic-missile submarines (SSBNs), each of which carries 24 SLBMs. 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. In that regard, the Navy has embarked on a Trident II Life Extension Program (D5LE) that will upgrade missile systems and maintain D5s in the Fleet into the 2040s, bridging the transition from *Ohio*-class SSBNs to *Ohio* Replacement submarines. The initial payload of the *Ohio* Replacement will be the Trident II/D5 D5LE SLBM.

Status

Full missile procurement ended in FY 2012, with a total acquisition of 108 additional missiles. Life extension kits and replacement solid-propellant rocket motors are procured throughout and beyond the FY 2015 future years defense program to refurbish obsolete electronics and expiring rocket motors on existing missiles.

Developers

Lockheed Martin — Sunnyvale, California

SUBMARINE SENSORS AND SYSTEMS

BQQ-10 Submarine Acoustic Systems

Description

Submarine acoustic systems modernization enables rapid warfighting capability enhancements at reduced costs and for affordable sustainment. Acoustic Rapid Commercial Off-the Shelf (COTS) Insertion (ARCI) upgrades legacy sonar systems and significantly expands processing capability for existing sensors and enables future sensors through advanced processing builds (APBs) and technology insertions (TIs). This model allows development and use of complex algorithms that were previously well beyond the capability of legacy processors. Additionally, the open architecture design of the ARCI system allows for the rapid insertion of new sensor systems and processing techniques at minimal cost. Illustrating this concept, the TB-34 next-generation fat-line array sonar uses COTS-based telemetry to reduce cost and allows concurrent processing with hull-mounted arrays with extended frequency response, compared to the in-service TB-16 towed sonar arrays. The low-cost conformal array also provides enhanced situational awareness and collision-avoidance capability.

Status

BQQ-10 ARCI is common across all submarine classes—*Los Angeles*/Improved *Los Angeles* (SSN 688/688I), *Seawolf* (SSN 21), and *Virginia* (SSN 774) attack submarines, and *Ohio*-class guided-missile and ballistic-missile submarines. These submarines receive biennial software APBs and quadrennial hardware TIs for improving and sustaining sonar capability. Maintaining the APB/TI upgrade rate for a target of 10-12 submarines per year is essential to meeting capability and long-range sustainment requirements. TIs support a maintenance APB and a capability APB that provide processing growth while minimizing lifecycle costs. ARCI has transitioned technology for detection, tracking, situational awareness, contact management, mine countermeasures (detection and avoidance), and ranging.

Developers

Applied Research Lab, University of Texas at Austin	Austin, Texas
General Dynamics Advanced Information Systems	Fairfax, Virginia
Lockheed Martin	Manassas, Virginia
Progeny Systems Corporation	Manassas, Virginia

BYG-1 Submarine Combat Control System

Description

BYG-1 is the common submarine combat control system across all U.S. Navy submarine platforms except *Ohio*-class fleet ballistic-missile submarines. BYG-1 is a commercial off-the-shelf (COTS), open-systems architecture (OSA) system that incorporates organic sensor fusion, target solution development, common tactical picture, weapon control, and tactical local-area network functions. The use of COTS/OSA technologies and systems enables frequent updates to both software and hardware with little or no impact on submarine scheduling. COTS-based processors allow computer power growth at a rate commensurate with that of commercial industry. Additionally, the open-architecture design of the BYG-1 system allows for the rapid integration of new sensors and processing techniques at minimal cost. BYG-1 allows the submarine force to update the ship safety tactical picture rapidly, integrates the common tactical picture into the battle group, improves torpedo interfaces, and provides Tactical Tomahawk land-attack cruise missile capability.

Status

BYG-1 has been installed on all U.S. attack and guided-missile submarines and is scheduled to be installed on ballistic-missile submarines starting in 2016. Submarines receive periodic improvements through technology insertions (TIs) of hardware and advanced processor builds (APBs) of software. While TI upgrades are designed and produced biennially, individual submarines nominally receive a TI every-other cycle. This nominal four-year refresh of hardware keeps each submarine's processing power on pace with the commercial computing industry while, in turn,

ensuring that the COTS components are upgraded before obsolescence. Biennial APBs permit rapid insertion of improved processing algorithms and increased capabilities requested by Navy type commanders to address emerging challenges. Navy research, development, testing, and evaluation will continue to develop processing algorithms from the surveillance, tactical, and advanced R&D communities, as well as to perform laboratory and at-sea testing.

Developers

General Dynamics Advanced Information Systems	Fair Lakes, Virginia Pittsfield, Massachusetts
Lockheed Martin	Eagan, Minnesota
Progeny	Manassas, Virginia

SUBMARINE EQUIPMENT AND SYSTEMS

Submarine Survivability

Description

Today's submariners use passive means to remove carbon dioxide from a disabled submarine's atmosphere, enabling survival up to seven days. Oxygen-generating chlorate candles and atmosphere-monitoring equipment are also used for submarine survivability. Survival improvements include introduction of new "flat-sheet" lithium hydroxide (LiOH) canisters for high-performance passive scrubbing.

Status

Passive carbon dioxide scrubbing curtains, granular lithium hydroxide, oxygen-generating chlorate candles and atmosphere monitoring equipment are installed on all submarines. Phased out-fitting of flat-sheet LiOH canisters on all *Virginia* (SSN 774)-class submarines is nearing completion.

Developers

Analox Sensor Technology, Ltd.	Stokesley, United Kingdom
Casco Manufacturing Solutions, Inc.	Cincinnati, Ohio
Micropore, Inc.	Newark, Delaware
Tangram Company, LLC	Holtsville, New York

SECTION 4

EXPEDITIONARY FORCES

The Navy's expeditionary forces carry out a wide range of responsibilities and provide a robust set of capabilities. The Navy's vast and geographically dispersed logistics network, including its fleet of amphibious ships, enable Navy and Marine Corps forces to sustain forward presence, exert sea control over large areas, and project power ashore. These survivable ships, equipped with aviation and surface-assault capabilities, rapidly close, decisively employ, and sustain Marines from the sea. Mine warfare ships operate forward to ensure operational access to key maritime crossroads, while coastal riverine forces operate in the littorals and inland waterways, protecting ships and maritime infrastructure. In addition, Joint High-Speed Vessels, hospital ships, and Mobile Construction Battalions ("Seabees") provide humanitarian assistance, disaster relief, and build partner-nation capacity.

EXPEDITIONARY FORCES

Coastal Riverine Force

Description

In 2012, the Navy Expeditionary Combat Command (NECC) merged the Riverine Force and the Maritime Expeditionary Security Force to form the Coastal Riverine Force (CRF). This new force is organized into three active squadrons with four companies each and four reserve squadrons with three companies each. The CRF delivers task-organized units that are effective, flexible, and responsive to Fleet and combatant commander littoral demands and seamlessly operate with the other Navy, joint, interagency, and coalition partners. The CRF performs combat and maritime security operations on inland waterways, harbors, and in the coastal environment, bridging the maritime gap between land forces and the Navy's traditional blue-water forces.

The primary unit of action for the CRF is the squadron, but the force maintains the capability to dis-aggregate into companies. Each CRF squadron can carry out "24/7" operations in all weather conditions and climates, including the Arctic, tropical areas, or deserts. It is the only U.S. force that can conduct sustained combat operations on inland waterways. The CRF is responsible for protecting and defending the littoral operating area for the Navy and is adaptive, scalable, and agile to respond to mission requirements. Units conduct force protection of critical maritime infrastructure, strategic sealift vessels, and naval vessels operating in inshore and coastal areas, anchorages, and harbors. CRF units deploy worldwide to defend an area, unit, or high-value asset against determined enemies, which could require offensive operations.

Status

The Navy Capabilities Board approved a CRF Capabilities-Based Assessment to inform the update of the Maritime Expeditionary Force Initial Capability Document; this will reflect the FY 2013 merger of the Maritime Expeditionary Security Force and Riverine Squadrons. The Assessment will inform an analysis of alternatives regarding CRF mission sets and the equipment needed to support them.

Developers

Multiple sources.

Explosive Ordnance Disposal (EOD) / Mobile Diving and Salvage (MDS)

Description

The Explosive Ordnance Disposal community is operationally organized into two deploying EOD groups, each headed by a Navy Captain (O-6). Each group comprises multiple EOD mobile units, a mobile diving and salvage unit (MDSU), a training and evaluation unit, and an expeditionary support unit. EOD units provide the Fleet, joint services, and the interagency community with the capability to detect, identify, render safe, recover, exploit, and dispose of ordnance that has been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, people, or materiel. Commonly operating in platoons and smaller elements, these EOD units assure access to battlespace by opening lines of communication in the sea-to-shore interface as well as blue-water and land-based operations. This can require diving operations, parachute insertion, or helicopter insertion and extraction. These mobility skills, along with responsibility for all underwater ordnance, make Navy EOD unique in the joint force. The Secretary of the Navy is the Single Manager for EOD Technology and Training, carrying out these duties primarily through the Navy EOD Technology Center and the Naval School Explosive Ordnance Disposal, where all U.S. and select foreign-partner military EOD technicians receive the same initial training to defeat conventional land and air ordnance as well as improvised explosive devices. Navy EOD also has capabilities to render safe chemical, biological, radiological, nuclear and enhanced-explosive weapons, including terrorist "dirty" bombs.

MDSUs conduct planning, coordinating, and directing combat harbor-clearance, anti-terrorism and force protection (ATFP) diving missions, salvage and recovery operations, and other assigned missions. MDSUs operate in direct support of naval, joint, or combined task forces, conducting operations afloat or ashore during combat or national emergencies in climate extremes—Arctic, tropical, or desert environments. In addition to expeditionary salvage, search, and recovery operations, they perform harbor clearance to remove obstructions restricting access to ports, piers, and waterways; assist vessels in distress; de-beaching and salvaging of ships, submarines and aircraft; locate and recover other high-value objects; underwater cutting and welding; limited underwater ship repair; ship husbandry; and ATFP dive support for ships in port and port facilities.

Status

The EOD and MDS communities recapitalized their authorized equipment inventories with new tables of allowance (ToA). Based on a complete review of their mission requirements, each ToA aligned with force structures and standardized equipment across the Navy Expeditionary Combat Enterprise. Specialty equipment—e.g., man-transportable robotic systems, unmanned underwater vehicles, and Mk-16 underwater breathing apparatus —were included for EOD units.

Developers

Multiple sources.

Maritime Civil Affairs and Security Training (MCAST) Command

Description

Maritime Civil Affairs and Security Training Command is a "soft power" enabling force that works within a combatant commander's area of operations to promote regional security and stability. The MCAST mission is to assess, plan, and evaluate civil/military affairs activities in the maritime environment. MCAST delivers critical small-footprint maritime civil affairs teams (MCATs) and security force assistance mobile training teams (SFA MTTs) across a wide range of civil and military organizations, making them better suited to the capabilities of emerging world partners than larger naval forces, significantly enhancing partnership building. MCATs and MTTs are specially trained with cultural and language skills tailored to a specific region.

The MCAST areas of expertise include traditional civil affairs functions such as public education and health, but are regionally aligned and focused on three maritime-specific functions: commercial port operations; harbor and channel construction and maintenance; and marine and fisheries resources. The MTTs likewise provide a broad range of training, including expeditionary security, small-boat operations and maintenance, weapons handling, marine-engine maintenance, and professional development. MCAST Command also assists with planning and coordination for U.S. country teams, non-combatant evacuation operations, refugee operations, host-nation interagency support, and restoration of communications and local infrastructures following military operations or natural disasters. MCAST Command is located in Dam Neck, Virginia.

Status

The MCAST table of allowance contains the equipment necessary for MCATs and MTTs to deploy in support of field operations.

Developers

Multiple sources.

Naval Beach Group

Description

The Two Naval Beach Group Commanders—Naval Beach Group One (NBG 1) and Naval Beach Group Two (NBG 2)—serve as the immediate higher command for all amphibious enabling forces: assault craft units (ACUs) for displacement landing craft and non-displacement assault craft; beach master units (BMUs); and amphibious construction battalions (ACBs). Components of each of these commands can be embarked in amphibious ships in support of landing-force operations or can be deployed on strategic airlift and sealift platforms to support other operations. Naval Beach Groups also provide advocacy for amphibious assault, ship-to-shore movement, logistics-over-the-shore units, and provide required unit level training and readiness assessments for all amphibious ships. Naval Beach Group One is also responsible for this function for all forward-deployed amphibious forces in Sasebo, Japan. The NBG missions, in single or multiple geographic locations, include wartime forward littoral operations supporting Marine Corps amphibious assault and follow-

on USMC and joint combat missions, as well as peacetime forward littoral and humanitarian assistance. Each Naval Beach Group Commander can rapidly deploy worldwide to serve as Navy logistics-over-the-shore commander supporting the offload of Navy/Military Sealift Command Maritime Prepositioned Squadron ships and the offload-in-stream offloading of maritime shipping.

Status
NBG 1 is located in Coronado, California, and has oversight of ACU 1, ACU 5, BMU 1, and ACB 1. NBG 1 also supports NBU 7 in Sasebo, Japan. NBG 2 is located in Little Creek, Virginia, and has oversight of ACU 2, ACU 4, BMU 2, and ACB 2.

Developers
Multiple sources.

Naval Mobile Construction Battalion (NMCB) "Seabees"

Description
Naval Construction Forces—"Seabees"—are the Navy's deployable engineer and construction force providing support to Marine Air-Ground Task Force (MAGTF), Navy commanders, and other joint forces and combatant commanders. The force comprises naval construction regiments, naval mobile construction battalions, construction battalion maintenance units, and underwater construction teams.

In support of sea-strike and sea-basing missions, the Navy/Marine Corps Team projects power from the sea with a rapid flow of maneuver forces ashore, using roads, expeditionary airfields, force-protection structures, intermediate-staging bases, and advanced logistics bases. Forward-deployed Seabees enable the surge of task-tailored engineer forces and equipment sets to enhance the MAGTF and other naval and joint forces on land. Seabee capabilities include bridge erection, roadway clearing and construction, pier and wharf repair, forward operating base construction, airfield repair and construction, water well installation, and building construction such as schools and medical clinics. In operations other than war, forward-deployed naval mobile combat battalions (NMCB) hone construction skills through humanitarian-assistance and disaster-recovery operations, participate in foreign engagement exercises, and complete construction projects that support sustainment, restoration, and modernization of Navy and Marine Corps forward bases and facilities.

Status
The Navy has developed a long-range plan to recapitalize the tables of allowance of all Seabee units. The initial priority is to correct existing inventory deficiencies and replace aging tools and equipment that are no longer parts-supportable. During the next several years, NMCB tables of allowance will be outfitted with modern and recapitalized tactical vehicles, construction and maintenance equipment, communications gear, infantry items, and field-support equipment.

Developers
Multiple sources.

Naval Special Warfare (NSW) "SEALs"

Description
The Naval Special Warfare (NSW) community—Navy Sea, Air, Land ("SEALs") forces—is the maritime component of the U.S. Special Operations Command and the U.S. Navy Special Operations Component. The Commander, Naval Special Warfare Command is responsible for strategic vision, doctrinal, operational, and tactical guidance, as well as training, organizing, and equipping operational-support components of the community. NSW forces provide a highly effective option across the spectrum of hostilities, from peacetime to global combat operations. Principal NSW operations include counter-terrorism, counter-proliferation, unconventional warfare, direct action, special reconnaissance, military information support operations, and security force assistance and civil affairs. NSW forces also conduct collateral missions, such as counter-drug activities, humanitarian assistance, and personnel recovery. The NSW community is organized under several major commands, which include five operational commands, one training command, one tactics and technology development command, and one reserve component command.

The major NSW operational components are: Naval Special Warfare Groups (NSWGs) One and Eleven in San Diego, California; NSWG Three in Pearl Harbor, Hawaii; and NSWGs Two, Four, and Ten in Little Creek, Virginia. The NSWG mission is to man, train, equip, support, and provide command and control elements as well as trained and ready SEAL platoons/troops, SEAL delivery vehicle (SDV) platoons, special boat team (SBT) combatant craft detachments, and other forces to the Geographical Combatant Commanders. Two of the NSWGs also provide administrative control to five NSW units that are home-ported forward, and are under operational control of a theater special operations command. The primary deployable operational component of the community is the NSW task group (NSWTG).

A NSWTG is a task-organized unit-centered on a SEAL team and led by a SEAL team commanding officer. NSWTGs comprise three NSW task units, which are further broken into two-to-three SEAL platoons, or NSW task elements when supplemented with combat support or combat service support enablers. When a NSWTG is provisionally established, the deploying SEAL team will normally be augmented by combatant craft, combat support and combat service support enablers, and special detachments to execute assigned missions.

Status
Resources to support the NSW community are principally provided by U.S. Special Operations Command, but the Navy retains resourcing of responsibilities for service common capabilities.

Developers
Multiple sources.

Navy Expeditionary Intelligence Command (NEIC)

Description
Navy Expeditionary Combat Command (NECC) established the Navy Expeditionary Intelligence Command to provide tactical indications and warning and force protection intelligence enabling Navy and joint commanders to conduct missions across the full spectrum of expeditionary operations. NEIC activities are framed around its overall function to man, train, and equip intelligence exploitation teams (IETs) in support of naval combatant command and joint forces command operational requirements. NEIC components include a command element, command support staff, active component operational units, and reserve units. IETs are multi-intelligence, surveillance, and reconnaissance (ISR)-collection platforms that operate at the tactical level, with unique access to areas and environments—from blue to green water, the coastal littoral, and far inland—that constrain more traditional ISR assets. NEIC capabilities give expeditionary, maritime, joint, and combined forces timely, relevant, and actionable intelligence to deny the enemy sanctuary, freedom of movement, and use of waterborne lines of communication while enabling friendly forces to find, fix, and destroy the enemy.

Status
In September 2012, Commander, NECC approved NEIC's reorganization into integrated teams and, also in 2012, approved NEIC's updated table of allowance.

Status
Multiple sources.

Navy Expeditionary Logistics Support Group (NAVELSG)

Description
The Navy Expeditionary Logistics Support Group comprises navy expeditionary logistics regiments (NELRs), navy cargo handling battalions (NCHBs), a training and evaluation unit, and expeditionary support units. NAVELSG is responsible for providing expeditionary logistics capabilities for the Navy, primarily within the maritime domain of the littorals. The NELRs and NCHBs are capable of rapid, worldwide deployment and are trained and equipped to provide shore-based logistical support to Navy, Marine Corps, and joint force commanders for peacetime support, humanitarian- and crisis response, and combat-service support missions. NCHBs can assume control of pier and terminal operations, surface or air cargo handling, and ordnance handling and management. Specialized capabilities include expeditionary fuel operations, pier and air terminal operations, cargo processing (including bulk mail), heavy-lift crane operations, customs inspections, expeditionary communications, short-haul trucking, and expeditionary warehousing.

Status
The ELSG table of allowance (ToA) was approved March 2010. The Navy has developed a long-range plan to recapitalize the ToAs of all expeditionary logistics units. The initial priority is to correct existing inventory deficiencies and replace aging tools and equipment that are no longer parts supportable.

Developers
Multiple sources.

EXPEDITIONARY AND SPECIAL MISSION SHIPS AND CRAFT

Landing Craft Air Cushion (LCAC)

Description
This high-speed, fully amphibious landing craft is capable of carrying a 60-ton payload at speeds of 35 knots. Range is load- and sea state-dependent, but can approach 200 nautical miles. Its ability to ride on a cushion of air allows it to operate directly from the well decks of amphibious warships. Carrying equipment, troops, and supplies, the Landing Craft Air Cushion launches from the well deck, transits at high speed, traverses the surf zone, and lands at a suitable place ashore where it quickly offloads and returns to amphibious shipping for follow-on sorties. LCACs provide amphibious task force commanders flexibility in selecting landing sites, permitting access to more than 70 percent of the world's shores, as compared with 17 percent for conventional displacement landing craft. LCACs deliver vehicles and cargo directly onto dry land rather than to the surf zone, and have proved invaluable in support of humanitarian-assistance/disaster-relief missions, including *Operation Tomodachi* Tsunami Relief in Japan, Hurricane Katrina, and *Operation Unified Response* in Haiti.

Some multi-mission LCACs have been outfitted with radar and radio system upgrades prior to entry into their service-life extension program (SLEP). A SLEP to extend service life from 20 to 30 years for 72 LCACs will be completed by FY 2018. As part of the LCAC SLEP, the Navy will incorporate the following enhancements: (1) hull (buoyancy box) upgrades, improvements, and improved corrosion control; (2) an open-architecture framework, relying on modern commercial off-the shelf equipment that will allow much easier incorporation of technology changes' such as precision navigation and communications systems; (3) engine upgrades (ETF-40B configuration) that will provide additional power and lift, particularly in hot (100° Fahrenheit and higher) environments and reduce fuel consumption and maintenance requirements; and (4) a new deep skirt to reduce drag, increase performance over water and land, and reduce maintenance requirements.

Status
LCAC initial operational capability was achieved in 1986. Contracts for 91 LCACs were approved in FY 1997, with all 91 craft

delivered by the end of FY 2001. Nine that were in deep reduced operating status were terminated in FY 2006 for cost reasons; two LCACs are dedicated research and development craft. The LCAC SLEP program began in 2000, and four SLEPs are planned each year through FY 2018.

Developers

Avondale Marine	Gulfport, Mississippi
Gryphon Technologies LC	Panama City, Florida
Textron Marine & Land Systems	New Orleans, Louisiana

LCU 1610 Landing Craft Utility Vessels

Description

The Landing Craft Utility (LCU 1610)-class vessels are a self-sustaining craft complete with living accommodations and messing facilities for a crew of 14. An adaptation of the designs pioneered during the Second World War, the LCU 1610 class replaced the venerable Landing Craft Tank (LCT) Mk V starting in 1959.

The LCU provides a persistent, long-range and high-capacity landing craft to complement the high-speed, over-the-beach delivery capacity of the LCAC. This steel-hulled and diesel-propelled craft is capable of carrying a 125-ton payload to a nominal range of 1,200 nautical miles. These vessels have bow ramps for onload/offload, and can be linked from their bow to the stern gate of amphibious ships to create a temporary causeway structure for at sea offload of vehicles and equipment. Its welded steel hull provides high durability, with deck loads of 800 pounds per square foot. Arrangement of machinery and equipment has taken into account built-in redundancy in the event of battle damage. The craft features two engine rooms separated by a watertight bulkhead to permit limited operation in the event that one engine room is disabled. An anchor system is installed on the starboard side aft to assist in retracting from the beach. The LCU's ability to transit intra-theater distances and operate independent of well-deck amphibious warships for up to ten days provides additional operational flexibility and a level of persistence that no other asset smaller than an amphibious warship can provide to the operational commander.

Carrying equipment, troops, and supplies in any variation up to its maximum capacity, the LCU launches from a well deck-equipped amphibious warfare ship, transits to the surf zone and lands vehicles and cargo to provide organic mobility for naval forces from the sea base to the shore. LCUs have been adapted for many uses, including salvage operations, ferry boats for vehicles and passengers and underwater test platforms, and have proven invaluable in support of humanitarian-assistance/disaster-relief missions, including *Operation Tomodachi* Tsunami Relief in Japan, Hurricane Katrina, and *Operation Unified Response* in Haiti. They have been critical to non-combatant evacuation

operations, such as the evacuation of more than 14,000 Americans from Lebanon in 2006. LCUs are multi-mission craft that can also conduct offload of Military Sealift Command Maritime Prepositioned Squadron ships via crane loading, and they interoperate with joint-logistics-over-the-shore operations to sustain forces operating inland.

Status

LCU 1610 craft entered service in 1959; the average age of the operational vessel in early 2015 is 44 years. Rugged steel hulls and diesel engines have allowed these craft to serve effectively well beyond their initial design service lives of 25 years. There are 32 LCU 1610 vessels stationed at Little Creek, Virginia; Coronado, California; and Sasebo, Japan.

Developers

Christy Corporation	Sturgeon Bay, Wisconsin
General Ship	Baltimore, Maryland
Gunderson Brothers Marine	Portland, Oregon
Marinette Marine	Marinette, Wisconsin

LHA 6 *America*-Class Amphibious Assault Ship

Description

America-class general-purpose amphibious assault ships—previously designated the LHA Replacement LHA(R) program—provide forward-presence and power-projection capabilities as elements of U.S. expeditionary strike groups. With elements of a Marine landing force, these warships will embark, deploy, land, control, support, and operate helicopters, MV-22 *Osprey* and F-35B *Lightning II* aircraft for sustained periods. The LHA 6-class will also support contingency-response and forcible-entry operations as an integral element of joint, interagency, and multinational maritime expeditionary forces. The USS America (LHA 6) is the first of the *America* class and is a variant of the USS Makin Island (LHD 8). This ship includes an LHD 8 gas turbine and hybrid-electric propulsion plant, diesel generators, and all-electric auxiliary enhancements. These improvements represent a significant increase in aviation lift, sustainment, and maintenance capabilities.

The Flight 0 (LHA 6 and LHA 7) ship optimization to support *Osprey* and F-35B aircraft includes: significantly increased JP-5 fuel capacity (1.3 million gallons, compared to 600,000 gallons for the Flight 1 (LHA 8) warships); space to support elements of a marine expeditionary unit or small-scale joint task force staff; an increase in service-life allowances for new-generation Marine Corps systems; and substantial survivability upgrades.

The Flight 1 LHA 8 will modify the LHA 6 design to incorporate a well deck capable of supporting two Landing Craft Air Cushion vehicles and a reduced-island flight deck to unlock seven F-35B

spots and include a topside MV-22 maintenance spot. This will increase flight deck space, thus retaining aviation capability on par with Flight 0 ships, which were optimized for aviation capability in lieu of a well deck.

Status

LHA 6 was launched June 4, 2012, delivered on April 10, 2014, and commissioned on October 11, 2014 in San Francisco during Fleet Week. The Navy awarded the contract for LHA 7 on May 31, 2012, the keel was laid on June 20, and the ship will deliver in December 2018. The LHA 8 is programmed as a FY 2017 ship with planned delivery in FY 2024.

Developers

Avondale Marine	Gulfport, Mississippi
Gryphon Technologies LC	Panama City, Florida
Huntington Ingalls Industries	
Ingalls Shipbuilding	Pascagoula, Mississippi

LHD 1 *Wasp*-Class Amphibious Assault Ship

Description

The *Wasp* class comprises eight 40,650-ton (full load) multi-purpose amphibious assault ships whose primary mission is to provide embarked commanders with command and control capabilities for sea-based maneuver/assault operations as well as employing elements of a landing force through a combination of helicopters and amphibious vehicles. The *Wasp*-class also has several secondary missions, including power projection and sea control.

LHD 1-class ships increase total lift capacity by providing both a flight deck for helicopters and vertical/short takeoff and landing (V/STOL) aircraft (AV-8B *Harrier* and the MV-22 *Osprey*), and a well deck for both air-cushioned and conventional landing craft. Each ship can embark 1,877 troops and has 125,000 cubic feet of cargo for stores and ammunition and 20,900 square feet for vehicles. Medical facilities include six operating rooms, an intensive-care unit, and a 47-bed ward. LHDs 5 through 7 are modified variants of the class. Design changes include increased JP-5 fuel capacity, fire-fighting and damage-control enhancements, and women-at-sea accommodations.

The USS Makin Island (LHD 8) incorporates significant design changes including gas-turbine propulsion, hybrid-electric drive, diesel generators, and all-electric equipment. Two gas turbines, providing 70,000 shaft-horsepower, replace the two steam plants found on earlier ships in the class, and the electric drive propels the ship while operating at low speeds to increase fuel efficiency. All ships in the class will be modified to support F-35B *Lightning II* Joint Strike Fighter operations.

Status

Eight LHDs have been delivered to the Fleet. The eighth and final ship of the class, the USS Makin Island (LHD 8), commissioned on October 24, 2009 in San Diego, California. The USS Wasp

(LHD 1) completed modifications to support F-35B operations in FY 2014. The LHD mid-life program is scheduled to begin in FY 2016 with the USS Essex (LHD 2) and will enable LHDs to meet amphibious mission requirements and a 40-year expected service life starting in FY 2029 through FY 2049. The mid-life program is a key component to achieve LHD 1 "Class Wholeness" and includes hull, mechanical and electrical upgrades and C5I (command, control, communications, computers, collaboration, and intelligence); aviation; and training improvements.

Developers
Huntington Ingalls Industries
Ingalls Shipbuilding — Pascagoula, Mississippi

LPD 17 *San Antonio*-Class Amphibious Transport Dock Ship

Description
The *San Antonio* LPD is an amphibious transport dock ship optimized for operational flexibility and satisfying Marine Air-Ground Task Force (MAGTF) lift requirements in support of the expeditionary maneuver warfare concept of operations. The *San Antonio*-class LPDs are 684 feet in length, with a beam of 105 feet, a maximum displacement of 25,000 long tons, and a crew of approximately 380. Four turbocharged diesels with two shafts and two outboard-rotating controllable-pitch propellers generate a sustained speed of greater than 22 knots. Other ship characteristics include 20,000 square feet of space for vehicles—about twice that of the *Austin*-class (LPD 4), which LPD 17 replaces—34,000 cubic feet for cargo, accommodations for approximately 700 troops (800 surge), and a medical facility comprising 24 beds and four operating rooms (two medical and two dental).

The well deck can launch and recover traditional surface assault craft as well as two landing craft air cushion (LCAC) vehicles capable of transporting cargo, personnel, Marine tracked and wheeled vehicles, and tanks. The LPD 17 aviation facilities include a hangar and flight deck (33 percent larger than the LPD 4-class) to operate and maintain a variety of aircraft, including current and future fixed- and rotary-wing aircraft. Other advanced features include the advanced enclosed mast/sensor for reduced signature/sensor maintenance, reduced-signature composite-material enclosed masts, other stealth enhancements, state-of-the-art C4ISR (command, control, communications, computers, intelligence, surveillance, and reconnaissance) and self-defense systems, a shipboard wide-area network linking shipboard systems with embarked Marine Corps platforms, and significant quality of life improvements.

Status
The initial contract award to design and build the lead ship of the class was awarded to the Avondale-Bath Alliance in December 1996. The Navy transferred LPD 17 class workload from Bath Iron

Works to Northrop Grumman Ship Systems (NGSS, now Huntington Ingalls Industries Ingalls Shipbuilding) in June 2002. LPDs 17 through 25 have been delivered. The final Pre-Commissioning Units John P. Murtha (LPD 26) and Portland (LPD 27) will deliver in FY 2016 and FY 2017, respectively.

Developers

Huntington Ingalls Industries	
Avondale Shipyard	New Orleans, Louisiana
Ingalls Shipbuilding	Pascagoula, Mississippi
Raytheon	San Diego, California

LSD 41 / 49 *Whidbey Island* / *Harpers Ferry*-Class Dock Landing Ships

Description

The mission of *Whidbey Island/Harpers Ferry* dock landing ships is to transport and launch amphibious assault vehicles and landing craft with their crews and embarked personnel. The key difference between the LSD 49-class and the LSD 41-class is that the LSD 49-class cargo variants have significantly expanded cargo and ammunition stowage facilities over those of the LSD 41-class at the cost of decreased Landing Craft Air Cushion (LCAC) capacity, from four to two. The LSD 41 *Whidbey Island* class is the primary support and operating platform for LCACs and can also provide limited docking and repair services as a boat haven for small ships and craft. Both LSD classes have two primary helicopter spots, and can support Navy and Marine Corps helicopters as well as MV-22 *Osprey* operations. Neither class is configured with a helicopter hangar, with aircraft fueling and rearming conducted on the flight deck. LSDs are equipped with a vehicle turning area and tactical logistics communication spaces to facilitate and coordinate troop/vehicle movement and logistics. These ships have a doctor and dentist assigned as ship's company, two dental examination rooms, and one medical operating room.

Status

In early 2015 12 LSDs were in the fleet: eight LSD 41-class and four LSD 49-class. Mid-life programs are designed around a 52-week maintenance availability with nine ships already completed or in progress. The mid-life program will enable both ship classes to meet amphibious mission requirements and a 40-year expected service life (ESL) with the first ship reaching ESL in FY 2025. The mid-life program improves material condition readiness, replaces obsolete equipment, and provides hull, mechanical, and electrical systems upgrades. All ships have completed their mid-life availabilities with the exception of the USS Tortuga (LSD 46).

Developers

Avondale Industries, Inc.	New Orleans, Louisiana
Lockheed Shipbuilding	Seattle, Washington
Raytheon	San Diego, California

LX(R) Dock Landing Ship Replacement

Description

LX(R) is intended to replace the LSD 41 *Whidbey Island* and LSD 49 *Harpers Ferry* classes of dock landing ships when they begin reaching end of service life in 2025.

Status

The Navy's long-range shipbuilding plan associated with the FY 2013 President's Budget identified the LX(R) as an 11-ship program with lead ship procurement in FY 2018. LX(R) will be a recapitalization of the LSD 41/49 class, which will reach the end of service life beginning in 2025. Planning for a replacement has already begun to ensure necessary lead-time for program development. The LX(R) initial capabilities have been defined, and the analysis of alternatives was completed on April 10, 2014. Milestone A Defense Acquisition Board will occur in March 2015.

Developers

To be determined.

MCM 1 *Avenger*-Class Mine Countermeasures Ship Modernization (MCM MOD)

Description

Avenger-class surface mine countermeasures ships are used to detect, classify, and neutralize or sweep mines in sea lines of communication and naval operating areas. These ships are one leg of the mine countermeasures "triad" comprising surface and airborne MCM and explosive ordnance disposal forces. MCM modernization improvements correct the most significant maintenance and obsolescence issues in order to maintain the ships through their full 30-year service lives. The modernization package includes: planned product improvement program upgrades on the Isotta Fraschini main engines and generators for MCM 3 through MCM 14; replacement of the SLQ-48 mine neutralization vehicle, addressing obsolete components; upgrading the existing SQQ-32 sonar with high-frequency wide-band capabilities; and replacing the existing acoustic sweep system with the advanced acoustic generator/infrasonic advanced acoustic generator system. Other major hull, mechanical, and electrical alterations include upgrades to the 400-Hz distribution system, replacement of aft deck hydraulic equipment with electric equipment, replacement of the diesel generator analog voltage regulators with digital voltage regulators, and upgrading the navigation system.

Status

The 14-ship MCM Modernization program commenced in FY 2004 and is scheduled to complete by FY 2016. Ship decommissionings have commenced and the entire class will be decommissioned by FY 2024.

Developers

Raytheon Portsmouth, Rhode Island

Ship-to-Shore Connector (SSC) / LCAC 100

Description

The Ship To Shore Connector/Landing Craft Air Cushion 100 is envisioned to provide high-speed, heavy-lift for over-the-horizon maneuver, surface lift, and shipping. The SSC/LCAC-100 is addressing the gap in heavy sea-to-shore lift that will emerge as the upgraded in-service LCAC reach their end of extended service lives after FY 2015. The SSC/LCAC-100 payload design will exceed the legacy LCAC payload of 74 short tons. The SSC design improves upon high failure rate and maintenance intensive systems to increase reliability and reduce life cycle costs. SSC/LCAC-100 will also employ enhanced lift fans, propellers, and greater use of composite materials.

Status

The Joint Requirements Oversight Council approved the Initial Capabilities Document in October 2006. An analysis of alternatives was approved in early FY2008, and the Capability Development Document was approved in June 2010. Initial operational capability is scheduled for FY 2020. A contract for the detailed design and construction of the first craft with options to build eight additional craft was awarded in July 2012. The first craft is funded by research, development, test and evaluations funds to serve as an operational test and evaluation platform, as well as a crew-transition training platform to allow for LCAC crews to become familiar with LCAC 100. The options included in the contract enable the Navy to begin low-rate initial procurement of the first test and training craft plus eight option craft to support fleet introduction in the FY2020 timeframe. Fabrication of the first SSC/LCAC 100 began in November 2014.

Developers

Alcoa Defense	Pittsburgh, Pennsylvania
L-3 Communications	New York, New York
Textron Marine & Land Systems	New Orleans, Louisiana

Surface Connector (X) Replacement (SC(X)R)

Description

The Surface Connector (X) Replacement will recapitalize the capabilities currently derived from the long serving LCU-1610 Class craft. SC(X)R will be a self-sustaining craft complete with living accommodations and messing facilities for the crew to enable persistence operations for up to 10 days or intra-theater transit of up to 1,200 nautical miles. Like the venerable LCU's, the SC(X)R's will provide operational flexibility and a level of persistence no other asset smaller than an amphibious warfare ship provides to the operational commander. Carrying equipment, troops, and supplies in any variation up to its maximum capacity of 170 tons, the SC(X)R will launch from a well deck-equipped amphibious warfare ship, transit to the surf zone and land vehicles and cargo to provide organic mobility for naval forces from the sea base to the shore. The SC(X)R is intended to address the gap in heavy

sea-to-shore lift that will emerge as a result of the advanced age and long service of the LCU-1610 class craft.

Status
The SC(X)R completed the Navy Requirements/Acquisition Gate Review 1 in 2013. The analysis of alternatives to identify the suitable candidates to replace the LCU-1610 was completed in May 2014 and approved in September 2014. Navy Gate 2 was completed in October 2014.

Developers
To be determined.

T-MLP 1 *Montford Point*
Mobile Landing Platform (MLP)

Description
The Mobile Landing Platform is based on commercial float-on/float-off (FLO/FLO) technology to provide a surface interface between large medium-speed roll-on/roll-off prepositioning ships and Landing Craft Air Cushion (LCAC) surface connectors. The MLP is a major component of the Navy-Marine Corps solution for enhancing Maritime Prepositioning Squadrons throughput capability by expanding operating environments and access opportunities. The MLP is 785 feet in length with a beam of 165 feet—more than a third wider than most ships of similar length—making it an extremely stable platform for sea-base operations.

MLP1 and 2 will provide an elevated vehicle staging area and three LCAC lanes that will allow for the transfer of equipment at sea in non-anchorage depths and delivery from over the horizon through restricted access environments.

MLP 3 and 4 are an Afloat Forward Staging Base (AFSB) variant and include a forward house (250 berths) outfitted with common spaces to support ready room, command, operations, and logistics functions; operating spots for two Airborne Mine Countermeasures (AMCM) helicopters, with parking for two additional helicopters, a hanger and ordnance magazines, an underway replenishment capability, and deck space for AMCM or special operations force boats, sleds, and equipment.

Status
Four ships are planned for purchase: two each of the MLP and AFSB variants. The USNS Montford Point (MLP 1) and USNS John Glenn (MLP 2) were delivered to the Navy in May 2013 and March 2014, respectively. Both ships will be ready for fleet tasking in spring 2015. The USNS Lewis Puller (MLP 3) is scheduled to be delivered in September 2015. The unnamed MLP 4 will be a FY 2015 procurement.

Developers

General Dynamics NASSCO	San Diego, California
Vigor Marine	Portland, Oregon

EXPEDITIONARY SYSTEMS

AES-1 Airborne Laser Mine Detection System (ALMDS)

Description

The Airborne Laser Mine Detection System is a light detection and ranging airborne mine countermeasures (AMCM high-area coverage system that detects, classifies, and localizes floating and near-surface moored sea mines. The system is deployed in the MH-60S helicopter and will provide organic airborne mine countermeasures defense to the battle force.

Status

ALMDS completed operational assessment in FY 2012. Pre-planned product improvement delivers in 2018. Initial operational capability is scheduled for FY16.

Developers

Arete Associates	Tucson, Arizona
Northrop Grumman	Melbourne, Florida

Airborne Mine Neutralization System (AMNS)

Description

Airborne Mine Neutralization System is deployed from the MH-60S and MH-53E helicopters using an expendable mine neutralization device, the Archerfish, with the capability to neutralize bottom and moored mines. The AMNS will be deployed from the Littoral Combat Ship (LCS) as a key element of the LCS mine countermeasures mission module. This capability will be of critical importance in littoral zones, confined straits, choke points, near shore, and the amphibious objective area.

Status

AMNS successfully completed integrated test in May 2013 and is on-track for an FY 2015 initial operational test and evaluation. Initial operational capability is scheduled for FY 2016.

Developers

BAE Systems	Portsmouth, England
Raytheon	Portsmouth, Rhode Island

AQS-20A Mine-Hunting Sonar

Description

The AQS-20A is an underwater mine-detection side-looking and forward-looking sonar suite that also employs an electro-optic identification sensor capable of locating and identifying bottom, close-tethered, and moored sea mines. The AQS-20A system will serve as a mine-hunting sensor subsystem of the Remote Minehunting System (RMS) hosted on board the Littoral Combat Ship.

Status

Improvements to the computer-aided detection/computer-aided classification and environmental data collection capabilities are

being implemented via enhanced research and development efforts. AQS-20A initial operational capability is projected for FY 2015.

Developers

Raytheon — Portsmouth, Rhode Island

Assault Breaching System (ABS)

Description

The Assault Breaching System program focuses on development of standoff systems to locate and neutralize mine and obstacle threats in the surf and beach zones. The program uses a system-of-systems approach that includes incremental development of the Coastal Battlefield Reconnaissance and Analysis (COBRA) mine/obstacle detection system and precision craft navigation and lane marking. The Joint Direct Attack Munition (JDAM) Assault Breaching System (JABS) provides in-service neutralization capability against "proud" (i.e., not buried) mines and obstacles in the beach and surf zone. The platform for the COBRA system is the *Fire Scout* vertical take-off unmanned aerial vehicle (VTUAV). Platforms for employment of the neutralization systems include Navy strike aircraft and Air Force bombers.

Status

The COBRA Block I system achieved Milestone C in FY 2009, and initial operational capability is scheduled for FY 2017. JABS is a fielded capability in the beach and surf zone with ongoing testing to expand its capability into the very-shallow water zone.

Developers

Arete — Tucson, Arizona
Boeing — St. Louis, Missouri

Joint Mission Planning System-Expeditionary (JMPS-E)

Description

Joint Mission Planning System-Expeditionary is a web-based, mission planning system that can be tailored as a decision support tool for the amphibious ready group (ARG). It is a scalable, distributed planning environment specifically designed to automate the Rapid Response Planning Process (R2P2) and to increase the mission effectiveness of the ARG with its amphibious squadron (PHIBRON) and marine expeditionary unit (MEU). The web-based implementation provides the technological capability for user-ready access to geographically/architecturally disparate systems' data.

The system provides an architecture that integrates two decision-support tools developed under other government programs with the JMPS framework—the Expeditionary Strike Planning Folder and Expeditionary Decision Support System. The reuse of these two systems provides a capability to conduct crisis action planning

from a sea-base for ship-to-objective-maneuver. Staff planning effectiveness will increase by reducing the time required to respond to initial tasking and change orders, thus providing more time for contingency planning and mission rehearsal. Time-intensive and tedious processes (e.g., filling of briefing templates and data import) will become automated. This will reduce human error and rework. Shorter planning times will also be facilitated by enabling standardization of the workflow processes, work products, and briefing material through implementation of workflow visual aids, administrative task automation, user alerts and notifications, and near-real time data updates from other systems.

The system bridges Navy and Marine Corps systems with planned interfaces to Portable Flight Planning Software, Global Command and Control System-Maritime, JMPS, and Command and Control Personal Computer, and will operate on naval networks including Integrated Shipboard Network System, Consolidated Afloat Networks and Enterprise Services, and the Marine Corps Enterprise Network. System interfaces will facilitate collaboration by sharing a common planning picture thereby increasing situational awareness for all planners.

Status

Fully information-assurance certified, JMPS-E integrates with current net-centric shipboard capabilities to streamline the R2P2 process, enhances concurrent parallel mission planning, assists in the administrative orders development and message process, and provides an excellent "on-map" and "real-time" briefing tool with auto export to PowerPoint. The systems reached full operational capability in May 2012, and the program is coordinating with the Marines to integrate service software planning tools, thereby ensuring cross-service planning synchronization.

Developers

BAE Systems	Rancho Bernardo, California
Science Applications International Corporation	McLean Virginia

KSQ-1 Amphibious Assault Direction System (AADS)

Description

The Amphibious Assault Direction System, with Enhanced Position Location Reporting System (EPLRS), integrates the NAVSTAR Global Positioning System to form a jam/intercept-resistant, friendly-force tracking and command and control system that supports the surface assault ship-to-shore movement in amphibious operations. It provides the capability to launch, monitor, track and control surface—Landing Craft Air Cushion (LCAC) and Landing Craft Utility (LCU) vessels—or combined surface and air (helicopter and tilt-rotor aircraft) amphibious assaults up to 100 nautical miles over the horizon (OTH). It seamlessly integrates with the Marine Corps tactical radio (PRC-117G), during ship-to-objective-maneuver operations, and

integrates with Global Command and Control System-Maritime system for OTH operations.

Status

By early 2015, AADS will have been installed in 32 amphibious ships, 78 LCACs and 32 LCUs, in addition to Assault Craft Units 4 and 5 control towers, and Expeditionary Warfare Training Group (Atlantic and Pacific) classrooms. AADS satisfies operational requirements for an OTH Amphibious Assault Command and Control System. Future capability enhancement will include acquisition of a downsized radio relay group to reduce relay helicopter footprint.

Developers

Naval Surface Warfare Center,
Panama City Division — Panama City, Florida

Mk 62/63/65 Naval Quickstrike Mines

Description

The in-service 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. The Quickstrike mines include one dedicated thin-wall mine—the 2,300-pound Mk 65 weapon—and two mines converted from conventional bombs using the Conversion Kit Mk 197: the Mk 62 500-pound and Mk 63 1,000-pound mines.

Status

In-service support continues for current inventories, and funding is in place for algorithm development and procurement of the TDD Mk 71 and associated hardware for Conversion Kit Mk 197. Aircraft integration and testing are ongoing to certify this new configuration for use on various Air Force and Navy aircraft.

Developers

Sechan Electronics, Inc. — Lititz, Pennsylvania

WLD-1 Remote Minehunting System (RMS)

Description

The WLD-1 Remote Minehunting System consists of one remote multi mission vehicle (RMMV) and one AQS-20A variable-depth sonar. RMS is a high-endurance, semi-submersible, unmanned, offboard, low-observable vehicle that will be operated from the Littoral Combat Ship (LCS). RMS is launched with a pre-programmed search pattern and will search detect, classify, and identify non-mine objects and mine threats. RMS is capable of line-of-sight and over-the-horizon operations. Once the mission is completed, RMS will return to the ship and data will be downloaded for post-mission analysis in which targets classified as mines are passed to follow-on systems for neutralization.

Status

To support LCS integration, RMS is implementing upgrades, including the multi-vehicle communication system, launch and recovery improvements, and fleet suitability upgrades. RMS initial operational capability will occur following completion of LCS mine countermeasures mission package initial operational test and evaluation in FY 2015.

Developers

Lockheed Martin — Riviera Beach, Florida

SECTION 5

INFORMATION DOMINANCE

The Navy's Information Dominance enables assured maritime command and control and superior battlespace awareness to deliver sustained, integrated fires across the full spectrum of 21st-Century maritime warfare. The Navy's information capabilities and info-centric communities place the Navy in a better position to meet the challenges and threats of the Information Age. Success in the Information Age will require unmatched mastery of the capabilities, tools and techniques that enable us to collect, process, analyze, and apply information.

ASSURED COMMAND AND CONTROL

Afloat Electromagnetic Spectrum Operations Program (AESOP)

Description

The U.S. Navy's Afloat Electromagnetic Spectrum Operations Program is the only fielded operational spectrum planning tool that integrates surface radars, combat systems, and communications frequencies to de-conflict and reduce the electromagnetic interference (EMI) impacts for ships and strike groups. AESOP also develops the Operational Tasking Communication (OPTASK COMM) and OPTASK Electronic Warfare (EW) Annex K Radar Frequency Plans that support strike groups and coalition navies in joint exercises and operations, to ensure all systems interoperate and missions are successful. AESOP uses U.S. Navy-approved propagation models that include all strike group emitters—Navy and coalition partners—to identify and mitigate potential interoperability issues. In addition, AESOP helps to ensure that systems are in compliance with both national and international spectrum allocations and regulations. AESOP provides many benefits and enables the warfighter to maximize the performance of their systems by reducing system susceptibilities to interference or unintentional jamming, resulting in clear communications, increased detection ranges and intercepts, and enhanced awareness for emission control.

Status

The importance of radio frequency assignments for guided missile ships dates back to 1963. Since then, guidance has been provided through messages, manuals, and, eventually, software with AESOP v1.0, first released in December 2003. In 2004, the Numbered Fleet Commanders mandated the use of AESOP for every underway period, deployment, operation, or exercise. In 2005, the Chief of Naval Operations reinforced this mandate in an "All Commands" message. AESOP v3.0, the version in service in FY 2014, was distributed to the Fleet in 2011 and in early 2015 is fielded and used by 218 ships and 196 ashore commands. Accompanying the AESOP software programs are the EMC Criteria for Navy Systems Revision 3 and the Littoral Spectrum Restrictions Revision 4. AESOP is a man-in-the-loop fleet capability. Using sophisticated models and algorithms, the program creates OPTASK plans in minutes versus a manual process that would require days to complete.

The next progression for AESOP is to integrate and automate this capability with shipboard sensors to develop a real-time spectrum operations (RTSO) capability, a key tenet and enabler of electromagnetic maneuver warfare (EMW). It is foundational to the EMW framework: electromagnetic resource control and allocation, EM awareness, EM agility, signature control, and EM engagement. RTSO will provide ships and strike groups the ability to sense, control, and plan the use of spectrum, detect electromagnetic interference, notify the operators of spectrum issues, and provide recommended actions allowing for command and control of the spectrum. It is

a networked collection of firmware, software, and hardware that continuously monitors the spectrum both via direct connections to existing shipboard systems as well as antennas receiving the external environment. Once deployed, it will share this information across the strike group and be cognizant of global frequency restrictions. RTSO will execute the Navy's vision for Information Dominance and EMW by controlling the electromagnetic spectrum terrain and mitigating EMI. RTSO will enable the Navy to transition from its legacy static spectrum operations through three major incremental improvements embracing a dynamic, automated, real-time spectrum operations approach. RTSO will provide real-time dynamic command and control of the spectrum terrain. This transition from a static, assignment-based spectrum management system to a fully automated, real-time system is outlined in the Navy's Information Dominance Roadmap for Electromagnetic Spectrum (EMS) Usage. The EMS Usage Roadmap provides plans of action with timelines to drive Navy policy, engagement, and investment decisions regarding the operationalization of the electromagnetic spectrum.

Developers

EOIR Corporation	Dahlgren, Virginia
Naval Surface Warfare Center	Dahlgren, Virginia
SENTEL Corporation	Dahlgren, Virginia

Automated Digital Network System (ADNS)

Description

The Automated Digital Network System is the key enabler for delivering net-centric capabilities that depend upon robust, dynamic, adaptable, survivable, and secure communications. ADNS is the shipboard network interface that enables connectivity between the ship's internal network and the outside world via radio frequency (RF) spectrum and landline when pierside. ADNS is also installed in Navy network operations centers (NOCs), enabling the NOCs to transmit and receive voice and data to and from ships. ADNS provides capability that enables unclassified, secret, top secret, and various joint, allied, and coalition services to interconnect to the Defense Information Systems Network.

ADNS Increment I combined data from different enclaves and transmits across available communications paths. ADNS Increment II added the capability to manage traffic from multiple enclaves simultaneously over multiple transit paths, including RF and terrestrial links, but still did not satisfy the Fleet's need for higher throughput. Increased throughput and converged Internet Protocol (voice, video, and data) capabilities were delivered to the Fleet with the deployment of Increment IIa/IIb. ADNS Increment III brings a protected core, reducing the exposure to cyber warfare network infiltration. It supports 25 megabits per second (Mbps) aggregate throughput for submarines and unit-level ships and 50 Mbps aggregate throughput for force-level ships. ADNS Increment III is a key enabler of the Navy's counter anti-access/area-denial capability.

Status

In FY 2005, all active ships and ashore network operations centers facilities were equipped with either ADNS Increment I or II; additionally, all active submarines and broadcast control authority facilities were equipped with Increment I. In FY 2006, ADNS Increment IIa installations began on aircraft carriers, large-deck amphibious assault ships, and fleet commander flagships (force-level ships). In FY 2007, ADNS Increment IIb installations began on unit-level ships (e.g., guided-missile cruisers and destroyers). In FY 2008, select airborne platforms were incorporated into ADNS, bringing network connectivity to additional fleet assets. Increment III low-rate initial production began in FY 2009. ADNS Increment III reached initial operational capability in FY 2010. Ashore NOC installs were completed in FY 2010. Increment III will be installed on all ships and submarines and their respective shore facilities. ADNS Increment III is planned to reach full operational capability in FY 2020 and is synchronized with Consolidated Afloat Networks Enterprise System deployment.

Developers

Science Applications	
International Corporation	Arlington, Virginia
Space and Naval Warfare Systems Command	
PEO C4I	San Diego, California
SPAWAR Systems Center Pacific	San Diego, California

Automatic Identification System (AIS)

Description

The Automatic Identification System is a maritime digital broadcast system that continually exchanges voyage and vessel data among network participants over very-high-frequency radio in support of regional and global maritime domain awareness (MDA) requirements. The data include vessel identity, position, speed, course, destination, and other information of critical interest for navigation safety and maritime security. The International Maritime Organization and the 1974 International Convention for the Safety of Life at Sea require commercial vessels greater than 300 gross tons and all passenger ships to use AIS. Warships are exempt. The Navy AIS program collects open-source AIS data broadcast from AIS transceivers on commercial vessels. These open-source AIS data, combined with other government intelligence and surveillance data, are used by Navy ships and submarines to improve safety of navigation and are integrated into the common operational picture to enhance situational awareness. The AIS data collected by Navy platforms are also aggregated within the MDA/AIS Sensor/Server (MASS) capability at several operational shore sites. The MASS then provides the data to unclassified and classified users in support of MDA efforts, with particular focus on improving the Nation's maritime security.

Status

Navy AIS began as a rapid deployment capability, transitioned to a program of record on December 24, 2008, and was designated as an Acquisition Category IV program. The Space and Naval Warfare Systems Command Program Executive Office C4I is the milestone decision authority. As of September 2014, Increment I AIS systems were installed on 140 unit-level ships (e.g., cruisers and destroyers), 21 force-level ships (e.g., aircraft carriers and large-deck amphibious assault ships), 33 submarines and four shore sites (Third Fleet, Fifth Fleet, Pacific Fleet, and Fleet Forces Command). The systems include a laptop computer display on the bridge and connectivity to send unclassified AIS data to shore sites. They also enable the direct transfer of AIS track information. The Navy is implementing a firmware upgrade to add encrypted capability on submarine AIS systems to improve safety of navigation for submarines operating in close proximity to Coast Guard vessels that routinely encrypt their AIS position reports.

Developers

L-3 Communications	Orlando, Florida
SAAB Transponder Technologies	Sterling, Virginia

Base Communications Office (BCO)

Description

Base Communications Office provides:

- Operations and Maintenance: Manage telephone switching networks and outside cable plant infrastructure.
- Telephone Services: Operate, maintain, and manage government and commercial service delivery points providing connectivity to Defense Switch Network (DSN), Public Switched Telephone Network (PSTN), and General Services Administration commercial long-distance service.
- Audio Conferencing Services: Operate and maintain ad-hoc unclassified audio conferencing services.
- Billing Support: Provide telephone invoice validation and customer billing, and process customer requests for services.
- Voicemail Services: Operate and maintain standard business-class voicemail services.
- Customer Support: Support of customer requirements; requirements definition and planning; review of military construction and special projects; move, add, and change telephone services.

Fleet Cyber Command/Tenth Fleet manages the program, and the PEO-C4I/PMW790 Shore Telephony Program Office provides acquisition support to the BCO program, which serves more than 350,000 Navy personnel worldwide. Lifecycle switch replacement provides voice over Internet Protocol capability.

Status

Naval Computer and Telecommunications Area Master Stations BCOs provide base communications services and support to approximately 3,890 Navy and non-Navy shore activities and deployable units. BCOs operate, maintain, and manage the communications infrastructure supporting the transport of switched voice, video, and data in support of 49 BCOs worldwide. BCOs provide services at 114 campuses (base/station/other) and manage 109 government-owned telephone switches and 13 commercial dial-tone Central Exchange switches. This program responds to more than 69,000 customer service requests worldwide each year, and its operators and auto attendants handle some 320,000 calls per month.

Developers

Science Applications	
International Corporation	Arlington, Virginia
Space and Naval Warfare Systems Command	
SPAWAR Systems Center Pacific	San Diego, California

Base Level Information Infrastructure (BLII)

Description

Base Level Information Infrastructure provides a fully integrated, interoperable, and secure information technology (IT) infrastructure that enables the rapid and reliable transfer of voice, video, and data to bases, stations, homeports, and piers outside of the continental United States (OCONUS). BLII area of responsibility includes 14 major OCONUS fleet bases, stations, and other remote locations. BLII provides the infrastructure, hardware, and software for the Fleet Cyber Command/Tenth Fleet-managed OCONUS Navy Enterprise Network (ONE-NET) Operations. BLII also sustains Navy CONUS/OCONUS pier IT infrastructure capability, which includes maintaining pier fiber runs, conduits, junction boxes, brow umbilicals, and associated electronics. Modern pier IT infrastructure enables forward-deployed ships to maintain situational awareness, receive operational and intelligence traffic, and perform maintenance or training on their radio frequency systems while pier-side.

Status

This program provides IT services to 28,000 BLII/ONE-NET seats, supporting approximately 51,000 forward-deployed OCONUS Navy users. Additionally, all piers/maintenance will be brought under a single program manager to centralize maintenance functions and accountability.

Developers

Booz Allen Hamilton	San Diego, California
Computer Sciences Corporation	San Diego, California
Deloitte	San Diego, California
Science Applications	
International Corporation	San Diego, California

Battle Force Tactical Network (BFTN)

Description

The Battle Force Tactical Network is the Navy's program of record for high-frequency internet protocol (HFIP) and subnet relay (SNR) communications, providing command and control in a satellite communications-denied anti-access/area-denied environment and serves as a primary backup for SIPRNET (Secret Internet Protocol Router Network) in the absence of satellite communications. HFIP operates in the HF spectrum and is capable of data rates of 9.6 kbps in single side band and 19.2 kbps in independent side band while SNR operates in the ultra- high-frequency spectrum and is capable of data rates up to 64 kbps. BFTN also provides critical non-satellite line of sight and beyond line of sight Transmission Control Protocol/Internet Protocol intra-aircraft carrier strike group connectivity among U.S. and coalition ships, submarines, and aircraft.

Status

In 2007, the USS Harry S. Truman (CVN 75) carrier strike group was the first strike group to deploy with HFIP and SNR. Elements of BFTN were tested during the 2013 Silent Banshee exercise. Initial operational testing and evaluation for BFTN(e) multi-layer spatial multiplexer is scheduled for FY 2015. In early 2015, BFTN is installed on 64 ships while BFTN(e) is on track for initial operational capability in FY 2017.

Developers

Quatech	Hudson, Ohio
Rockwell-Collins	Cedar Rapids, Iowa
Science Applications International Corporation	San Diego, California

Commercial Satellite Communications (COMSATCOM)

Description

The Commercial Satellite Communications program augments military satellite communications capabilities in support of surface combatants and includes two elements: the new Commercial Broadband Satellite Program (CBSP) and the legacy Commercial Wideband Satellite Program (CWSP). CWSP will continue in the Fleet until replaced by CBSP. The CBSP terminal is the USC-69; the CWSP terminal is the WSC-8. The CBSP USC-69 terminal has three variants for force-level, unit-level, and small ships. All terminal groups transport voice, video and data, e.g.,

NIPRNET (Non-secure Internet Protocol), SIPRNET (Secret Internet Protocol Router Network), JWICS (Joint Worldwide Intelligence Communications System), DCGS-N (Distributed Common Ground System-Navy), and other requirements. The CBSP program also includes the worldwide space segment and end-to-end architecture. INMARSAT terminals are no longer operational on surface warships. Navy use of Iridium on surface combatants is for emergency communications. Separate from the emergency communications requirement on ships, the Navy

has more than 3,000 Iridium devices that are used for various purposes at shore command locations to meet low-bandwidth voice and video requirements.

Status

CBSP was established as a rapid deployment capability in March 2007, achieved program Milestone C September 2009, initial operational capability in June 2010, and full rate production in September 2011; full operational capability is estimated for FY 2020. As of December 31, 2011, all ships reliant on INMARSAT transitioned to CBSP. The approved CBSP terminal objective is 192 ships. As of the end of FY 2014, 50 ships were operational with the CBSP terminal, and a total of 15 additional are funded through FY 2019. The legacy CWSP WSC-8 will continue in the fleet until replaced by the CBSP terminal in the FY 2019 timeframe.

Developers

CBSP/CWSP: Harris Corporation	Melbourne, Florida
CBSP: CVG, Inc.	Chantilly, Virginia
JEOD VSAT: L3 Communications	Victor, New York
IRIDIUM: IRIDIUM, LLC	McLean, Virginia

Consolidated Afloat Networks and Enterprise Services (CANES)

Description

Consolidated Afloat Networks and Enterprise Services is the Navy's program of record to replace existing afloat networks and provide the necessary infrastructure for applications, systems, and services required for the Navy to dominate the cyber warfare domain. CANES is the technical and infrastructure consolidation of existing, separately managed afloat networks including Integrated Shipboard Network Systems (ISNS), Combined Enterprise Regional Information Exchange System-Maritime (CENTRIXS-M), Sensitive Compartmented Information (SCI) Networks, and Submarine Local Area Network (SubLAN). CANES is replacing these legacy, obsolete afloat network designs. CANES provides capacity for enterprise information assurance management. It also reduces total ownership cost through consolidation and normalization of products and services while employing constant competition to enable efficient acquisition of new fleet requirements and capabilities.

The fundamental goal of CANES is to bring "Infrastructure as a Service" (IaaS) and "Platform as a Service" (PaaS), within which in-service and future iterations of Navy Tactical Network computing and storage capabilities will reside. CANES will provide complete infrastructure inclusive of hardware, software (including Agile Core Services for Navy Tactical Cloud), processing, storage, and end-user devices for unclassified, coalition, secret, and sensitive compartmented information for all basic network services (email, web, chat, collaboration) to a wide variety of Navy surface combatants, submarines, maritime operations centers, regional network operations and security centers, and aircraft. CANES

will develop updates on a rolling four-year hardware baseline and a two-year software baseline. CANES is based on the overarching concept of reducing the number of afloat network baselines and providing enhanced efficiency through a single engineering focus on integrated technical solutions.

Navy-validated applications, systems, and services that use the CANES infrastructure and services include the Distributed Common Ground System-Navy, Global Command and Control System-Maritime, Naval Tactical Command Support System, and Undersea Warfare Decision Support System.

Status

CANES Milestone C was achieved December 2012, authorizing the program to transition to the production and deployment phase of the acquisition lifecycle. Initial limited deployment fielding of CANES systems commenced with the USS Milius (DDG 69) in December 2012. As of early 2015, CANES has successfully accrued more than 15,000 operational hours on board nine destroyers, two of which are operationally deployed as part of the program's limited deployment fielding plan. Initial operational testing and evaluation aboard the USS Higgins (DDG 76) was completed in September 2014 to support a full deployment decision by the third quarter FY 2015.

Developers

Naval Undersea Warfare Center	Newport, Rhode Island
Northrop Grumman Space and Mission Systems	Reston, Virginia
Space and Naval Warfare Systems Command	
Space and Naval Warfare Systems Center Atlantic	Charleston, South Carolina
Space and Naval Warfare Systems Center Pacific	San Diego, California

Defense Red Switch Network (DRSN)

Description

The Defense Red Switch Network is the secure circuit-switched element of the Defense Information System Network, providing reliable and high-quality secure voice, data, and conferencing capabilities to senior national, combatant commander, and fleet commander decision-makers. The DRSN program ensures that operational commanders have immediate access to a flash-precedence, robust, multi-level secure, physically diverse, and survivable voice network. The Department of Defense and select federal agencies have a continuing operational requirement for a separate, controlled, and interoperable multi-level secure communications and conferencing network to support command, control, and crisis-management activities. The DRSN capability satisfies that requirement and comprises a network of circuit switches interconnected by the DISN backbone and commercial transmission links as well as gateway access to the Voice over Secure IP network.

Status
As assigned by the Joint Staff, the Navy has responsibility for operations and maintenance of five switches in the DRSN network: Joint Staff Detachment (Former Commander, Joint Forces Command, Norfolk, Virginia); Commander, Pacific Command (Camp H.M. Smith, Hawaii); Commander, Pacific Fleet (Pearl Harbor, Hawaii); Commander, Naval Forces Europe (Naples, Italy); and Commander, U.S. Naval Forces Central Command (Manama, Bahrain). Fleet Cyber Command is responsible for personnel, training, logistics, security and accreditation, and command policy for DRSN assets under Navy operational control.

Developers
Raytheon — Waltham, Massachusetts

Deployable Joint Command and Control Capability (DJC2)

Description
The Deployable Joint Command and Control program provides a standardized, rapidly deployable, scalable, and reconfigurable C2 and collaboration capable combat operations center that can be set up anywhere in the world in six-to-24 hours after arrival in theater to support geographic combatant commanders and their joint component commands in the rapid standup of a joint task force (JTF) headquarters. DJC2 can be employed when executing operations ranging in scale from a first responder or small early-entry, forward-component operations center to a full JTF headquarters. DJC2 has been used for humanitarian assistance/disaster response operations, including: *Operation Damayan* after Typhoon Haiyan in the Philippines; Hurricane Sandy relief in New Jersey and New York; *Operation Tomodachi* after the earthquake and tsunami in Japan; JTF Unified Response after the earthquake in Haiti; JTF Caring Response after Cyclone Nargis in Myanmar; and JTF Katrina after Hurricane Katrina in New Orleans, Louisiana. Additionally, the systems are used extensively for JTF headquarters joint exercises and training. DJC2 extends the joint sea base ashore for rapid, dynamic joint operations.

The DJC2 system has three modular tent/mobile shelter configurations, which iteratively build up C2 capability during the first phases of a joint operation. Configurations include: an autonomous Rapid-Response Kit (five to 15 seats); Early Entry (20 to 40 seats); and Core (60 seats). An Early Entry configuration can be set up and operational with three networks and communications in less than six hours. The fully fielded DJC2 configuration in a footprint of approximately 40,000 square feet can be set up and operational with five networks in less than 24 hours. The number of users supported can be expanded by lashing together two or more Cores, or by adding Core Expansion Kits (three available, adding 60-seats each, 180 total). A fully fielded DJC2 includes self-generated power, environmental control, shelters (tents), infrastructure, limited communications equipment, C2 applications, and office automation and collaboration software applications with operator workstations (laptop computers, chairs, and tables), displays, intercommunications, local-area networks, and access to wide-area networks.

Status

In September 2008, the DJC2 program attained full operational capability with the delivery of six operational Core systems to: the U.S. Southern Command (two Core systems, with one transferred to U.S. Army South); U.S. European Command; U.S. Pacific Command (two Core Systems, with one transferred to III Marine Expeditionary Force); and U.S. Africa Command. A seventh system was provided to Naval Forces Central Command in support of an urgent operational needs statement and their continuity of operations plan requirements. Programmed funding supports hardware sustainment, information technology refresh, and technology insertion efforts (based on warfighter input as technologies mature) across the future years defense program. The DJC2 program is in the operations and support phase and has successfully fielded several cycles of technology insertion (delivered in spirals) since September 2008. Because of its open architecture and modular design, the DJC2 system can be reconfigured to meet a wide variety of form/fit/functions.

Developers

ARINC	Panama City, Florida
Georgia Tech Research Institute	Atlanta, Georgia
ISPA Technology	Panama City, Florida
Naval Surface Warfare Center	Panama City, Florida

Digital Modular Radio (DMR)

Description

The USC-61(C) Digital Modular Radio is the Navy's first software-defined radio to have become a communications system standard for the U.S. military. DMR has four independent, full-duplex channels that provide surface ships, submarines, and shore commands with multiple waveforms and associated internal multilevel information security for voice and data communications. A single DMR is capable of replacing numerous existing Navy and Coast Guard legacy radios in the high frequency, very high frequency, and ultra-high frequency (UHF) line-of-sight and UHF satellite communications (SATCOM) frequency bands. The DMR is software configurable and programmable with an open system architecture using commercial off-the-shelf/non-developmental item hardware. DMR is the Navy's primary solution for providing the UHF SATCOM Integrated Waveform (IW)and Mobile User Objective System (MUOS) waveform to the Fleet.

Status

The Navy has procured 556 DMR systems through FY 2014. The DMR is installed on various platforms, including the *Nimitz* (CVN 68)-class aircraft carriers, *Arleigh Burke* (DDG 51)-class guided missile destroyers, the USS Makin Island (LHD 8) and America (LHA 6) amphibious assault ships, *San Antonio* (LPD 17)-class amphibious transport dock ships, *Lewis and Clark* (T-AKE)-class ships, select shore communications stations, and on submarines as part of the Common Submarine Radio Room. DMR is the Navy and Coast Guard's radio/terminal solution for implementing the IW and MUOS waveforms. For Navy new construction, DMR is also used to provide an HF capability as part of the High-

Frequency Distribution Amplifier Group (HFDAG). With the introduction of IW, MUOS and HFDAG, DMR is the Navy's complete tactical communication solution for the radio-frequency spectrum from 2 MHz through 2 GHz. IW/MUOS-capable DMRs are planned to start fielding in FY 2017.

Developers

General Dynamics	Scottsdale, Arizona

DoD Teleport

Description

Department of Defense (DoD) Teleport links the satellite communications space segment with the shore infrastructure and provides tactical users with a worldwide communications interface to the global information grid (GIG). Through multiple military radio frequency paths, DoD Teleport provides inter-theater reach-back into the Defense Information Systems Network and service C4I (command, control, communications, computers, and intelligence) systems, as well as intra-theater communications support for tactical users. In 2001, DoD designated the Navy as the DoD Teleport requirements sponsor, with the Defense Information Systems Agency as the Teleport executive agent. Teleports are located at six primary sites and one secondary site. The Navy operates and maintains Teleports at Wahiawa, Hawaii; Northwest, Virginia; Lago Patria, Italy; and Bahrain. Non-Navy Teleport sites are located at Fort Buckner, Okinawa, Japan; Camp Roberts, California; and Landstuhl/Ramstein, Germany.

Status

DoD Teleport Generation (GEN) I and II are in sustainment, and GEN III has commenced procurement. GEN III comprises three phases. Phase 1 provides advanced extremely high frequency (AEHF)-capable terminals at the Teleports using the Navy Multiband Terminal (NMT). Phase 1 reached Milestone C in September 2010, and NMT installs began in the second quarter of FY 2012. Phase 2 upgrades the X/Ka-band terminals, using the Army Modernization Enterprise Terminal to ensure compatibility with the Wideband Global Satellite constellation. Phase 2 went through a successful critical design review in FY 2011. DoD Teleport Gen III Phase 2 reached Milestone C in the third quarter of FY 2012. Phase 3 provides Mobile User Objective System-to-legacy Ultra-High Frequency (MUOS-UHF) interoperability. DoD Teleport GEN III will reach full operational capability in FY 2018.

Developers

Arrowhead	Alexandria, Virginia
Raytheon	St. Petersburg, Florida
ViaSat	Carlsbad, California

E-6B *Mercury*

Description

Derived from the Boeing 707, the E-6B platform provides the Commander, U.S. Strategic Command (USSTRATCOM), with the command, control, and communications capability needed

for execution and direction of strategic-nuclear forces. Designed to support a robust and flexible nuclear deterrent posture well into the 21st Century, the E-6B performs very low frequency (VLF) emergency communications, the U. S. Strategic Command airborne command post mission, and airborne launch control of ground-based inter-continental ballistic missiles. It is the Navy's only survivable means of nuclear command and control.

Status

The Block I modification program will sustain and improve E-6B capability and is focused on several aircraft deficiencies identified by USSTRATCOM. The contract for Block I was awarded to Rockwell Collins in March 2004, and became operational in 2013 with the last Block I modification scheduled for 2017. In 2005, the Navy initiated the Internet Protocol and Bandwidth Expansion (IP/BE) program to modernize the E-6B platform, which became operational in 2014. In 2008, the Navy directed the Multi-Role Tactical Common Data Link (MR-TCDL) and Family of Advanced Beyond Line-of-Sight Terminal/Presidential National Voice Conferencing (FAB-T/PNVC) programs to provide additional enhancements to field a T-3 capability and the replacement of the MILSTAR terminals to connect with the advanced extremely high frequency satellite system. In March 2012, the Navy awarded to Northrop Grumman the contract for MR-TCDL integration and installation into one E-6B aircraft and the E-6B Systems Integration Lab. The IP/BE, MR-TCDL, and FAB-T/PNVC programs will support USSTRATCOM;s migration of nuclear command and control (C2) to a distributed, network/IP-based global C2 system as an airborne node. Planned initial operational capabilities for MR-TCDL and FAB-T/PNVC programs are in 2018 and 2020, respectively.

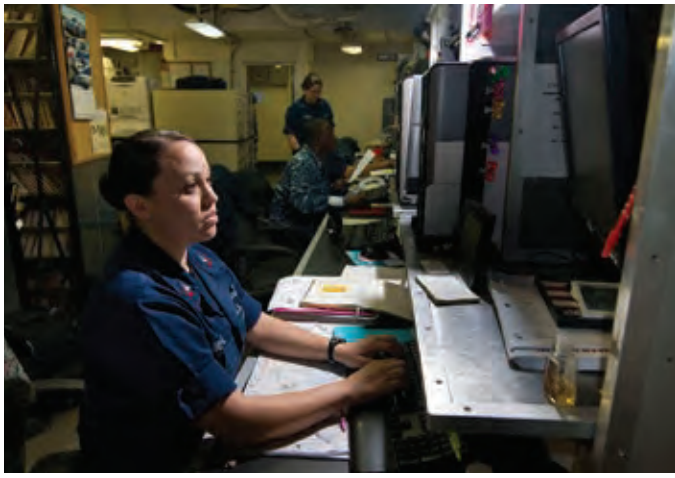
Developers

Boeing	Wichita, Kansas
Northrop Grumman	Herndon, Virginia
Rockwell Collins	Richardson, Texas

Enterprise Services

Description

Enterprise Services establishes Navy's enterprise-level information technology (IT) services that provide opportunities and enhance user capabilities to meet Navy needs while increasing security and achieving cost efficiencies. Enterprise Services provides the capabilities to manage and deliver the Navy's IT services centrally, enabling it to: reduce total ownership costs; promote information sharing and interoperability in the Department of the Navy (DoN) and Department of Defense (DoD); ensure compliance with DoD and congressional IT mandates; and significantly improve the Navy's information assurance (IA) posture. This allows seamless access to resources no matter where they connect to the Navy or DoD. Initial efforts in Enterprise Services focus on consolidating data centers, as well as establishing enterprise software licensing agreements. Managing services at the enterprise level provides an opportunity to eliminate stovepipe systems that do not communicate with each other and enhance the Navy warfighters' capability to access mission critical information. The



DoN has made significant progress eliminating legacy networks, servers, systems, applications, and duplicative data environments. These Enterprise Services will be leveraged across the DoN and joint partners to provide seamless connectivity to mission-critical information. Future technological demands warrant higher levels of interoperability with our joint partners and allies to achieve operational efficiency and success. Enterprise Services are critical enablers to help the DoN achieve information dominance, offering significant advantages operationally while enhancing our cyber security posture.

Status

The Navy is in the process of consolidating its data centers dispersed throughout the continental United States. The Navy Data Center Consolidation (DCC) initiative will leverage DoN, Space and Naval Warfare Systems Command, Defense Information Systems Agency, and commercial data centers to provide enterprise capabilities to satisfy system, application, and database hosting requirements for the Navy. The Navy is engaged in implementing various IT infrastructure modernization and cost savings consolidation initiatives in preparation for transitioning to the Joint Information Environment. In addition to DCC, the Navy is actively engaged in other IT efficiency efforts, including enterprise software licensing (ESL), Navy portal consolidation, and application rationalization. The Navy established enterprise service license agreements with major software manufacturers starting in FY 2012. ESL is a strategic effort to leverage the combined buying power of the Navy and Marine Corps to improve the DoN's IT/cyberspace investment decision practices by providing DoN enterprise-level evaluation and management.

Developers

Multiple sources.

Global Broadcast Service (GBS)

Description

The Global Broadcast Service is a military satellite communications (MILSATCOM) extension of the global information grid that provides worldwide, high-capacity, one-way transmission of voice, data, and video supporting fleet command centers and joint combat forces in garrison, in transit, and deployed to global crisis and combat zones. Specific products include unmanned aerial vehicle feeds, imagery, intelligence, missile-warning, weather, joint and service-unique news, education, training, video, and various other high-bandwidth services. GBS is a joint Acquisition Category (ACAT) 1 program overseen by the Air Force, and Navy GBS is an ACAT 3 program that aligns to joint development. GBS interfaces with other communications systems in order to relieve overburdened and saturated satellite networks and provide information services to previously unsupportable (due to low bandwidth) users. It provides fleet and strike group commanders the highest broadband data rate available afloat, up to 23.5 Mbps per channel on ultra-high-frequency follow-on (UFO) satellites and 45 Mbps with the Wideband Global SATCOM (WGS) constella-

tion. GBS also enables critical delivery of information products required to provide assured command and control in anti-access/area-denial environments.

Status

Navy GBS is fully deployed and is undergoing sustainment and improvement efforts. Installations include aircraft carriers, assault and command ships, submarines, and an increasing number of cruisers and destroyers. Architectural enhancements permit improved sharing and reallocation of broadcast coverage and bandwidth between users, information products, media types, and security levels. Worldwide SIPRNET (Secret Internet Protocol Router Network) Split Internet Protocol capability was established on all GBS-equipped platforms in FY 2011, enabling users to request real-time data via an alternate off-ship system for delivery via GBS and significantly enhancing the warfighter's situational awareness. Sustainment efforts include the upgrade of the Receive Broadcast Manager (RBM) GBS application software and the shift to a DVB-S2 transmission security-enabled broadcast architecture using a standardized joint modem to replace in-service integrated receiver decoders. Navy GBS is planning to award a follow-on production contract award for procurement of GBS below-deck RBM terminals for additional unit-level cruisers and destroyers and for all new-construction ships and submarines. All cruisers and destroyers will be equipped with GBS by FY 2021, with installations concurrent with the AN/WSC-9 Navy Multiband Terminal that will provide the antenna for GBS.

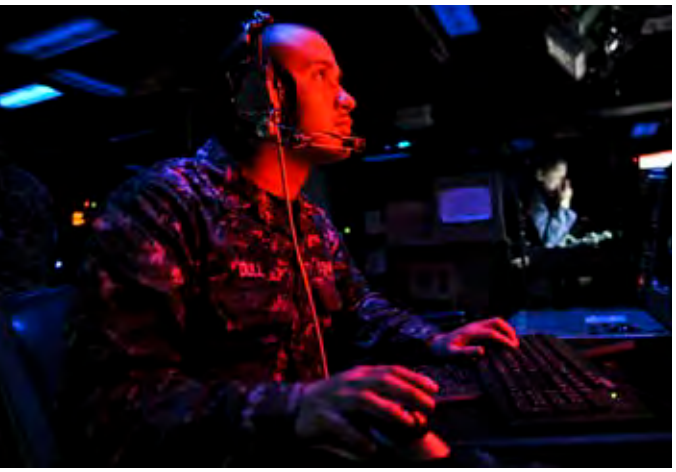
Developers

Raytheon	Reston, Virginia
Space and Naval Warfare Systems Command	
PEO C4I/PMW170	San Diego, California
USAF Space and Missile Systems Center	El Segundo, California

Global Command and Control System–Maritime (GCCS-M)

Description

Global Command and Control System-Maritime is the maritime implementation of the Department of Defense GCCS family of systems. It supports decision making at all echelons of command with a single, integrated, scalable C4I (command, control, communications, computers, and intelligence) system. The C4I system fuses, correlates, filters, maintains, and displays location and attribute information on friendly, hostile, and neutral land, sea, and air forces, integrated with available intelligence and environmental information. It operates in near real-time and constantly updates unit positions and other situational-awareness data. GCCS-M also records data in databases and maintains a history of changes to those records. System users can then use the data to construct relevant tactical pictures using maps, charts, topography overlays, oceanographic overlays, meteorological overlays, imagery, and all-source intelligence information coordinated into a common



operational picture that can be shared locally and with other sites. Navy commanders review and evaluate the general tactical situation, plan actions and operations, direct forces, synchronize tactical movements, and integrate force maneuver with firepower. The system operates in a variety of environments and supports joint, coalition, allied, and multinational forces. GCCS-M is implemented afloat and at select ashore fixed command centers.

Status

The GCCS-M program is designated an Acquisition Category IAC evolutionary acquisition program, with development and implementation progressing in increments. The acquisition strategy calls for each GCCS-M increment (major release) to proceed through acquisition milestone reviews prior to fielding. The program is operating in two simultaneous acquisition increments: Increment 1 (GCCS-M Version 4.0 and prior) is in deployment/sustainment; and Increment 2 (GCCS-M Version 4.1) completed a fielding decision review (FDR) on August 16, 2011, resulting in authorization of full fielding of Increment 2 force-level (e.g., aircraft carriers) and unit-level (e.g., guided-missile cruiser) configurations. The Increment 2 group-level configuration is in the testing phase, with an operational test completed in June 2014 and an FDR planned for FY 2015. GCCS-M includes efforts necessary to ensure synchronization and interoperability with the GCCS family of systems.

Developers

Space and Naval Warfare Systems Command — San Diego, California

Information Systems Security Program (ISSP)

Description

The Navy's Information Systems Security Program (ISSP) ensures protection of Navy and joint cyberspace systems from exploitation and attack. Products and capabilities are provided through development, testing, certification, procurement, installation, and lifecycle support of network and host-based security products and systems. ISSP includes: Computer Network Defense (CND); Communication Security (COMSEC)/Cryptography (Crypto); Electronic Key Management System (EKMS)/Key Management Infrastructure (KMI); Public Key Infrastructure (PKI); and Information Assurance (IA) Services/Engineering. Cyberspace systems include wired and wireless telecommunications systems, information technology systems, and content processed, stored, or transmitted. The ISSP includes protection of the Navy's national security systems and provides for procurement of secure communications equipment for Navy ships, shore sites, and aircraft, and Marine Corps and Coast Guard assets. This program also provides cybersecurity capabilities to protect information systems from unauthorized access or unauthorized modification and against the denial of service to authorized users. Cybersecurity programs comprise a layered protection strategy using commercial off-the-shelf and government off-the-shelf hardware and soft-

ware products that collectively provide multiple levels of security mechanisms to detect and react to intrusions and assure the confidentiality and integrity of information. Cybersecurity is critical in protecting our ability to wage network-centric warfare; as such, this program supports the entire naval cyberspace domain that includes mobile forward-deployed subscriber, supporting shore information infrastructure, and interconnection with other cyberspace domains. Effective cybersecurity capabilities are critical to supporting information dominance activities and must evolve quickly to meet rapidly evolving advanced threats and new vulnerabilities. The Navy's ISSP will continue to provide tools, technology, cryptographic equipment, security products, operations, people, and services in alignment with the Department of Defense Cyber Defense Program.

Status

The Navy ISSP is a collection of related abbreviated acquisition programs and projects that provide the full spectrum of cybersecurity capabilities. These programs are in various phases of the acquisition process, from concept development through capability sustainment. The ISSP provides Navy warfighters the essential information trust characteristics of availability, confidentiality, integrity, authentication, and non-repudiation. CND Increment 2 reached initial operational capability (IOC) in FY 2012 and is scheduled to reach full operational capability (FOC) by FY 2026. KMI reached IOC in FY 2013, with FOC scheduled for FY 2018. The Tactical Key Loader (TKL) reached IOC in FY 2013, with FOC in FY 2014. VINSON/ANDVT (Advanced Narrowband Digital Voice Terminal) Crypto Modernization (VACM) is planned to reach IOC in FY 2015, with FOC estimated for FY 2022.

Developers

Naval Research Laboratory	Washington, D.C.
Northrop Grumman	Los Angeles, California
Raytheon	Torrance, California
Space and Naval Warfare Systems Command	
Systems Center Atlantic	Charleston, South Carolina

Integrated Broadcast Service/ Joint Tactical Terminal (IBS/JTT)

Description

The Integrated Broadcast Service is an integrated, interactive dissemination system that provides Navy commanders and forces with real-time/near-real-time all-source, multiple-intelligence, intelligence, information, and data allowing for continuous prior-to-mission execution; indications and warning, strategic and threat warning/intelligence, tactical warning and intelligence, time-sensitive targeting, and situational awareness during mission execution; and post-mission assessment and analysis. Legacy IBS will migrate into the Joint Service IBS Common Interactive Broadcast (CIB) waveform incorporating the Common Message Format (CMF). The IBS will send data via communications paths

such as ultra-high frequency SATCOM and networks over super-high-frequency, extremely high-frequency, and Global Broadcast Service. The Joint Tactical Terminal (JTT) is a multi-channel transmit and receive radio with onboard capabilities to encrypt/decrypt, filter, process, and translate the IBS data for shipboard use on tactical data processors. The in-service fleet inventory of JTT-Maritime systems is being upgraded to implement the CIB waveform and CMF, and demand assigned multiple access integrated waveform capabilities for improved bandwidth use.

Status

The Navy commenced initial shipboard installations of JTT in FY 2001, and 104 JTT-M systems have been fielded as of the end of CY 2014. In order to support the addition of new ships requiring access to near-real-time over-the-air IBS special intelligence, the Navy contracted with Raytheon Space and Airborne Systems to reopen the JTT-Senior production line. This multi-year indefinite delivery/indefinite quantity contract for new JTT-Senior IBS terminals will meet increasing fleet, Aegis ballistic missile defense, and Aegis Ashore requirements beginning in FY 2012. The transition to the next-generation Common Interactive Broadcast services began in FY 2013 with the installation of JTT Upgrade Kits for legacy systems, procured from Raytheon via a joint-service contract.

Developers

IBS: L-3 Communications	Fairfax, Virginia
JTT: Raytheon Systems	St. Petersburg, Florida

Maritime Operations Center (MOC)

Description

Navy Maritime Operations Centers are a warfighting capability of the Navy component commander (NCC) and numbered fleet commander (NFC), organized, trained, manned, and equipped to support commanders' decision-making and set conditions for operational command and control (C2) of naval, joint, interagency, and combined forces. MOCs ensure the Navy's C2 capabilities at the operational level are manned by individuals proficient in joint and naval operational-level staff processes and equipped to provide globally networked, standardized, scalable, and flexible capability across the spectrum of conflict. MOCs provide organizational consistency, scalability, and flexibility to transition between various command roles, and enhanced global networking among Navy-maritime organizations. The MOC construct sustains effective, agile, networked, and scalable staffs, employing a standardized system of command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) systems, in accordance with common doctrine and processes. Each MOC supports its NCC/NFC tasked with command and control of Navy and joint forces in joint, interagency, and combined roles. The global network and standardized Core Baseline with Mission Build (CB/MB) systems and applications that enable both reach-back and load sharing between MOCs. Education provided via the Maritime Staff Operators Course provides foundational knowl-

edge in joint and naval operational-level processes and prepares personnel to perform Navy operational-level MOC functions. Training and assist teams from U.S. Fleet Forces Command and the Naval War College provide MOCs with on-site training and assessment and share best practices in order to maintain proficiency in and ability to execute critical staff processes.

Status

Eight Navy operational level headquarters at nine locations are equipped with the initial MOC CBMB material baseline. Key MOC baseline systems hardware and software capabilities have been fielded to U.S. Fleet Forces Command, Pacific Fleet, Third Fleet, Naval Forces Southern Command/Fourth Fleet, Naval Forces Central Command/Fifth Fleet, Naval Forces Europe/Africa/Sixth Fleet (ashore and afloat), Seventh Fleet, and Fleet Cyber Command/Tenth Fleet. Systems fielded to these MOC locations include the Combined Enterprise Regional Information Exchange System-Maritime, Air Defense System Integrator and Link Monitoring and Management Tool, Radiant Mercury, Maritime Integrated Air and Missile Defense Planning System, Command and Control Battle Management and Communications System, Command and Control Personal Computer, Distributed Common Ground System-Navy, Joint Automated Deep Operations Coordination System, Theater Battle Management Core System, and Global Command and Control System-Joint. Support and program wholeness depend on multiple suppliers, joint and Navy programs of record across several interconnected requirements and resource seams.

Developers

DRS	Tinker AFB Oklahoma
Rockwell Collins	Richardson, Texas

Maritime Tactical Command and Control (MTC2)

Description

Maritime Tactical Command and Control is the next generation maritime command and control (C2) software-only solution and the follow-on to the Global Command and Control System - Maritime (GCCS-M) program of record. It provides tactical C2 capabilities and maritime unique operational level of war capabilities not supported by the joint C2 effort. MTC2 will leverage the Integrated Shipboard Network System (ISNS), Consolidated Afloat Networks Enterprise Services (CANES), Afloat Core Services (ACS), Next-Generation Enterprise Network (NGEN), and the Navy Tactical Cloud (NTC). MTC2 will retain capability of GCCS-M 4.1 system while ultimately providing a suite of C2 maritime applications as part of an Application Store concept that enables enhanced situational awareness, planning, execution, monitoring, and assessment of unit mission tasking and requirements. MTC2 will greatly expand the scope of C2 functions across all Navy echelons, from the Maritime Operations Center level to maritime tactical units, afloat and ashore.

Status

MTC2 completed an analysis of alternatives in the third quarter of FY 2013, with the recommendation to satisfy maritime C2 requirements, as defined in the MTC2 Initial Capabilities Document, with the addition of leveraging NTC as an expanded data source. In FY 2014, MTC2 was directed to realign the development and implementation strategy to field in alignment with CANES, Distributed Common Ground System-Navy Inc.2, and Naval Integrated Tactical Environmental System Next (NITES NEXT). Program Executive Officer Command, Control, Communications, Computers, and Intelligence (PEO C4I) is preparing to execute an initial build decision for Release 1 in FY 2016 and expects formal approval as a program of record.

Developers

Space and Naval Warfare
Systems Center, Pacific — San Diego, California

Mobile User Objective System (MUOS)

Description

The Mobile User Objective System is a next-generation narrowband tactical communications system that improves communications for U.S. forces on the move. The Navy is responsible for providing narrowband satellite communication for the Department of Defense (DoD). Each Service is responsible for procurement of MUOS-capable terminals. In addition to providing reliable communication for all branches of the U.S. military, Navy-delivered space-based narrowband capability provided by MUOS also supports reliable worldwide coverage for national emergency assistance, disaster response, and humanitarian relief when these missions are properly equipped and operated within the bounds of information-assurance policies.

MUOS satellites have a legacy ultra-high-frequency (UHF) payload that provides replacement capability similar to legacy UHF satellites, as well as a new MUOS wideband code division multiple access (WCDMA) payload that will provide a significant improvement to the number of simultaneous voice and data services required to meet growing warfighter needs.

The MUOS constellation will consist of five geo-synchronous satellites, one of which will be an on-orbit spare. The system also includes four ground stations strategically located and interconnected around the globe to provide worldwide coverage and the ability to connect users to DSN (Defense Switch Network), NIPRNET (Non-secure Internet Protocol), and SIPRNET (Secret Internet Protocol Router Network) services. The ground system transports data, manages the worldwide network, and controls the satellites.

The MUOS design leverages commercial technology, providing worldwide netted, point-to-point, and broadcast services of voice, video, and data. Target users are unified commands and joint task force components, DoD and non-DoD agency mobile users who

required communications on the move, and allied and coalition legacy users. Legacy narrowband communication system users have to be stationary with an antenna up and pointed toward a satellite. MUOS will provide more than ten times the worldwide capacity and allow the warfighter to move around the battlespace while communicating.

Status

MUOS was designated a DoD major acquisition program in September 2004. Key decision point Milestone C occurred in August 2006, and build approval was granted in February 2008. The first satellite was launched in February 2012 and was accepted for initial operational use supporting legacy terminal users in November 2012. The second satellite was launched in July 2013 and is on orbit and available for tasking. Remaining MUOS satellites are on contract and in production, with two launches scheduled for 2015. After completion of Multi-Service Operational Test and Evaluation-2, projected to conclude by December 2015, MUOS will provide military users simultaneous voice, video, and data capability by leveraging 3G-mobile communications technology. The MUOS constellation is expected to achieve full operational capability in FY 2017, extending narrowband availability beyond 2028.

Developers

Boeing	El Segundo, California
General Dynamics	Scottsdale, Arizona
Lockheed Martin	Sunnyvale, California

Navy Air Operations Command and Control (NAOC2)

Description

Navy Air Operations Command and Control program provides task force commanders the ability to plan, disseminate, monitor, and execute theater air battles. NAOC2 capability is provided by the Theater Battle Management Core Systems (TBMCS). TBMCS is an Air Force Acquisition Category III program of record with joint interest. TBMCS is integrated and fielded to enable the air planner to produce the joint air tasking order and air space control order, which give afloat battle staffs and maritime operations centers the capability to lead, monitor, and direct the activities of assigned or attached forces during large-scale combined joint service operations with a joint force air and space component commander (JFACC).

Status

TBMCS 1.1.3 is in the operations and sustainment phase. Software and security upgrades are fielded as they become available. The NAOC2 program is integrated and tested within the Navy operational environment for fielding to force-level ships (e.g., aircraft carriers, amphibious assault ships, and command ships), maritime operations centers, and selected training sites. The Air Force's Command and Control Air and Space Operations Suite and Command Control and Information Services programs of record

will replace TBMCS. The Air Force will develop these programs in a service-oriented architecture environment, and the Navy will migrate into these programs, which will reside in the Consolidated Afloat Networks and Enterprise Services environment.

Developers

Lockheed Martin — Colorado Springs, Colorado

Space and Naval Warfare Systems Command

SPAWAR Systems Center Pacific — San Diego, California

Navy Multi-band Terminal (NMT)

Description

The Navy Multi-band Terminal is the Navy's primary means of transporting a variety of protected and wideband command, control, and communications (C3) application data (e.g., secure voice, imagery, data, and fleet broadcast systems). It is replacing the USC-38/Follow-on Terminal (FOT) and the WSC-6 super-high-frequency satellite communications (SHF SATCOM) terminals on Navy ships, submarines, and shore stations. It provides access to new MILSATCOM-protected and wideband services provided by the Advanced EHF and Wideband Global SATCOM (WGS) satellites. It also expands number of users and offers increased protected and wideband throughput. NMT enhances space resiliency with improved protected SATCOM capabilities and an alternate anti-jam path through the addition of an SHF wideband anti-jam modem to the program. It is a key element of the Navy's mitigation of anti-access/area-denial environment concerns and is an enabler of the ballistic missile defense mission.

The NMT is more reliable with a 22 percent greater designed reliability requirement than predecessor systems. A completely redesigned user interface will make operator use easier with 85 percent fewer operator terminal interactions. The terminal lowers fleet operating cost by reducing number of parts and terminal footprint onboard ships. NMT-equipped units will be able to access military EHF and SHF SATCOM satellites, including protected SATCOM services available on Advanced EHF, Milstar, EHF payloads on board ultra-high-frequency follow-on satellites, and interim polar EHF payloads. It provides wideband service using the Wideband Global Service and Defense Satellite Communications System satellites. Three international partners—Canada, the Netherlands, and the United Kingdom—are procuring a variant of the NMT. In addition, the Department of Defense Teleport and Enhanced Polar SATCOM system programs have procured NMTs to provide fleet units with shore reach-back capabilities.

Status

On November 8, 2012, NMT entered full-rate production status. In the first three years of production, 127 of an objective 250 terminals have been placed under contract. Installations began in February 2012 with 39 ship, submarine, and shore installations completed as of August 2014.

Developers
Raytheon Marlborough, Massachusetts

Network Tactical Common Data Link (NTCDL)

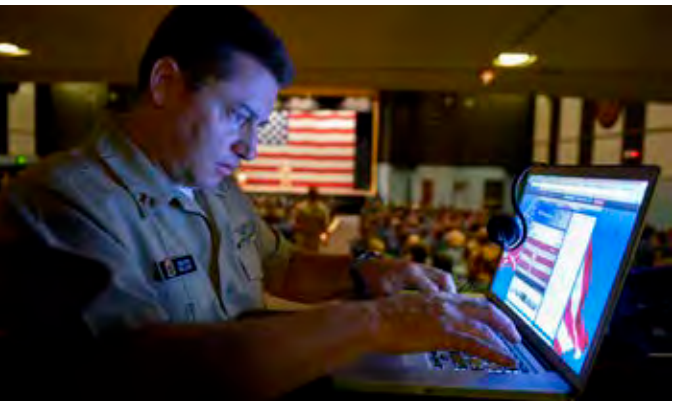
Description
Navy Common Data Link systems on force-level ships (e.g., aircraft carriers and amphibious assault ships) include the Network Tactical Common Data Link and its predecessor, the Communications Data Link System (CDLS), with Hawklink on unit-level ships (e.g., cruisers and destroyers) and other configurations on Littoral Combat Ships. NTCDL provides the ability to transmit/receive real-time intelligence, surveillance, and reconnaissance (ISR) data simultaneously from multiple sources (air, surface, subsurface, and man-portable) and exchange command and control information (voice, data, imagery, and full-motion video) across dissimilar joint, service, coalition, and civil networks. NTCDL provides warfighters the capability to support multiple, simultaneous, networked operations with in-service Common Data Link (CDL)-equipped aircraft (e.g., F/A-18 *Hornet*, P-3 *Orion*, and MH-60R *Seahawk*) in addition to next-generation manned and unmanned platforms (e.g., *Poseidon*, *Triton*, Unmanned Carrier-Launched Airborne Surveillance and Strike vehicle, Small Tactical Unmanned Aircraft Systems, and *Fire Scout*).

NTCDL is a tiered capability providing modular, scalable, multiple-link networked communications. NTCDL benefits the Fleet by providing horizon extension for line-of-sight sensor systems for use in time-critical strike missions, supports anti-access/area-denial (A2/AD) requirements through relay capability, and supports Tasking Collection Processing Exploitation Dissemination (TCPED) via its ISR networking capability. NTCDL will support multi-simultaneous CDL missions; provide capability for ship-ship, ship-air and air-air communication; facilitate download of ISR information to multiple surface commands (ship/shore); support A2/AD portfolio for unmanned aerial vehicles; and support TCPED architecture. NTCDL also supports humanitarian-assistance/disaster-relief efforts through its ability to share ISR data across dissimilar joint, service, coalition, and civil organizations.

Status
In December 2010, the Chief of Naval Operations directed a solution to address the Navy's requirement for multi-simultaneous CDL mission support within the future years defense plan. The task was to replace the existing single, point-to-point shipboard CDLS with a multi-point networking system to support ISR transport. Initial investment in 2013 stood up the NTCDL program of record and funded the requirement for NTCDL on board aircraft carriers, with initial operational capability planned for 2019. Future investments will fund requirement for large-deck amphibious ships and develop multi-link NTCDL to meet requirements for use on aircraft, smaller ships, submarines, and shore-based handheld users and mobile platforms.

Developers

BAE	London, United Kingdom
Cubic	San Diego, California
Harris Corporation	Melbourne, Florida
L3 Communications	New York, New York,



Next-Generation Enterprise Network (NGEN)

Description

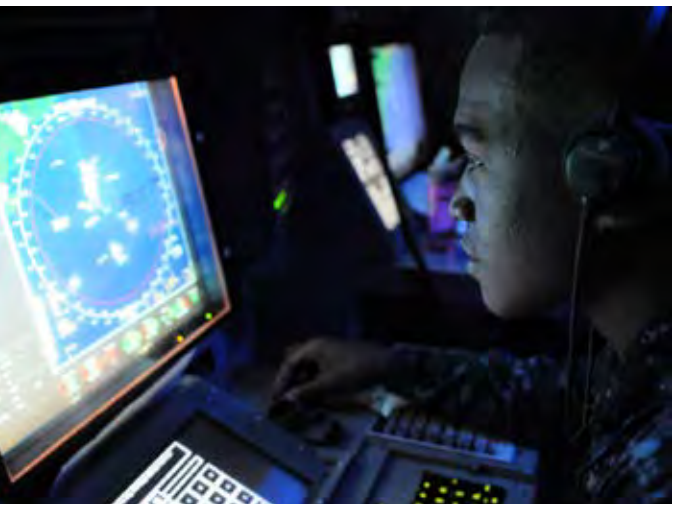
The Next-Generation Enterprise Network is a Department of the Navy (DoN) enterprise network program that supports user access to protected voice, video, and data services over continental U.S. Navy ashore unclassified and classified networks. NGEN will provide the acquisition framework for secure net-centric data and information technology services to the Navy and Marine Corps similar to the program/system under the Navy Marine Corps Intranet (NMCI) Continuity of Services Contract (CoSC). NGEN changes the previous contractor- owned/contractor-operated paradigm under NMCI CoSC, to a government-owned/contractor-operated program for Navy, with the Navy assuming command and control of the network with enhanced information assurance.

Status

The NGEN contract was awarded in June 2013; the contract award was protested July 2013; and the protest was denied/award upheld at the end of October 2013. The NMCI CoSC provided NMCI services through September 30, 2014. The Navy transitioned to NGEN services on October 1, 2014, and final transition achieved in December 2014.

Developers

HP Enterprise Services	Plato, Texas



OCONUS Navy Enterprise Network (ONE-NET)

Description

The outside of the continental United States (OCONUS) Navy Enterprise Network (ONE-NET) provides the manpower and administration services to operate the Base Level Information Infrastructure (BLII) architecture, a fully integrated and interoperable network that consists of standard hardware, software, and information-assurance suites governed by operational and administrative policies and procedures. ONE-NET is the OCONUS equivalent to the Navy's CONUS-based Enterprise Services and is the medium that enables the rapid and reliable transfer of official classified and unclassified messages, collaboration, e-mail, and data. ONE-NET manpower provides information technology operations including e-mail, print, storage, directory, and Internet services, as well as help desk and enterprise management for approximately 28,000 seats, delivering vast performance and security improvements compared to legacy networks. ONE-NET manages the enterprise through three Theater Network Operation and Security Centers (TNOSCs) at Yokosuka, Japan; Naples, Italy;

and Bahrain; in addition to 11 Local Network Support Centers (LNSCs) within their respective regions.

Status

The program provides IT services to approximately 28,000 BLII/ONE-NET seats, supporting approximately 51,000 forward-deployed OCONUS Navy users. Fleet Cyber Command operates the three TNOSCs and 11 LNSCs servicing ONE-NET customers. The network is operated and maintained by a blended workforce of active duty, civilian, and contractor personnel. This program is expected to transition into the Next-Generation Enterprise Network contract no later than early FY 2017. This merger will realize cost savings associated with a centrally funded and managed program, and reduce costs associated with multiple program management functions and service providers.

Developers

Computer Sciences Corporation Falls Church, Virginia

Submarine Communications Equipment

Description

The goal of the Submarine Communications Equipment program is to create a common, automated, open-system architecture radio room for all submarine classes. The program provides for the procurement and installation of systems incorporating the technical advances of network centric warfare to allow the submarine force to communicate as part of the strike group. It addresses the unique demands of submarine communications, obsolescence issues, and higher data rate requirements and includes two elements: common submarine radio room (CSRR) and submarine antennas.

CSRR is a network-centric communications gateway that supports interoperable communications and information dominance between on-board subsystems, external platforms, and land-based communications facilities and is interoperable with the planned Department of Defense (DoD) infrastructure. CSRR comprises an open-architecture hardware and software approach for integrating government-off-the-shelf, commercial-off-the-shelf, and non-developmental item hardware and application specific software into a common, centrally managed architecture. CSRR leverages existing Navy and DoD C4I (command, control, communications, computers, and intelligence) capability-based acquisition programs. CSRR allows common systems, software, and equipment to be installed on all submarine classes, use of common logistics products across all submarine classes, and the uniform training of personnel across all submarine classes, resulting in new capability at a reduced cost.

The submarine antennas programs support the development and sustainment of antennas designed to withstand the underwater environment. These antennas cover the frequency spectrum from very-low-frequency to optical. Programs in the develop-

ment phase include OE-538 Increment II Multi-function Mast, Submarine High-Data-Rate (SubHDR) antenna, and Advanced High-Data-Rate (AdvHDR) antenna. The improvements to the OE-538 Multi-Function Mast antenna support Mobile User Objective System (MUOS), Link-16, Global Positioning System Anti-Jam, and Iridium capabilities. The improvement to the SubHDR antenna is an improved radome and shock hardening. AdvHDR is to replace the SubHDR antenna, providing improved bandwidth.

Status

CSRR Increment I Version 3 began fielding in FY 2011 and is scheduled to complete in FY 2018. OE-538 Increment II is scheduled for a Milestone C decision in July 2015. SubHDR radome replacement began fielding in FY 2014. AdvHDR is scheduled for a technology demonstration in January 2015.

Developers

Lockheed Martin	Eagan, Minnesota
Lockheed Martin Sippican	Marion, Massachusetts
Naval Undersea Warfare Center	Newport, Rhode Island
Space and Naval Warfare Systems Center	San Diego, California

Super-High-Frequency Satellite Communications (SHF SATCOMS)

Description

The Super-High-Frequency Satellite Communications program includes: the WSC-6(V) 5, 7, and 9 terminals; the X-Band Kit Upgrade to the Extremely-High-Frequency Follow-On Terminal installed on submarines; and the Enhanced Bandwidth Efficient Modem (EBEM) installed on surface ships. The SHF SATCOM WSC-6 terminal is the primary SATCOM terminal in the Fleet, providing the bandwidth for voice, video, data, and imagery requirements for the warfighter, including NIPRNET (Non-secure Internet Protocol), SIPRNET (Secret Internet Protocol Router Network), JWICS (Joint Worldwide Intelligence Communications System), JCA (Joint Concentrator Architecture), video teleconferencing, and telephones. These SHF system terminals have been in the Fleet since the early 1990s and are in sustainment. The Navy Multiband Terminal WSC-9 began replacing the WSC-6 terminal in FY 2012.

Status

Program is in sustainment with 133 AN/WSC-6(V) terminals operational in the Fleet.

Developers

WSC-6(V) 5, 7: Raytheon	Marlborough, Massachusetts
WSC-6(V) 9: Harris	Melbourne, Florida
X-Band Kit Upgrade: Raytheon	Marlborough, Massachusetts

Tactical Messaging

Description

Command and Control Official Information Exchange (C2OIX) provides the Navy with organizational messaging services and interfaces with the worldwide Department of Defense (DoD) consumers, such as tactical deployed users, designated federal government organizations, and foreign allies. C2OIX Afloat consists of the Navy Modular Automated Communications System (NAVMACS), a shipboard message processing system that guards broadcast channels and provides the only General Service (GENSER) Top Secret level communications path on and off the ship. C2OIX Shore provides the shore-messaging infrastructure via C2OIX Version 1.x at the Naval Computer and Telecommunications Area Master Stations.

Status

The C2OIX project combined the Tactical Messaging (ACAT IVT) and the Defense Message System (DMS) (ACAT IVM) into a single service life extension project (SLEP) supporting all Navy messaging requirements, providing organizational C2 messages to shore, afloat and mobile Navy users. Afloat component NAVMACS II is in the operations and sustainment phase to technically refresh all shipboard systems that lack support and adherence to in-place cyber security requirements. Shore components are in the operations and sustainment phase and C2OIX v1.0.2 is fielded on three enclaves (NIPR, SIPR and TA) at NCTAMS PAC and NCTAMS LANT. C2OIX v2.0 will be installed at NCTAMS PAC and NCTAMS LANT on all three enclaves in FY 2015.

Developers

General Dynamics	Taunton, Massachusetts
Scientific Research Corporation	Charleston, South Carolina

Tactical Mobile (TacMobile)

Description

The Navy Tactical Mobile program provides systems to support maritime commanders with the capability to plan, direct, and control the tactical operations of maritime patrol and reconnaissance forces (MPRF), joint and naval expeditionary forces, and other assigned units within their respective areas of responsibility. The TacMobile systems that support these missions are Tactical Operations Centers (TOCs) and Mobile Tactical Operations centers (MTOCS). TOCs and MTOCs provide MPRF and aircraft (MPRA) operational support ashore at main operating bases, primary deployment sites and forward-operating bases that is similar to support provided on board an aircraft carrier to embarked tactical air wings. Support includes persistent situational operational and tactical awareness, MPRA pre-mission coordination and planning, mission and target briefings, tactical in-flight support, post-mission analysis of collected sensor data, data dissemination, and feedback to aircraft sensor operators and supported commanders. Services provided include: analysis

and correlation of diverse sensor information; data management support; command decision aids; data communication; mission planning, evaluation, and dissemination of surveillance data; and threat alerts to operational users ashore and afloat. As advances in sensor technology are fielded on MPRF/MPRA, TOC and MTOC sensor analysis equipment will evolve to support the new sensor capabilities.

Status

TacMobile Increment 2.1 full-rate production and fielding were authorized in November 2012 to field new capabilities incorporating P-8A *Poseidon* Multi-mission Maritime Aircraft mission support, applications and systems interfaces as well as critical communications upgrades needed for TOCs and MTOCs to support P-8A intelligence surveillance and reconnaissance operations. Increment 2.1 achieved initial operational capability in October 2013 and will reach full operational capability in FY 2016.

Development is ongoing, and fielding is commencing to support P-8A Increment 2 engineering change proposals and MQ-4C *Triton* Unmanned Aircraft System to achieve more efficient information flow across the Navy's sensor grid through implementation of tactical service-oriented architecture enabled by the global information grid. Joint Capabilities Integration and Development System documentation will identify requirements for Increment 3 to support P-8A and MQ-4C multi-intelligence-upgrade.

Developers

Northrop Grumman	Hollywood, Maryland
Science Applications International Corporation	Charleston, South Carolina
Space and Naval Warfare Systems Center Atlantic	Charleston, South Carolina

Telephony

Description

The Navy's Shore Telephony program is a component of unified capabilities (UC) that procures and installs fully integrated, interoperable, information assurance-certified voice and video systems, and peripherals in support of the Defense Switch Network (DSN). In-service Telephony systems consist of time division multiplex (TDM) legacy switches. In the near future, these switches will be replaced with Internet Protocol (IP)-capable switches through the IP Trunking Modernization Project that meets Federal Communications Commission (FCC) and Navy

shore telephony requirements. These IP-capable switches will be hybrid solutions that will service TDM systems and facilitate connectivity to Public Switched Telephone Network, Navy Marine Corps Intranet, and outside the continental United States (OCONUS) Navy Enterprise Network. Telephony is in compliance with Public Law, FCC regulatory requirements, and Chairman Joint Chiefs of Staff, Department of Defense, and Department of the Navy mandates.

Specific Telephony capabilities include the following:

- Voice (Analog, Digital) Integrated Services Digital Network
- Voice over Internet Protocol (VoIP)
- Conferencing, voicemail and call centers
- Telephony Management System
- Tactical Voice over Secure Internet Protocol, classified tactical Video Teleconferencing over Secure IP (VTCoIP), and dial-up data services to customers ashore and afloat
- C2 voice communications to the Navy warfighter, including Multi-Level Precedence and Preemption
- Telecommunications engineering support for Base Communications Office locations
- C2 shore-to-ship dial tone (Plain Old Telephone Service) and pier side lines via tactical networks and infrastructure

Telephony suite replacement and modernization funding ensures that all telephony equipment under Navy's purview in the CONUS and OCONUS are replaced in accordance with industry life-cycle standards, and that software is upgraded in a systemic manner to ensure compatibility with DoD and commercial telephone systems. Technology insertions and upgrades of FCC/C10F-owned switches (approximately 153 CONUS/OCONUS) are in progress.

Status

Telephony is replacing legacy TDM switches with VoIP technology in response to TDM technology obsolescence. As Telephony capabilities migrate to VoIP and VTCoIP, they will become increasingly reliant on Navy Enterprise Services.

Developers

Space and Naval Warfare Systems Command

PEO C4I	San Diego, California
PMW790	San Diego, California

BATTLESPACE AWARENESS

Airborne ASW Intelligence

Description

Airborne anti-submarine warfare intelligence (AAI) is responsible for 70 percent of the U.S. Navy's acoustic intelligence collections, 100 percent of active target strength measurement (ATSM) collections, and 100 percent of electromagnetic collections. Additionally, AAI enables environmental characterization as well as rapid prototyping and deployment of advanced ASW capabilities. AAI products provide input to the Navy's tactical ASW decision aids, oceanographic prediction models, strategic simulations, fleet ASW training, and the development of future ASW sensors. The program additionally supports emergent and special ASW operations. In-service AAI collection platforms include the P-3C *Orion*, P-8A *Poseidon*, and SH-60B *Seahawk* helicopters. AAI will also be incorporated on board the MH-60R helicopters. AAI provides rapid turn-around of tactical intelligence products to theater ASW commanders for inclusion into tactical decision aids and for all ASW engineering disciplines for performance improvements and development of next-generation ASW weapons systems.

Status

The Airborne ASW intelligence program maintains calibration of 11 P-8A *Poseidon* systems and 12 adjunct recorders for SH-60B helicopters in support of acoustic collections. The program modified nine P-3Cs and 12 SH-60Bs in FY 2014 in preparation of squadron forward deployments to Fifth, Sixth, and Seventh Fleet areas of responsibility. The program is recapitalizing the Navy underwater active "multiple-ping" family of sonobuoys that enables calibrated measurement of threat submarines for the improvement of ASW modeling, simulations, and weapons systems that use active sonar emissions.

In FY 2015, the program will design, develop, and conduct engineering analysis for certification of the Acoustic Intelligence Collection Suite (ACINT ACS) to be used on board P-8A, P-3C, and other aircraft of opportunity as a quick-reaction collection capability. AAI will analyze the MH-60R acoustic system to determine opportunities for platform certification. The program will continue to make improvements to the tactical acoustic processing system used to conduct detailed analysis and mission reconstruction of collected acoustic intelligence data against real-world submarines.

Developers

EAGLE Systems	Lexington Park, Maryland
ERAPSCO	Columbia City, Indiana
General Scientific Corporation	Lexington Park, Maryland

EP-3E *ARIES II* Spiral 3

Description

The EP-3E *ARIES II* aircraft is the Navy's manned airborne intelligence, surveillance, reconnaissance, and targeting (AISR&T) platform supporting naval and joint commanders. EP-3Es provide long-range, high-endurance support to carrier strike groups and amphibious readiness groups, in addition to performing independent maritime operations. The 2015 force consists of one active-duty squadron based at Naval Air Station Whidbey Island, Washington. Although optimized for the maritime and littoral environments, capability upgrades have ensured EP-3E mission effectiveness in support of global contingency operations. The fusion of Internet Protocol (IP) connectivity, the incorporation of imagery intelligence capability, and completion of significant signals intelligence (SIGINT) upgrades enables continued alignment with the Intelligence Community and the early implementation of a distributed SIGINT concept of operations. Multi-INT sensors, robust communication and data links, and employment on the flexible and dependable P-3C *Orion* aircraft ensure effective AISR&T support to conventional and non-conventional warfare forces across the range of military operations. With the EP-3E scheduled for retirement in FY 2020, the Navy is focused on sustainment and modernization to pace emerging threats until transitioning the capabilities across the spectrum of manned and unmanned platforms.

Status

EP-3E aircraft are being sustained through a series of special structural inspections (SSIs) and replacement of outer wing assemblies (OWAs). SSIs and OWAs provide the inspections and repairs necessary to ensure safety of flight until more comprehensive maintenance can be performed. The pre-emptive modification and replacement of critical structural components allows up to 7,000 additional flight hours. These programs ensure sustainment of the EP-3E fleet until the capability is recapitalized across the spectrum of manned and unmanned platforms.

The EP-3E Joint Airborne SIGINT Architecture Modification Common Configuration (JCC) program accelerates the introduction of advanced capabilities to the AISR&T fleet. The resultant program aligns mission systems to meet the challenges of rapidly emerging threat technology and addresses obsolescence issues.

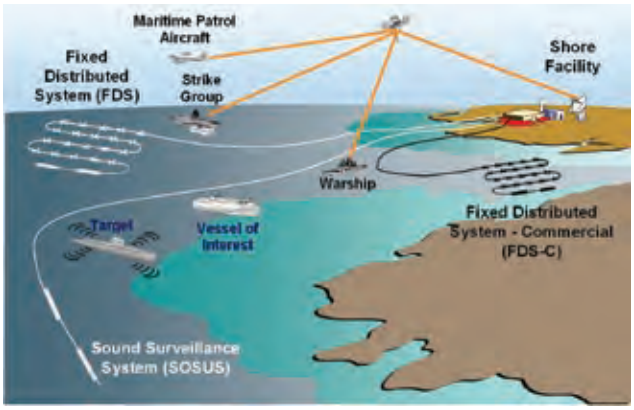
Spiral developments have modernized the aircraft systems, which include capabilities for an IP-based, sensitive compartmented information network, improved electronic intelligence and communication intelligence collection, multi-platform geo-location, advanced special signals collection, and quick-reaction capabilities developed for overseas contingency operations. The aircraft is also equipped with forward-looking infrared and remote reach-back capabilities. Recapitalization capabilities migration will allow continued development of the EP-3E and vital testing of equipment

designed for use in the next generation of intelligence, surveillance, reconnaissance, and targeting platforms.

The JCC Spiral 3 upgrade enables the EP-3E to pace the enemy threat by providing faster, more precise geo-location capability for better precision targeting, indications and warning, and direct threat warning that can match rapidly developing threat technology. The first JCC Spiral 3 aircraft was delivered to the Fleet in the summer 2011. Three of these aircraft deployed in FY 2014.

Developers

Aeronixs	Melbourne, Florida
Argon	Fairfax, Virginia
L3 Communications	Waco, Texas
Ticom Geomatics	Austin, Texas



Fixed Surveillance Systems (FSS)

Description

The Fixed Surveillance Systems program consists of the Sound Surveillance System (SOSUS), the Fixed Distributed System (FDS), and the FDS-Commercial (FDS-C), a commercial off-the-shelf (COTS) version of FDS. FSS provides threat location information to tactical forces and contributes to an accurate operational maritime picture for the joint force commander. FSS comprises a series of arrays deployed on the ocean floor in deep-ocean areas and strategic locations. Due to its long in-situ lifetime, it provides indications and warning of hostile maritime activity before conflicts begin. The system consists of two segments: the integrated common processor (ICP), which handles the processing, display, and communication functions; and the underwater segment, which consists of SOSUS, a long array of hydrophones, and FDS or FDS-C. FSS leverages advances made in the commercial industry to provide a more cost-effective FDS caliber system to meet the Fleet's ongoing needs for long-term undersea surveillance.

Status

ICP technical refreshes are installed as required to provide increased operator efficiency, functionality, and savings in logistics support and software maintenance.

Developers

Multiple sources.

Large Displacement Unmanned Undersea Vehicle (LDUUV)

Description

The Large Displacement Unmanned Undersea Vehicle will provide a robust, long endurance, persistent, multi-mission, unmanned undersea vehicle capability for the Navy. Like all unmanned systems, LDUUV will provide near 100 percent combat

support without human limitations while expanding the undersea forces' operating envelope. LDUUV will complement and augment manned undersea platforms by conducting "dull, dirty, dangerous, and distant" operations, freeing up manned platforms to perform higher-complexity missions. LDUUV will be integrated with manned platforms as well as fixed and mobile distributed netted sensor systems. Surface and subsurface platforms will launch and recover the LDUUV. LDUUV leverages the research and development efforts by the Office of Naval Research (ONR) LDUUV Innovative Naval Prototype (INP) Program that started in FY 2011.

Status

The LDUUV completed Milestone A in the fall of 2014, after the service capability development document and concept of operations were approved. In 2015, program efforts will focus on technology maturation and risk reduction. The Navy will achieve an early operational capability in FY 2017 by converting three ONR LDUUV INP vehicles into user operational evaluation systems to begin development of tactics, techniques and procedures. LDUUV initial operational capability is expected in FY 2022.

Developers

To be determined.

MQ-4C *Triton* Unmanned Aircraft System (UAS) [Formerly Broad-Area Maritime Surveillance (BAMS) UAS]

Description

The MQ-4C *Triton* UAS is a key element in the recapitalization of Navy's maritime patrol and reconnaissance force (MPRF) airborne intelligence, surveillance, and reconnaissance (ISR) capability. *Triton* will be a force multiplier for joint force and fleet commanders, enhancing their situational awareness and shortening the sensor-to-shooter kill chain by providing a multiple-sensor, persistent maritime ISR capability. *Triton*'s persistent-sensor dwell and ability to network its data, deliver a capability that will enable the MPRF family of systems to meet the Navy's maritime ISR requirements. A single Triton orbit provides continuous surveillance capability at a maximum mission radius of 2,000 nautical miles for a minimum of 24 hours. At full operational capability, the system will provide up to five simultaneous orbits worldwide.

Status

The *Triton* UAS achieved Milestone B in April 2008. The system design document delivered in August 2008, and the Gate 6 review completed on August 6, 2012. *Triton*'s first flight occurred on May 23, 2013, and initial envelope-expansion flights were completed in March 2014. Sensor integration will begin in early FY 2015 at Naval Air Station Patuxent River, Maryland.

Milestone C is expected in the first quarter FY 2016, and initial operational capability is planned for FY 2018.

Developers

Exelis	Baltimore, Maryland
L3COM	Salt Lake, Utah
Northrop Grumman	Bethpage, New York
Rolls Royce	Indianapolis, Indiana

MQ-8B/C *Fire Scout* Vertical Takeoff and Landing Tactical UAV (VTUAV) System

Description

The MQ-8B/C *Fire Scout* Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle System is a component of the Navy's airborne intelligence, surveillance, and reconnaissance (ISR) family of systems. The MQ-8 provides day and night real-time ISR target acquisition—using the Brite Star II turret electro-optical/infrared/laser designator-range finder payload—along with other modular mission-specific payloads for voice communications relay, and battlefield management support to the tactical commander. With two variants (B and C), *Fire Scout* can operate at a maximum range of up to 150 nautical miles with an endurance of some 12 hours, depending on payload, environment, and air vehicle variant. The VTUAV System comprises one or more air vehicles, a mission control station, UAV common automatic recovery system, tactical common data link, and tactical control system software interface for operator control of the air vehicle. Dual-qualified (MH-60R/S helicopter and MQ-8 VTUAV) members of an aviation detachment from the expeditionary rotary-wing communities operate and maintain the system.

The system will conduct launch, recovery, and mission command and-control functions from the Littoral Combat Ship (LCS) or any suitably equipped air-capable ship; it can also be flown from sites ashore to support land-based expeditionary operations. *Fire Scout* will complement the LCS surface warfare and mine countermeasures mission modules of the LCS or other surface platforms. Additionally, the air vehicle's open architecture will accommodate modular payloads and facilitate integrating future capabilities to support other warfare areas as technologies mature.

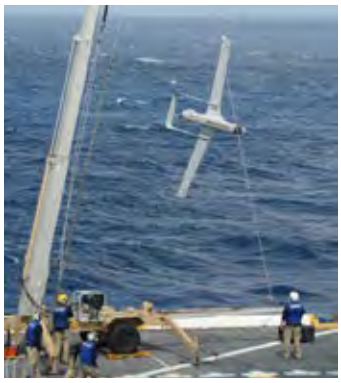
Status

The Navy terminated production of the MQ-8B in FY 2011 in favor of a more capable airframe. The decision to terminate MQ-8B production was in response to a joint emergent operational need and payload, range, and endurance upgrades to the Bell 407 (MQ-8C) platform to replace the Schweizer 333-based model (MQ-8B). Flight-testing the MQ-8C began in October 2013 in preparation for its fleet introduction. Additionally, integration and developmental testing of radar and an advanced precision-kill systems continue. Through FY 2014, *Fire Scout* has completed ten deployments on board *Oliver Hazard Perry* (FFG 7)-class frigates. The Navy "clocked" more than 14,000 total flight hours for the program prior to its deployment on board the USS Fort Worth (LCS 3) in the first quarter of FY 2015.

Developers

Bell Helicopter	Ozark, Alabama
Northrop Grumman	San Diego, California
Raytheon	Falls Church, Virginia
Sikorsky Aircraft Corporation	Stratford, Connecticut

RQ-21 *Blackjack* Small Tactical Unmanned Air System (STUAS)



Description

The *Blackjack* system is an asset organic to Navy Special Warfare, Navy Expeditionary Combat Command, and *Whidbey Island* (LSD 41)-class ships to provide tactical intelligence, surveillance, and reconnaissance capability. *Blackjack* vehicles are equipped with electro-optic/infrared sensors, laser range finders and illuminators, automatic identification system, and a communications relay. A system consists of five air vehicles, one (ship) or two (shore ground) control stations, launch and recovery system, spare parts, and government furnished equipment. The RQ-21 *Blackjack* is a 75-pound/16-foot wingspan vehicle (135 pounds fully loaded) capable of some 15 hours endurance at 55 knots and greater than 15,000 feet altitude.

Status

Initial operational capability is expected in the second quarter FY 2015.

Developers

HoodTech	Hood River, Oregon
Insitu, Inc.	Bingen, Washington
Northwest UAV Propulsion Systems	Portland, Oregon
Quatro Composites	Poway, California

Unmanned Carrier-Launched Airborne Surveillance and Strike (UCLASS) System

Description

In FY 2009, the Office of the Chief of Naval Operations Power Projection from the Sea Capabilities-Based Assessment identified gaps in persistent sea-based intelligence, surveillance, and reconnaissance (ISR) with precision strike across the entire range of military operations. Concurrently, the Combatant Commander Integrated Priority Lists identified a high-priority need for additional ISR. The Navy identified funding in FY 2012 to begin development of a carrier-based, unmanned air system (UAS) to provide ISR with precision strike capability to close these gaps. The UCLASS System will operate from all *Nimitz* (CVN 68)-class and eventually *Ford* (CVN 78)-class carriers, enhancing ship versatility through integration of four to eight UAVs into a carrier air wing, enabling "24/7" ISR, targeting, strike, bomb-damage assessment, and other naval missions in support of the carrier strike group and combatant commanders. The UCLASS System comprises an air vehicle segment (airframe, ISR payloads, mission

systems, and weapons integration), a control and connectivity segment, and a carrier integration segment. The UCLASS system will include incremental growth capability designed in up-front. The UCLASS system will interface with existing shipboard and land-based processing, exploitation, and dissemination systems and leverage emerging programs to include Consolidated Afloat Networks Enterprise System, Navy Tactical Common Data Link, Automated Digital Network System, and Joint Precision Approach and Landing System. The scope of the UCLASS effort includes design, development, integration, test, and training. The acquisition program will be structured with the goal of delivering an early operational capability in 2020.

Status

The Navy endorsed the program baseline in May 2011. Later that year, the Joint Requirements Oversight Council approved the UCLASS initial capabilities document. Subsequently, the Undersecretary of Defense for Acquisition, Technology, and Logistics authorized the UCLASS program for entry into the materiel solutions analysis phase. The UCLASS analysis of alternatives (AoA) completed in May 2012 and was approved by the Navy Resources and Requirements Review Board. The AoA was reviewed by the Office of the Secretary of Defense and determined that it was sufficient. The Navy approved the UCLASS service-level capabilities development document in April 2013, endorsing the UCLASS draft system concept of operations and the technology development strategy. In April 2014, the Navy released the draft request for proposal (RFP) and plans to release the final RFP for the air vehicle system in FY 2015. The carrier integration and control system and connectivity segments continue to progress on schedule and initial shipboard hull/mechanical/electrical modifications are slated for late FY 2015.

Developers

To be determined.

Unmanned Combat Aircraft System Demonstration (UCAS-D)

Description

The Navy Unmanned Combat Air System Demonstration program evolved from the Joint Navy/Air Force (Joint Unmanned Combat Aircraft System Demonstration) J-UCAS development program. Program management and associated technologies were transferred to the Navy in August 2006. The UCAS-D program uses a low-observable X-47B platform to demonstrate unmanned carrier operations and will advance the associated technologies in support of potential follow-on unmanned acquisition programs. These efforts include maturing technologies for actual aircraft carrier catapult launches and arrested landings, deck operations, as well as autonomous operations in carrier-controlled airspace. Autonomous air refueling demonstrations are also part of the technology maturation program. The UCAS-D air vehicles will not be operational, as they do not include any mission systems, sensors or weapons.

Status

Northrop Grumman Systems Corporation was awarded the UCAS-D contract in August 2007. The Navy conducted surrogate aircraft flights in the vicinity of aircraft carriers in 2009 and 2010 and completed the first six, fully autonomous carrier-arrested landings by an F/A-18 *Hornet* surrogate aircraft in July 2011. The program transitioned from Edwards Air Force Base to Naval Air Station (NAS) Patuxent River, Maryland, and conducted the first flight of the X-47B at PaxRiver in July 2012. Shore-based carrier suitability testing was initiated in the fall of 2012 as surrogate aircraft continued to demonstrate successful autonomous operations in the carrier-controlled airspace. The X-47B was hoisted on board the USS Harry S. Truman (CVN 75) in December 2012 and successfully executed a variety of aircraft carrier deck operations. The X-47B completed shore-based catapult and precision landing testing in early 2013. On May 4, 2013, the X-47B completed the first shore-based arrested landing at NAS Patuxent River.

On May 14, 2013 an X-47B successfully catapulted from the USS George H. W. Bush (CVN 77) for a flight back to Patuxent River. On May 17 2013, the X-47B flew from Patuxent River to the ship and executed the first carrier "touch-and-go" by an unmanned air vehicle. Following more shore-based arrestment testing, X-47B made the first carrier-based arrested landing by a fully autonomous unmanned air vehicle on July 10, 2013, marking a key event in the history of U.S. Navy carrier aviation.

Carrier history was re-made on August 17, 2014 when the X-47B and F/A-18s from Air Test and Evaluation Squadron Twenty Three conducted integrated carrier operations. This was the first time manned and unmanned aircraft conducted sequential carrier operations at sea. UCAS-D serves as an essential risk-reduction effort to achieve the appropriate technology readiness level for transition of technologies to the Unmanned Carrier-Launched Airborne Surveillance and Strike System. UCAS-D risk-mitigation flight-testing will continue until late FY 2015 when the program is expected to "sundown."

Developers

Aeronixs	Melbourne, Florida
Northrop Grumman Systems Corporation	El Segundo, California
Schweizer Aircraft Corporation	Big Flats, New York
Ticom Geomatics	Austin, Texas

UQQ-2 Surveillance Towed Array Sensor System (SURTASS)

Description

The UQQ-2 Surveillance Towed Array Sensor System consists of a fleet of five ships that provide passive detection of nuclear and diesel-electric powered submarines, and real-time reporting to theater commanders and operational units. SURTASS employs the TL-29A twin-line acoustic towed array, which offers passive detection capability for undersea surveillance operations in both deep-ocean and shallow-water littoral environments using directional noise rejection and a bearing ambiguity resolution capability.

Status

Five SURTASS vessels are operational in the Pacific Fleet. All have TL-29A twin-line arrays and have been upgraded with the integrated common processor (ICP), which will result in increased operator proficiency, functionality, and savings in logistics support and software maintenance. Technical refreshes to ICP hardware will be installed to meet future requirements.

Developers

Lockheed Martin	Manassas, Virginia
	Syracuse, New York

WQT-2 Surveillance Towed Array Sensor System (SURTASS)/Low Frequency Active (LFA)

Description

The Low Frequency Active system is the active adjunct to the Surveillance Towed Array Sensor System sonar system. LFA consists of a vertical source array with active transducers, power amplifiers, and an array-handling system. The LFA transmit array is deployed through the center well hatches of T-AGOS oceanographic survey ships. It uses the SURTASS passive array as the receiver and is capable of long-range detections of submarine and surface ship contacts. A mobile system, SURTASS LFA can be employed as a force-protection sensor wherever the force commander directs, including forward operating areas or in support of carrier strike group and amphibious ready group operations.

Status

One LFA array system is installed on board the USNS Impeccable (T-AGOS 23). The Compact LFA (CLFA) system, employing smaller and lighter sources, has been installed on the USNS Victorious (T-AGOS 19), USNS Able (T-AGOS 20), and USNS Effective (T-AGOS 21). Technical refreshes to the integrated common processor are installed to maintain increased operator proficiency and functionality.

Developers

BAE Systems	Manchester, New Hampshire
Lockheed Martin	Manassas, Virginia

INTEGRATED FIRES

Advanced Tactical Data Link Systems (ATDLS)

Description

The ATDLS program provides tactical data link (TDL) command and control for U.S. forces, allies, and coalition partners in accordance with the Joint Tactical Data Enterprise Services Migration Plan (JTMP). ATDLS sustains and improves existing networks while developing future networks. Joint TDLs (Link 11, Link 16, and Link 22) include terminals, gateways, networks, and support initiatives that improve connectivity, interoperability, training, and support. Link 16 is the Department of Defense's (DoD) primary TDL implemented to most TDL-capable platforms and some munitions for specific applications. Link 22 is a multinational development effort replacing Link 11 with a more suitable high-frequency protocol using a message format similar to Link 16. Terminals include the Joint Tactical Information Distribution System (JTIDS) and Multi-functional Information Distribution System (MIDS), which provide a Link 16 capability for C2 of aircraft, ships, and ground sites. Gateways include the Command and Control Processor (C2P), the Air Defense System Integrator (ADSI), and the Link Monitoring and Management Tool (LMMT).

MIDS-Low Volume Terminal (MIDS-LVT) is a joint and multinational cooperative program to develop, produce, and sustain a successor terminal to JTIDS and is the most widely employed Link-16 terminal. The United States serves as MIDS-LVT program leader, with France, Germany, Italy, and Spain as full partners. Dynamic Network Management (DNM) increases Link 16 network efficiency and reconfiguration flexibility.

MIDS Joint Tactical Radio System (JTRS) is an engineering change proposal of the MIDS-LVT and is fully interoperable with JTIDS and MIDS-LVT providing Link-16, tactical air navigation (TACAN), J-series messages, voice, and three channels for future scalability.

C2P is a TDL communication processor associated with host combat systems, such as Aegis or the Ship Self-Defense System (SSDS). The in-service system (often called the Next-Generation C2P) provides extended-range capabilities and improved operator interfaces through an incremental approach for capability enhancements and technology refresh. C2P is adding Link 22 capability through its next major upgrade.

Common Data Link Management System (CDLMS) is the engineering at the heart of the C2P system and integrates components to monitor multi-TDL networks simultaneously.

ADSI is a time-sensitive tactical C2, commercial off-the-shelf system providing for processing and display of multiple TDL interfaces, data forwarding, and TDL information to the Global Command and Control System–Maritime (GCCS-M).

LMMT is a network monitoring management and communications system to meet emerging Maritime Operations Center

(MOC) C2 multi-mission TDL requirements and address the shortcomings of existing systems such as ADSI.

Status

JTIDS/MIDS on Ships (MOS): Planned updates to JTIDS/MOS terminals will satisfy National Security Agency (NSA) cryptographic modernization and DoD/DoT frequency remapping mandates with an initial operational capability (IOC) planned for FY 2018. Program management and acquisition authority for JTIDS/MOS is under the Link 16 Network Program.

DNM: Time Slot Reallocation (TSR) achieved IOC on ships in the C2P and JTIDS programs in FY 2007. TSR fielded on E-2C, EA-6B, and H-60 aircraft in FY 2009, and is scheduled to field on other joint platforms such as E-3 and E-8. DNM achieved Milestone C in 2014 and is scheduled for full deployment decision review/IOC in FY 2016, and FOC in FY 2018.

MIDS-LVT: the program entered the engineering, management, and development (EMD) phase in December 1993. MIDS was approved for low-rate initial production (LRIP) in FY 2000 and reached IOC on the F/A-18C/D *Hornet* in FY 2003. Within the Navy, MIDS is being procured from FY 2012 through FY 2017 for F/A- 18 C/D/E/F, E/A-18/G, MH-60R/S, and CH-53K aircraft. MIDS-LVTs will be updated to the Block Upgrade 2 (BU2) configuration commencing in FY 2017. MIDS LVT BU2 will incorporate crypto modernization (CM), frequency remapping (FR), and enhanced throughput (ET) to maintain system viability and address NSA and DoD/DoT mandates. As of the end of 2014, more than 9,725 MIDS-LVTs had been delivered or were on contract, and integrated in 76 platforms of the five partners (France, Germany, Italy, Spain, and the United States) and 36 foreign military sales customer nations.

MIDS JTRS: MIDS JTRS completed operational testing on its lead platform, the F/A-18E/F *Super Hornet*, in the second quarter of FY 2012. The F/A-18 initial operational test and evaluation report assessed MIDS JTRS as operationally effective and suitable with minor deficiencies for fleet deployment. MIDS JTRS received full production and fielding approval in 2QFY 2012, with IOC for the F/A-18E/F in the fourth quarter of FY 2012. MIDS JTRS is deployed on six operational and three F/A-18 training squadrons. MIDS JTRS Block Cycle 1 (BC1) was awarded in FY 2011. BC1 configuration includes Crypto Modernization upgrades to fully comply with NSA mandates. BC1 retrofits will be available in FY 2014. MIDS JTRS Block Cycle 2 (BC2) was awarded in second quarter of FY 2013. BC2 will incorporate Dynamic Network Management, Relative Navigation, and specific MIDS-On-Ship (MOS) platform requirements into MIDS JTRS. To support From The Air (FTA) Naval Integrated Fire Control-Counter Air (NIFC-CA), the Navy funded MIDS JTRS improvements including Four Nets Concurrent Multi-Netting with Concurrent Contention Receive (CMN-4) and Tactical Targeting Network Technology (TTNT). CMN-4 full development and TTNT technology development were both awarded the fourth quarter of FY 2013. TTNT SD&D contract awarded on 21 Aug 2014. CMN-4 increases Link-16 network

capacity by allowing better use of the Link-16 network. CMN-4 is fully interoperable with non-CMN-4 Link-16 platforms. TTNT complements Link-16 and meets emerging networking requirements that Link-16 cannot fulfill. TTNT will enable IP capability in an airborne environment for tactical aircraft. MIDS JTRS CMN-4 limited production and fielding and retrofits are planned for FY 2016 with full production starting in FY 2017. MIDS JTRS TTNT limited production is planned for FY 2018 with production in FY 2019.

C2P: C2P Legacy, C2P Rehost, and C2P Increment 1 have completed fielding and are in the operations and support phase. C2P Increment 2 achieved full rate production in July 2008, and will achieve full operational capability and transition to the operations and sustainment phase by FY 2016 as per the in-service shipboard architecture upgrade plan. C2P Increment 3 began development in FY 2013.

North Atlantic Treaty Organization (NATO) Improved Link Eleven (NILE): NILE partner countries have fielded Link-22 on a limited number of ships and shore sites. Link-22 capability will be implemented in NGC2P as Increment 3, with development work having commenced in FY 2013 and IOC planned for FY 2019.

ADSI: ADSI Version 14 is in fielding. ADSI Version 15 testing is complete and limited fielding commenced in FY 2014. The program intends to supplement/replace certain ADSI systems with the Link Monitoring and Management Tool capability.

Developers

Data Link Solutions	Wayne, New Jersey
Northrop Grumman	San Diego, California
ViaSat	Carlsbad, California

Airborne Electronic Attack (AEA) Next-Generation Jammer (NGJ)

Description

The Next-Generation Jammer is the replacement for the ALQ-99 Tactical Jamming System (TJS). Fielded in 1971, ALQ-99 is the only airborne tactical jamming system in the Department of Defense inventory. ALQ-99 is facing material and technological obsolescence and cannot counter all current, much less future, threats. The NGJ will provide significantly improved jamming capabilities with an open-system architecture that will support software and hardware updates to rapidly counter a wide variety of technically complex systems. It will be a full-spectrum jammer, developed in increments, and will initially be fielded on the EA-18G *Growler*. NGJ will be the prime contributor for the airborne electronic attack mission.

Status

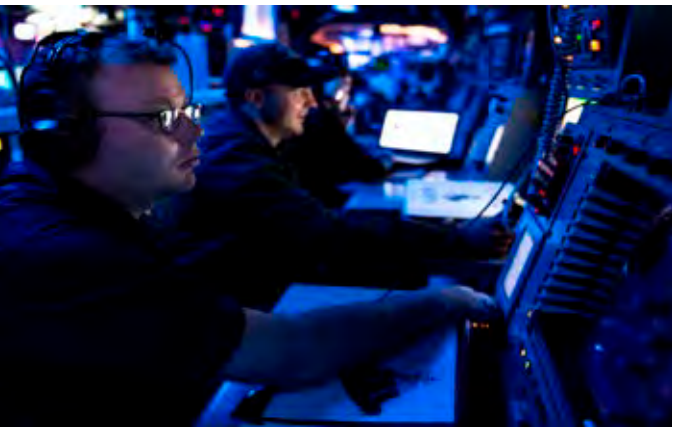
The Navy awarded the 22-month technology development (TD) contract in July 2013. A post-contract award protest delayed start

of execution of the TD contract to January 2014, resulting in a shift in the schedule. The TD period of performance was revised to 25 months, and the overall impact to the program is an initial operational capability shift to FY 2021.

Developers

Boeing (Platform Prime)	St. Louis, Missouri
Raytheon (Pod Prime)	El Segundo, California

Cooperative Engagement Capability (CEC)



Description

CEC provides improved battle force air-defense capabilities by integrating sensor data of each cooperating ship, aircraft, and ground station into a single, real-time, fire-control-quality, composite track picture. CEC is a critical pillar of the Naval Integrated Fire Control-Counter Air (NIFC-CA) capability and will provide a significant contribution to the Joint Integrated Fire Control (JIFC) operational architecture. CEC interfaces the weapons and sensor capabilities of each CEC-equipped ship and aircraft in the strike group, as well as ground mobile units in support of integrated engagement capability. By simultaneously distributing sensor data on airborne threats to each ship within a strike group, CEC extends the range at which a ship can engage hostile tracks to beyond the radar horizon, significantly improving area, local, and self-defense capabilities. CEC enables a strike group or joint task force to act as a single, geographically distributed combat system. CEC provides the Fleet with greater defense in-depth and the mutual support required to confront evolving threats of anti-ship cruise missiles and theater ballistic missiles.

Status

In April 2002, the Defense Acquisition Board approved full rate production for CEC (USG-2) shipboard and low rate initial production for E-2C *Hawkeye* (USG-3) airborne equipment sets. In September 2003, the Defense Department approved FY 2004/2005 follow-on production for the USG-3 and full rate production in April 2014 for the airborne version. There are 160 CEC installations (89 ships, 39 aircraft, eight Army aerostats, ten Marine Corps Composite Tracking Networks and 14 land-based test sites) as of September 2014. Total future CEC installation is planned for 261 ships, aircraft, and land units. Successful Navy Integrated Fire Control-Counter Air From the Sea (NIFC-CA FTS) live-fire testing was completed at the White Sands Missile Range and on board the USS Chancellorsville (CG 62). Live NIFC-CA FTS testing is scheduled to continue with approximately one event every six-to-nine months, through FY 2022.

Developers

Johns Hopkins University Applied Physics Laboratory	Laurel, Maryland
Raytheon Systems Company	St. Petersburg, Florida
Sechan Electronics Inc.	Lititz, Pennsylvania

Distributed Common Ground System-Navy (DCGS-N)

Description

Distributed Common Ground System–Navy is the Navy component of the Department of Defense (DoD) DCGS family of systems. It is the Naval Service's primary intelligence, surveillance, reconnaissance, and targeting (ISR&T) support system, and provides processing, exploitation, and dissemination services at the operational and tactical levels of war. DCGS-N operates at the secret and sensitive compartmented information (SCI) security levels. DCGS-N makes maximum use of commercial-off-the-shelf (COTS) and mature government-off-the-shelf (GOTS) hardware and software along with joint services software, tools, and standards to provide a scalable, modular, extensible multi-source capability that is interoperable with the other service and agency DCGS systems.

Increment 1 (INC 1). In 2007, the DCGS-N program realigned to the Consolidated Afloat Networks and Enterprise Services (CANES) Common Computing Environment/Agile Core Services architecture. DCGS-N Increment 1 replaces all legacy Joint Service Imagery Processing System-Navy and SCI Global Command and Control Maritime systems. The DCGS-N INC 1 Block 2 capability will be hosted by CANES and provide users with an integrated ISR suite.

Increment 2 (INC 2). INC 2 will provide an enterprise solution to fulfill specific capability gaps, to include: the ability to integrate and automate all-source fusion and analysis capabilities, enhance Tasking, Collection, Processing, Exploitation, and Dissemination (TCPED) capabilities via automation of workflow processes, and sustain and enhance Maritime Domain Awareness capabilities. INC 2 will share information across commands, services, and agencies to improve situational awareness in accordance with emerging Joint Information Environment and Intelligence Community Information Technology Enterprise concepts. DCGS-N INC 2 will be a robust, integrated ISR&T capability which is a scalable, modular, and extensible multi-source capability and interoperable with Navy and Joint ISR, sensor and infrastructure capabilities.

DCGS-N INC 2 will leverage CANES on afloat force-level ships and select ashore locations to combine ISR capabilities into a federated, integrated Information Dominance enterprise. Ashore, DCGS-N INC 2 will allow maritime operations centers and other intelligence organizations the ability to collaborate in the exploitation, analysis, production, and dissemination of intelligence at the ashore Enterprise Node. The Enterprise Node will provide an all-source cross-cueing capability that improves the workflow automation for TCPED for Navy Intelligence analysts. Additionally, DCGS-N INC 2 will provide all-source exploitation afloat and fuse organic TCPED with maritime pattern of life intelligence produced by strategic and theater intelligence production organizations to address time sensitive, dynamic tactical planning, and execution decisions afloat.

Intelligence Carry-On Program (ICOP). The ICOP fulfills fleet requirements and urgent operational needs for a subset of DCGS-N intelligence capabilities on Navy unit-level ships. The ICOP suite includes an integrated 3-D operational display of intelligence and other data sources to provide a complete picture of the battlespace. The system supports a full-motion video receive, process, exploit, and disseminate capability as well as the ability to process and correlate electronic intelligence and communications externals. It integrates mature COTS and GOTS applications with shared storage and communication paths to reach back to the DCGS-N Enterprise Node and national ISR systems, making the tactical user a part of the larger ISR enterprise. The ICOP prototype received positive feedback from fleet users and won both the Department of Navy Acquisition Excellence Award for Technology Transition and the Office for Naval Research Rapid Technology Transition Achievement Award.

Status

The DCGS-N installation plan includes aircraft carriers, large-deck amphibious assault ships, fleet command ships, intelligence training centers, schoolhouse facilities, and shore-based numbered fleet maritime operations centers. Increment One fielded 23 systems through FY 2013 and a total of 28 locations by the end of CY 2014. Increment Two is scheduled to test and field in FY 2017 as an enterprise node ashore, and it will subsequently replace all Increment One installations. ICOP development began in FY 2014 with delivery commencing in FY 2015.

Developers

BAE Systems — Rancho Bernardo, California

E-2C/D *Hawkeye* Airborne Early Warning Aircraft

Description

The E-2 *Hawkeye* is the Navy's airborne surveillance and battle management command and control (BMC2) platform, providing support of decisive power projection at sea and over land for the carrier strike group and joint force commanders. In addition to in-service capabilities, the E-2 has an extensive upgrade and development program to continue improving the capability of the aircraft.

The E-2C *Hawkeye* 2000, with the APS-145 radar, features a mission computer upgrade (MCU), cooperative engagement capability (CEC), improved electronic support measures, Link-16, global positioning system, and satellite data and voice capability. The MCU greatly improves weapons systems processing power, enabling incorporation of CEC. In turn, CEC-equipped *Hawkeye* 2000s significantly extends the engagement capability of air-defense warships. They are key to early cueing of the Aegis Weapons System, dramatically extending the lethal range of the Standard Missile.

The E-2D Advanced *Hawkeye*, with the APY-9 radar, is a two-generation leap in radar performance from the E-2C, which brings an improved over-the-horizon, overland, and littoral detection and tracking capability to the carrier strike group and joint force

commanders. The APY-9, coupled with CEC, Link-16, and the Advanced Tactical Data Link, fully integrates the E-2D Advanced *Hawkeye* into the joint integrated air and missile-defense (IAMD) role. The APY-9's advanced detection and tracking capability, in conjunction with Aegis and the upgraded Standard Missile, as well as the F/A-18 *Hornet* and its upgraded AIM-120 Advanced Medium Range Air-to-Air Missile (AMRAAM), will allow strike groups to deploy an organic, theater-wide air and cruise missile defense capability to protect high-priority areas and U.S. and coalition forces ashore and afloat. The E-2D is the key enabler for the naval integrated fire control-counter air (NIFC-CA) capability and will continue as the airborne "eyes" of the Fleet.

Status

As of August 2014, there were 52 E-2C aircraft in the Fleet and 14 E-2Ds had been delivered. The Navy signed a 25 aircraft multi-year procurement contract on June 30, 2014 covering fiscal year 2014 through FY 2018. The E-2D developmental test program and initial operational test and evaluation were completed in October 2012 and reported the E-2D as effective and suitable. The first fleet squadron completed transitioning to the E-2D in January 2014, achieved initial operational capability in October 2014, and is on track for deployment in early 2015.

Developers

Lockheed Martin	Syracuse, New York
Northrop Grumman	Melbourne, Florida
	St. Augustine, Florida

Joint Automated Deep Operations Coordination System (JADOCS)

Description

Joint Automated Deep Operations Coordination System is the principal tool for joint time-sensitive targeting (TST) and maritime dynamic targeting (MDT) collaboration, information sharing, targeting situational awareness plus command and control. JADOCS is an Army Acquisition Category (ACAT) III program of record with joint interest supporting TST/MDT fire-support management for Navy tactical- and operational-level forces, targeting coordination, and common operational picture capabilities.

Status

JADOCS is pre-Milestone C with an acquisition decision memorandum approved by the Army in April 2013. JADOCS is delivered to the Navy as a software-only capability. JADOCS 1.0.5 is in the operations and sustainment phase, with the stand-up of a Navy project office in FY 2014. JADOCS is tested within the Navy operational environment for fielding to force-level ships (e.g., aircraft carriers, amphibious assault ships, and command ships), maritime operations centers, and selected training sites. The Army is developing JADOCS 2.0 with additional capabilities that will be fielded to Navy sites when available in a Consolidated Afloat Networks and Enterprise Services environment.

Developers
Communications-Electronics Command Fort Sill, Oklahoma
Raytheon Waltham, Massachusetts

Joint Counter Radio-Controlled Improvised Explosive Device (RCIED) Electronic Warfare (JCREW)

Description
Improvised explosive devices (IEDs) continue to present a significant threat to U.S. and coalition forces throughout the world. The Counter Radio-Controlled IED Electronic Warfare (CREW) program encompasses mobile, man-portable, and fixed-site protection systems employed to counter IEDs that are either armed or initiated by radio signals. Fielded first- and second-generation CREW systems were acquired largely by non-developmental urgent operational need initiatives to address immediate warfighter requirements. Joint CREW (JCREW) is a Navy-led program to develop the next generation of joint-service CREW systems. JCREW will correct deficiencies in existing CREW systems and address emerging worldwide RCIED threats. Additionally, JCREW has an open architecture, facilitating the system's evolution as new threats, advances in technology, and new vehicle requirements are introduced.

Status
JCREW Increment 1 Block 1 (I1B1) program management remains with the Navy (Naval Sea Systems Command, PMS-408) through the program life cycle, integrating joint service requirements. Milestone C was approved 9 September 2014. The acquisition program baseline was approved October 5, 2014. The Navy and Air Force joint low-rate initial production contract is planned for award in July 2015. The Navy is responsible to upgrade JCREW techniques to defeat evolving global threats, and in early FY 2015 four potential technical insertions are in development.

Developers
Northrop Grumman Systems Corporation San Diego, California

Mk XIIA, Mode 5 Identification Friend or Foe (IFF) Combat ID

Description
The Mk XIIA Mode 5 Identification Friend or Foe (IFF) is a secure, real-time, cooperative "blue-force" combat identification system designed to inform commanders' "Shoot/No-Shoot" decisions. Advanced technology, coding, and cryptographic techniques are incorporated into IFF Mode 5 to provide reliable, secure, and improved performance. The Mode 5 waveform is defined in NATO Standardization Agreement 4193 and is compatible with all U.S. and international civil IFF requirements. This Navy Acquisition Category II program is based on the improved Mk XII Cooperative IFF Operational Requirements Document dated April 27,

2001. Transponders will be installed on more than 3,000 ships and Navy/Marine Corps aircraft. Mode 5 interrogator equipment will be fielded on aviation ships, air-capable ships, and selected aircraft, including MH-60R *Seahawk* helicopters, E-2D *Advanced Hawkeye*, F/A-18C/D/E/F *Hornet/Super Hornet*, and E/A-18G *Growler*.

Status

Navy initial operational capability and full-rate production were approved in 2012. Interoperability and valid IFF Mode 5 responses were demonstrated with E-2C, P-3C, MH-60R, and UH-1Y aircraft, DDG 51-class destroyers, and CG 47-class cruisers during Quest 13-01/Joint Operational Test Approach Event 2 in June 2013. The program is on track to meet the operational requirements specified in the joint full operational capability by 2020. Operational testing of the combined interrogator/transponder on the F/A-18E/F and EA-18G aircraft completed in 2014.

Developers

BAE Systems	Greenlawn New York
Boeing	St. Louis, Missouri
General Dynamics C4 Systems	Scottsdale, Arizona
Northrop Grumman	Woodland Hills, California

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 (ASCMs). The Nulka decoy employs a broadband radio frequency repeater mounted on a hovering rocket platform. After launch, the Nulka decoy radiates a large, ship-like radar cross-section and flies a trajectory that seduces incoming ASCMs away from their intended targets. Australia developed the hovering rocket, launcher, and launcher interface unit. The Navy developed the electronic payload and fire control system. The in-service Mk 36 Decoy Launching System (DLS) has been modified to support Nulka decoys and is designated the Mk 53 DLS.

Status

Nulka received Milestone C approval for full-rate production in January 1999. Installation began on U.S. and Australian warships in September 1999. The system is installed on U.S. Coast Guard cutters and more than 120 U.S. Navy ships. Installation on aircraft carriers began in the fourth quarter of FY 2013. Additional installations will continue throughout FY 2015.

Developers

BAE Systems	Edinburgh, Australia
Lockheed Martin Sippican	Marion, Massachusetts
Sechan Electronics Inc.	Lititz, Pennsylvania

SSQ-130 Ship Signal Exploitation Equipment (SSEE) Increment F

Description

The SSQ-130 SSEE Increment F is a shipboard combat systems suite that provides area commanders with automatic target acquisition, geo-location, and non-kinetic fires capabilities. SSEE Increment F incorporates counter-intelligence, surveillance, and reconnaissance (C-ISR) capabilities that improve situational awareness and enhances integrated fires. Additionally, SSEE delivers a unique cyber operations afloat capability. SSEE is an evolutionary acquisition program that takes good advantage of modular commercial-off-the-shelf/non-developmental technology, which allows the system to be easily reconfigured and respond rapidly to emergent tasking and evolving threats. SEEE's hardware and software are scalable and tailorable with respects to modernization, enabling the rapid insertion of new and emerging technologies with minimal integration efforts.

Status

SSEE Increment F entered full-rate production in July 2011, and 56 units will be delivered by FY 2018, with full operational capability estimated for FY 2021. At the start of FY 2015, 30 units had been delivered and 20 units completely installed.

Developers

Argon-ST / Boeing Company — Fairfax, Virginia

Surface Electronic Warfare Improvement Program (SEWIP)

Description

The Surface Electronic Warfare Improvement Program is an evolutionary development block upgrade program for the SLQ-32 electronic warfare system. In early FY 2014, 170 SLQ-32 systems are installed on Navy aircraft carriers, surface combatants, amphibious ships, and Coast Guard cutters. SEWIP was established as an Acquisition Category II program in July 2002 after cancellation of the Advanced Integrated Electronic Warfare System. Block 1A replaces the SLQ-32 processor with an electronic surveillance enhancement processor and the UYQ-70 display console. Block 1B also improves the human-machine interface of the SLQ-32 and adds specific emitter identification capability that provides platform identification. The high-gain, high-sensitivity receiver (Block 1B3) provides improved situational awareness through non-cooperative detection and identification of platforms beyond the radar horizon. Block 2 provides improvements to the electronic support receiver. Upgrades to the antenna, receiver, and combat system interface allow the SLQ-32 system to pace new threats; improve signal detection, measurement accuracies, and classification; and mitigate electromagnetic interference. Block 3 will provide improvements for the electronic attack transmitter by providing integrated countermeasures against radio frequency-guided threats and extending frequency range coverage. SEWIP will also cue Nulka decoy launch.

Status

The Navy awarded the SEWIP Block 2 development contract on September 30, 2009 and began delivery in 2014. Approximately 60 units are to be delivered within the future years defense plan. SEWIP Block 3's advanced, active-EA capabilities are in full development with a Milestone B decision in FY 2014. Block development completion and first procurement are expected in 2017, followed by first delivery in the 2018 timeframe.

Developers

General Dynamics Advanced Information Systems	Fairfax, Virginia
Lockheed Martin	Eagan, Minnesota
Northrop Grumman PRB Systems	Goleta, California

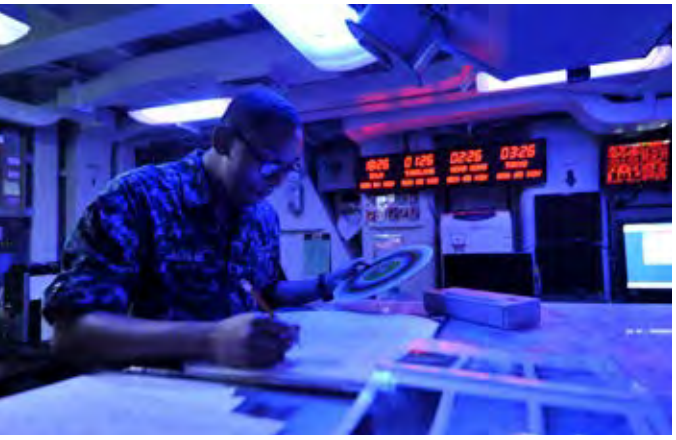
UYQ-100 Undersea Warfare Decision Support System (USW-DSS)

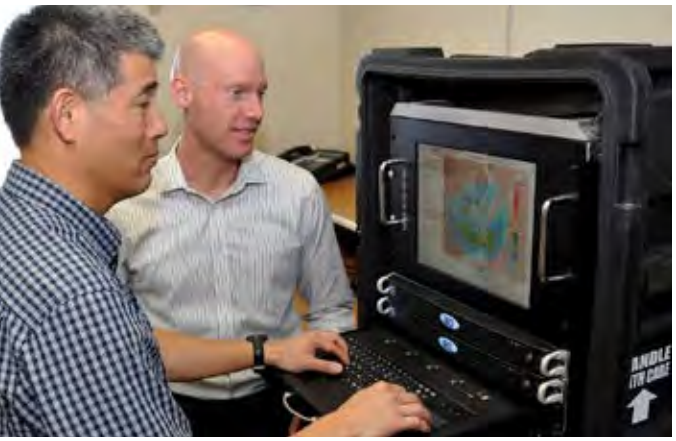
Description

The Undersea Warfare Decision Support System enables the anti-submarine warfare (ASW) commander (ASWC) to plan, coordinate, establish, and maintain an undersea common tactical picture and execute tactical control. Employing net-centric decision-making tools in an open-architecture framework, it enables near-real-time sharing of key ASW tactical data and shortens the ASW kill chain. USW-DSS complements and interfaces with common operational picture (COP) systems such as Global Command and Control System–Maritime and Link-11/16. The SQQ-89 surface ship sonar system on cruisers and destroyers provides ship, sensor and track data to USW-DSS. The Tactical Support Center provides these data on board aircraft carriers. These data sources enable USW-DSS to generate a shared composite track picture for situational awareness. Integrated decision support tools provide the sea combat commander, theater ASW commander, and ASWC the ability to plan, conduct, and coordinate USW operations across all ASW platforms. USW-DSS provides highly detailed visualization, integrated platform sensor and distributed combat systems, reduced data entry, improved sensor performance predictions, and data fusion while reducing redundancy of USW tactical decision aids.

Status

USW-DSS Build 2 Release 3 (B2R3) completed initial operational test and evaluation (IOT&E) in FY 2013. USW-DSS has been delivered to a total of 43 surface combatants, aircraft carriers, and shore commands. B2R3 fully leverages the Consolidated Afloat Networks and Enterprise Services hardware and software-computing environment by installing as software-only on ships. Initial operating capability was fielded in the first quarter of FY 2010. A B2R3 software update will commence (as a result of the completed IOT&E) in FY 2015. B2R3 fielding is planned to continue through FY 2020 on a total of 107 ships and shore sites.





Developers

Adaptive Methods Inc.	Centerville, Virginia
Naval Surface Warfare Center Carderock Division	Carderock, Maryland
Naval Undersea Warfare Center Keyport Division	Keyport, Washington
Progeny Systems Corporation	Manassas, Virginia

OCEANOGRAPHY, SPACE, AND MARITIME DOMAIN AWARENESS

Hazardous Weather Detection and Display Capability (HWDDC)

Description

Hazardous Weather Detection and Display Capability passively extracts data from the tactical scans of the SPS-48(E) and SPS-48(G) 3-D air-search radars to generate weather situational awareness products in near-real-time. Within the footprint of the radar, HWDDC provides data on precipitation intensity, storm cell movement, and wind speed and direction. This is the first capability of its kind and dramatically increases safety of flight and reduces risk to other shipboard operations, such as small boat operations and deck evolutions. Not only is the data used on board the ship by aerographers to support the flagship and other ships in company (within the radar footprint), but the data is also transmitted to the Fleet Numerical Meteorological and Oceanographic Command, where it is ingested into numerical environmental models, thereby increasing the accuracy of model runs.

Status

Designated an abbreviated acquisition program by the Space and Naval Warfare Systems Command PEO C4I (command, control, communication, computers, and intelligence) on May 22, 2013, the SPS-48(E) variant is installed on six aircraft carriers and five large-deck amphibious assault ships, and the SPS-48(G) variant is installed on two carriers and one amphibious assault ship. HWDDC is scheduled to enter the Consolidated Afloat Networks Enterprise System (CANES) system integration and testing event in early FY 2016, and full operational capability will be achieved when all aircraft carrier and amphibious assault platforms have received the SPS-48(G) upgrades, CANES installations, and CANES-hosted HWDDC.

Developers

Basic Commerce and Industries, Inc.	Morristown, New Jersey
Space and Naval Warfare Systems Command PEO (C4I) and PMW120	San Diego, California

Littoral Battlespace Sensing – Unmanned Undersea Vehicles (LBS-UUV)

Description

The Littoral Battlespace Sensing–Unmanned Undersea Vehicle program provides a low-observable, continuous capability to characterize ocean properties that influence sound and light propagation for acoustic and optical weapon and sensor performance predictions. Critical to realizing undersea dominance, the system has delivered buoyancy-driven undersea gliders (LBS-G) and electrically powered, autonomous undersea vehicles (LBS-AUV) to enable anti-submarine, mine countermeasures, expeditionary, and naval special warfare planning and execution and persistent intelligence preparation of the environment (IPOE). Launched and recovered from *Pathfinder* (T-AGS 60)-class oceanographic survey vessels, LBS-G and LBS-AUV will provide persistent battlespace awareness. Additionally, LBS is a force multiplier for the T-AGS ships that further expands collection capabilities in contested areas to ensure access and reduce risk in fleet operations.

LBS-UUV is Increment 1 of Littoral Battlespace Sensing, Fusion, and Integration (LBSF&I), the Department of the Navy's principal IPOE programmatic construct for meteorological and oceanographic data collection, processing, and data/product dissemination. LBSF&I is an integrated end-to-end system-of-systems capable of measuring a large variety of environmental parameters from the sea floor to the top of the atmosphere. LBSF&I will be capable of processing, exploiting, and assuring the quality of these data. The relevant information collected from this system is integrated at the Glider Operations Center into naval C4ISR (command, control, communication, computer, intelligence, surveillance, and reconnaissance) systems as part of the Global Information Grid Enterprise Services.

Status

LBS-G reached full operational capability in July 2012, and by November 2014 the program had delivered 130 gliders to the government with 74 delivered to the Naval Oceanographic Office after government acceptance testing. A total of 142 gliders will be delivered by late FY 2015. LBS-AUV reached and obtained initial operational capability in September 2013 and by May 2014 has delivered a total of five AUVs, including two engineering design models to the Naval Oceanographic office; a total of seven vehicles will be delivered by FY 2017. Both LBS-G and LBS-AUV are conducting real-world ocean-sensing missions in overseas locations in support of anti-submarine warfare, mine warfare, and IPOE.

Developers

Hydroid, Inc.	Pocasset, Massachusetts
Teledyne Brown Engineering	Huntsville, Alabama
Teledyne Webb Research	East Falmouth, Massachusetts

Maritime Domain Awareness (MDA)

Description

Maritime Domain Awareness facilitates timely decision-making that enables early actions to neutralize threats to U.S. national security interests. MDA results from the discovery, collection, sharing, fusion, analysis, and dissemination of mission-relevant data, information, and intelligence in the context of maritime political, social, economic, and environmental trends within geographic regions. MDA requires a collaborative and comprehensive information and intelligence-sharing environment working across international and interagency borders.

The Navy MDA Concept signed in July 2011 emphasizes Navy maritime operations centers as the focal points for efforts to improve Navy MDA, leveraging reach-back intelligence hubs for analytical support. The Navy's MDA concept complements the 2012 Presidential Policy Directive (PPD)-18 on Maritime Security and the 2013 National MDA Plan, which direct integration of all-source intelligence, law-enforcement information, and open-source data. Navy funding also supports MDA-focused analytical capabilities at the Office of Naval Intelligence and numerous Navy activities to close validated capability gaps.

Understanding the maritime challenges that the United States and its partners face and promoting progress in identifying and addressing these challenges, MDA seeks to enable decision-makers by strengthening and enhancing the information sharing environment. MDA will accomplish this through the continued development of policies, enhanced situational awareness, intelligence integration, and information-sharing and -safeguarding capabilities to provide a maritime domain supporting prosperity and security within our domestic borders and around the world.

Status

In 2010, the Joint Requirements Oversight Council approved the MDA initial capabilities document, which identified 20 prioritized MDA capability gaps aimed at improving information access, analysis, and sharing to a wide range of interagency and international partners. For example, the Dynamic Enterprise Integration Platform is a Secret-level, web-based software deployed in 2011 that fuses and aggregates data from multiple levels and sources to address MDA gaps. Future tools will reside within Increment 2 of the Distributed Common Ground System-Navy program.

Developers

Space and Naval Warfare Systems Center, Pacific	San Diego, California
Space and Naval Warfare Systems Command PMW120	San Diego, California

Meteorological Mobile Facility (Replacement) Next Generation [MetMF(R) NEXGEN]

Description

The Meteorological Mobile Facility (Replacement) [MetMF(R)] Next Generation environmental collection and forecast system provides meteorological and oceanographic (METOC) support to Marine Corps and joint forces. The main functions of the system are to collect and analyze data, predict the future environment, tailor METOC products and information, and mitigate the impact of and exploit the future environment. Following evolutionary acquisition, MetMF(R) NEXGEN is a replacement of the Meteorological Mobile Facility (Replacement) and provides greater mobility and operational flexibility in response to identified meteorological capability gaps. The required capabilities are defined in two operational requirements documents.

Status

MetMF(R) reached full operational capability (FOC) in July 2002 and deployed in support of Marine Corps operational forces during *Operation Iraqi Freedom*, during which operational deficiencies were identified and subsequently validated in several studies. On May 31, 2006, the Marine Corps Combat Development Command (MCCDC) approved an urgent need statement (UNS) for a METOC environmental support system. The UNS identified a need for an expeditionary capability with a smaller footprint than MetMF(R), as well as upgraded sensing, fusing, and communications capabilities.

The Space and Naval Warfare Systems Command Program Executive Office Command, Control, Communications, Computers, and Intelligence (PEO C4I) and Program Manager, Warfare (PMW120) performed an analysis of alternatives to analyze Marine Corps METOC capabilities and gaps, and determined the most effective course of action for best satisfying Marine METOC requirements to be an upgraded or a next-generation MetMF(R). Two MetMF(R) NEXGEN prototypes were developed, and the capability production document was approved in July 2010. MetMF(R) NEXGEN passed its operational evaluation in September 2011, and was approved at Milestone C for full rate production in October 2011. MetMF(R) NEXGEN officially met all requirements for initial operational capability in July 2013.

Developers

Smiths Detection	Edgewood, Maryland
Space and Naval Warfare Systems Command	
PEO (C4I)/PMW120	San Diego, California

Naval Integrated Tactical Environmental System – Next Generation (NITES-Next)

Description

Naval Integrated Tactical Environmental System–Next Generation is a software-centric solution that leverages Consolidated Afloat Networks Enterprise System (CANES) infrastructure and services on force-level ships (e.g., aircraft carriers and large-deck amphibious assault ships). It is being developed to replace legacy meteorology and oceanography (METOC) capabilities in support of the Navy Meteorology and Oceanography Command's Battlespace on Demand concept, fleet safety, integrated fires, and battlespace awareness. NITES-Next represents the core processing, exploitation, and dissemination tool of the METOC professional and provides a "one-stop shop" of tools and tactical decision aids required to generate decision products in support of full-spectrum naval operations. It is capable of consuming Open Geospatial Consortium (OGC)-compliant information and products, processed remotely sensed environmental information, as well as ocean and atmospheric models. This data is analyzed and fused with embedded tactical decision aids to expedite the METOC professional's forecasts of environmental conditions and impacts to fleet safety, weapons performance, sensor performance, and overall mission. NITES-Next is also capable of producing OGC-compliant products that can be shared/viewed on in-service and future Navy command and control systems, including Command and Control Rapid Prototype Continuum, Maritime Tactical Command and Control, and Distributed Common Ground System–Navy systems that will increase fleet-wide situational awareness.

Status

NITES-Next was designated an IT streamlining pilot program in March 2012 and received a Fleet Capability Release (FCR)-1 build decision in May 2012. NITES-Next is expected to be fully developed in five FCRs. Initial operational capability will be achieved after successful operational test and evaluation of FCR-1 during the second quarter FY 2015, with FCR-2 build decision approximately the same time. Full operational capability will be achieved in FY 2020 after FCR-5 is fielded.

Developers

Forward Slope, Inc.	San Diego, California
General Dynamics Information Technology	San Diego, California
Space and Naval Warfare Systems Center, Pacific	San Diego, California
Space and Naval Warfare Systems Command PEO C4I and PMW120	San Diego, California

NAVSTAR Global Positioning System (GPS)

Description

The NAVSTAR GPS program is a space-based, satellite radio navigation system that provides authorized users with "24/7," worldwide, all-weather, three-dimensional positioning, velocity, and precise time data. Navy responsibilities include the integration of GPS in 285 surface ships and submarines and more than 3,700 aircraft, integration of shipboard combat systems with the Navigation Sensor System Interface (NAVSSI) and the deployment of follow-on GPS-based Positioning, Navigation, and Timing Services (GPNTS) and anti-jam (A/J) protection for high-priority combat platforms through the navigation warfare (NAVWAR) program.

NAVSSI is the in-service shipboard system that collects, processes, and disseminates position, velocity, and timing data to weapons systems, C4I, and combat-support systems on board surface warships.

GPNTS will incorporate the next-generation of GPS receivers, initially the Selective Availability Anti-Spoofing Module, to be followed by M-Code receivers, to ensure that U.S. Navy ships can use the new GPS signals being broadcast from the latest GPS satellites. GPNTS also features A/J antennas and multiple atomic clocks to support assured position, navigation, and timing services.

NAVWAR provides anti-jam antennas to protect air and sea naval platforms against GPS interference to ensure a continued high level of mission effectiveness in a GPS jamming environment. GPS plays a critical role not only in precise navigation, but also in providing precise time synchronization to precision-strike weapons, naval surface fire support systems, and ship C4I (command, control, communication, computers, and intelligence) systems.

Status

All Navy platform GPS installations are complete. The Air NAVWAR program continues tests on suitable A/J antennas for Navy unmanned aerial vehicles such as *Fire Scout*. Installation of A/J antennas in F/A-18 E/F/G *Super Hornet/Growler* aircraft is ongoing. Efforts to integrate GPS A/J antennas into E-2D *Hawkeye* aircraft and H-1 helicopters have been initiated. The Sea NAVWAR program is installing GPS A/J antennas on major surface combatants and the Navy's submarine force. The Navy is completing installation of NAVSSIs on select Navy surface combatants and an expected full operational capability in FY 2015. The GPNTS program's next major event is Milestone C, scheduled for mid-2016. GPNTS initial operational capability is expected in 2018.

Developers

Boeing Military Aircraft	St. Louis, Missouri
Litton Data Systems	San Diego, California
Raytheon	Los Angeles, California
Rockwell-Collins	Cedar Rapids, Iowa

Precise Timing and Astrometry (PTA)

Description

The Navy Precise Timing and Astrometry program executes Department of Defense (DoD) tasking to develop and maintain precise timing and time interval services, earth orientation parameters, and the celestial reference frame for the DoD Components as well as Title 10 requirements to produce astronomical applications. PTA is a critical component to the effective employment of a myriad of DoD systems, including command and control systems, intelligence operations, network operations, and data fusion; it is essential to battlespace awareness, assured command and control, and integrated fires. Assuring PTA to support navigation warfare efforts is the focus of several lines of effort within the PTA portfolio.

Coordinated Universal Time as referenced to the U.S. Naval Observatory (CUT-USNO) is the DoD standard and the primary timing reference for the global positioning system (GPS) and numerous other military applications.

The USNO Master Clock, an ensemble system with dozens of independent atomic clocks, is the most precise and accurate operational clock system in the world. The Navy, through USNO, also determines and predicts earth orientation parameters that are the time-varying alignment of the Earth's terrestrial reference frame to the celestial reference frame. USNO is the DoD and international lead for defining the celestial reference frame, which is the basis for the extremely precise and accurate positions and attitudes of hostile systems as well as friendly navigational and positioning/targeting systems.

PTA also supports relevant research conducted by USNO necessary to improve mission performance in clock development and time dissemination, determining and cataloguing the positions and motions of celestial objects for the celestial reference frame, earth orientation parameters, and astronomical application production for navigation and operations.

Status

USNO is in the process of adding six Navy Rubidium Fountain atomic clocks to its time-keeping suite, which will improve the precision and accuracy of CUT-USNO, and support the more stringent GPS III nanosecond timing precision requirement. Additionally, the Navy has ongoing initiatives to ensure precise timing is readily available to all DoD users. The Critical Time Distribution program provides upgrades to DoD timing stations to overcome dependence on GPS-only solutions. Additional "signals of opportunity" augment the GPS solution to ensure timing delivery to the warfighter.

Developers

Naval Meteorology and Oceanography Command	Stennis Space Center, Mississippi
Navigator of the Navy	Washington, D.C.
U.S. Naval Observatory Flagstaff Station	Flagstaff, Arizona
U.S. Naval Observatory	Washington, D.C.

T-AGS Oceanographic Survey Ship

Description

The *Pathfinder* (T-AGS 60)-class oceanographic survey vessels comprise six 329-foot long, 5,000-ton vessels that provide multi-purpose oceanographic capabilities in coastal and deep-ocean areas. Under the Military Survey restrictions of the United Nations Convention on the Law of the Sea, the T-AGS 60 represents an internationally recognized environmental information-collection capability that can operate within the exclusive economic zones of sovereign nations in support of DoD requirements without host-nation approval. Non-military ships conducting these collections may only do so with host-nation approval. T-AGS ships perform acoustic, biological, physical, and geophysical surveys, and gather data that provide much of DoD's information on the ocean environment as well as mapping the ocean floor to update nautical charts and promote safety of navigation. These data points help to improve undersea warfare technology and enemy ship and submarine detection. The T-AGS ships are manned and operated for the Oceanographer of the Navy by civilian crews provided by the Military Sealift Command, and the Naval Oceanographic Office provides mission scientists and technicians.

T-AGS 60-class ships are designed with a common-bus diesel-electric propulsion system consisting of twin-screw propellers driven through Z-drives. The Z-drives, with 360-degree direction control, provide for precise and accurate position-keeping and track-line following.

The Navy will deliver the newest vessel to the T-AGS fleet, the USNS Maury (T-AGS 66), in FY 2015. A modified version of the *Pathfinder*-class vessels, the ship is named after Matthew Fontaine Maury, the father of modern oceanography and naval meteorology. T-AGS 66 will be 24 feet longer than the in-service *Pathfinder* T-AGS vessels to accommodate the addition of an 18- by 18-foot inboard moon pool. The moon pool will allow access to the water through the ship's hull for the deployment and retrieval of unmanned undersea vehicles. The increased ship length will also provide 12 additional permanent berthing accommodations. As on previous vessels, a hull-mounted mission system gondola will house the multi-beam sonar system.

Status

The construction of the USNS Maury (T-AGS 66) is under contract with VT Halter Marine of Pascagoula, Mississippi. The keel was laid on February 1, 2011, and the ship was christened and launched on March 27, 2013. The ship is scheduled for delivery to the Navy in FY 2015.

Developers

Naval Meteorology and Oceanography Command	Stennis Space Center Mississippi
Oceanographer of the Navy	Washington, D.C.
VT Halter Marine	Pascagoula, Mississippi

Task Force Climate Change (TFCC)

Description

The Chief of Naval Operations (CNO) established Task Force Climate Change (TFCC) in 2009 to address the impacts of climate change on naval readiness. TFCC engages with representatives from multiple offices and staffs, including the National Oceanic and Atmospheric Administration and the U.S. Coast Guard. The objective of TFCC is to develop policy, strategy, and investment recommendations regarding climate change and the Navy, with a near-term focus on the Arctic, a maritime region that is changing more rapidly than any other area of the world. Other climate-change effects are receiving increased attention from the Task Force, particularly the challenges associated with sea level rise and its effect on base infrastructure and mission readiness.

Status

Task Force Climate Change has developed multiple roadmaps signed by the CNO. These roadmaps provide plans of action with timelines intended to drive Navy policy, engagement, and investment decisions regarding the Arctic and global climate change. The most recent release, *U.S. Navy Arctic Roadmap: 2014-2030*, expands upon the previous roadmap's efforts and is aligned with the Administration's *National Strategy for the Arctic Region* and the *Department of Defense Arctic Strategy*. Actions specified in the roadmaps are underway, and TFCC provides to the CNO regular updates on the status of their implementation. Following the guidance in the 2014 Quadrennial Defense Review, the Navy's investments are focused on improvements in observation, prediction, and communication capabilities in high-latitude maritime regions, as well as vulnerability assessments, local sea level rise methodologies, and uncertainty management.

Developers

Naval Meteorology and Oceanography Command	Stennis Space Center Mississippi
Oceanographer of the Navy	Washington, D.C.
Office of Naval Research	Arlington, Virginia

SECTION 6

SUPPLY AND LOGISTICS

Naval logistics is essential to our combat power, bridging our Nation's industrial base to forward-deployed naval forces. Readiness and the ability to sustain forward operations hinge upon logistics support. Naval logistics is the process of getting material from the manufacturer's shipping terminal to our forces worldwide. In addition to material, naval logistics encompasses planning, acquisition, maintenance, engineering support, training, transportation, facilities operations, and personnel support backing up our naval forces around the globe, day and night, in peace and war.

JHSV 1 *Spearhead*-Class Joint High-Speed Vessel

Description

The Joint High-Speed Vessel (JHSV) is a high-speed, shallow-draft surface vessel with an expansive open mission bay and ample reserve power and ships services capacity. Manned by Military Sealift Command civilian mariners, JHSVs will provide a persistent deployed presence in operational theaters around the world. Capable of speeds in excess of 35 knots and ranges of 1,200 nautical miles fully loaded, the JHSV's shallow-draft allows it to operate effectively in littoral areas and small, austere ports. FY 2015 will see the continued deployments of JHSVs, providing increased opportunities to integrate these new, highly adaptable platforms into the Fleet and evaluate the many ways the Navy can employ the vessels' unique combination of persistent forward presence, flexible payload capacity, and speed.

Status

The Navy will acquire ten JHSVs, four of which have been delivered as of early 2015 and two programmed to be delivered in each year from FY 2015 through FY 2017. The USNS Spearhead (JHSV 1) delivered in October 2012 and was ready for fleet tasking in November 2013. The USNS Choctaw County (JHSV 2) delivered in June 2013 and was ready for fleet tasking in July 2014. The USNS Millinocket (JHSV 3) delivered to the Navy in March 2014 and will be ready for fleet tasking in April 2015. The USNS Fall River (JHSV 4) delivered to the Navy in September 2014 and will be ready for fleet tasking in August 2015. Trenton (JHSV 5) and Brunswick (JHSV 6) will be delivered to the Navy in March and September 2015, respectively. The other ships in the class are Carson City (JHSV 7), Yuma (JHSV 8), Bismarck (JHSV 9), and Burlington (JHSV 10).

Developers

Austal USA — Mobile, Alabama

Naval Tactical Command Support System (NTCSS)

Description

The Naval Tactical Command Support System is the combat logistics support information system used by Navy and Marine Corps commanders to manage and assess unit and group material and personnel readiness. NTCSS provides intermediate and organizational maintenance, supply, and personnel administration management capabilities to aviation, surface, and sub-surface operational commanders. NTCSS also supports network-centric warfare by integrating logistics information to complement the tactical readiness picture for operational commanders. Business process improvements are developed and implemented under sponsorship of functional and fleet managers. Ongoing initiatives include:

- Migrating to an open service-oriented architecture
- Using Navy Enterprise Data Centers

- Converting Navy and Marine Corps aviation squadrons to an NTCSS Virtual Environment, significantly reducing hardware requirements
- Centralizing visibility of Navy assets (Operational Supply)
- Streamlining aviation maintenance repair operations (Beyond Capability Maintenance Interdiction and Global Individual Components Repair List management)

As a result, the Navy and Marine Corps will realize greater operational efficiency and lower total ownership costs.

Status

NTCSS is a mature program in full-rate production and continues to be the warfighters' production system to maintain fleet readiness. Full operational capability (FOC) at Naval Air Stations, Marine Corps air logistics squadrons, and on board ships and submarines occurred in FY 2009. An optimized NTCSS capability, targeted for aircraft squadrons, began full-rate production in FY 2007 and achieved FOC in the first quarter of FY 2012. The "tech refresh" to replace legacy NTCSS hardware/software and maintain compliance with Department of Defense/Department of the Navy Information Assurance and Baseline Reduction mandates commenced in FY 2010, with completion of the deployment cycle planned for FY 2017.

Developers

Advanced Enterprise Systems	Norfolk, Virginia
CACI	Norfolk, Virginia

Navy Electronic Procurement System (EPS)

Description

The operational goal of the Navy Electronic Procurement System is to provide end-to-end contract writing and management solutions to the Department of the Navy (DoN), which will electronically support multiple stakeholder financial and operational data inputs and maintain contracting process audit trails. EPS will cover numerous DoN buying enterprise activities that include small procurements, mobile and remote operations, major weapon systems acquisitions, research and development, military construction, grants, Service buys, and cooperative agreements. EPS will replace legacy contracting systems used by the Head of Contracting Activities, be web-based, maximize automation throughout the contracting process, and reform contracting from its current electronic process to a data-driven process. Data will become visible and transparent in EPS from requirements inception through administration, payment, and final closeout. EPS will handle purchasing data for trading partners throughout the world who have contracts with the DoN. Such stakeholders (vendors/DoD/other agencies, etc.) will interface electronically with the system through a standard enterprise service bus. Consequently, vendors will have an integrated means of submitting electronic proposals, connected

financial systems will be able to generate timely and accurate Financial Accounting Data, and distribution and reporting of contracts and modifications will occur automatically.

Status
EPS is in the pre-acquisition phase. The EPS analysis of alternatives, completed on November 21, 2013, evaluated potential solutions to fulfill more than 700 distinct EPS requirements primarily focused on contract writing. EPS achieved a favorable Naval Capabilities Board endorsement on October 12, 2012 and a favorable Resource Requirements Review Board endorsement on May 14, 2014, thus paving the way for EPS to enter the acquisition framework in the fourth quarter of FY 2015.

Developers
To be determined.

Navy Energy Program

Description
The Navy Energy Program addresses energy as a strategic resource. Energy security is fundamental to executing the Navy's mission afloat and ashore, and the service must be resilient to a future in which conventional sources of energy could be less available. The goal is to invest in energy efficiency and consumption-reduction initiatives that reduce the Navy's overall requirement for energy, while increasing the use of alternative fuels and energy in our operations and facilities. The Navy Energy Program guides a strong portfolio of investments in people, technology, and programs across the Navy's aviation, expeditionary, maritime, and shore enterprises. In the near term, the Navy will enable more energy-efficient operations, enhance awareness, and promote energy-conscious behavior by optimizing existing technologies to reduce energy consumption. The Navy will also accelerate the implementation of new technologies with the intent of enhancing or enabling greater combat readiness and mission success.

Maritime efficiency initiatives will reduce energy consumption in all shipboard variations. Hydrodynamic technologies such as stern flaps modify the flow field under the hull, thereby reducing drag, turbulence, and overall hull resistance. Some technologies, such as the Hybrid Electric Drive Electric Propulsion System (HED EPS), are used when it is tactically appropriate. Other technologies, including the Shipboard Energy Dashboard, provide commanding officers real-time situational awareness of the energy demand associated with on board equipment. Aircraft engine research is focused on new turbine engine configurations, with program goals to decrease fuel consumption and acquisition and maintenance costs, while increasing aircraft operational availability and performance. Engine improvements will be accomplished through innovative materials and processes to produce improved components and obtain greater fuel efficiency. This includes developing high temperature metal alloys for lighter and more heat resistant turbine blades and disks, and thermal/

environmental barrier coatings to improve component heat resistance. Additionally, increased use of improved fidelity and increased-capability aviation simulators for flight training is helping pilots to reduce fuel use while increasing readiness.

The Department of Navy (DoN) is investing in alternative fuel research to diversify its energy supply. The Navy has completed testing and qualification and approved military specifications for JP-5, JP-8, and F-76 for the Hydrotreated Esters and Fatty Acids and Fischer-Tropsch pathways, which will enable widespread use by both aircraft and ships. Hydro-processed renewable and synthetic fuel blends produced through these two processes will be purchased in operational quantities once they become cost competitive with conventional fuels.

The incentivized Energy Conservation (iENCON) Program encourages ships' crews to apply energy-efficient procedures and operations during all suitable ship missions, underway and in port. During FY 2014 and continuing, iENCON helped achieve a savings of 792,200 barrels of fuel, resulting in a cost avoidance of more than 13 percent, equal to an additional 40,160 underway-steaming hours. The Aircraft Energy Conservation Program (AirENCON) will launch fleet-wide to optimize fuel consumption in the Navy's 3,700 aircraft.

Ashore, the Navy continues to focus on increased efficiency through infrastructure and utility system upgrades. The Service has installed advanced meters to monitor energy consumption, deployed alternative fuel vehicles to decrease the fuel consumption of the non-tactical vehicle fleet, and established energy management systems to drive changes in culture and behavior. The Navy is implementing renewable energy technologies including a geothermal power plant at China Lake, wind power in the Bahamas and California, large-scale photovoltaic farms in Hawaii and California, and solar-powered lighting and hot water heaters at installations throughout the world. In 2014, the DoN created the Renewable Energy Program Office (REPO) to achieve the goal of producing or procuring one gigawatt of renewable energy by the end of 2015. REPO will work with Navy installations and regional partners to implement cost-effective (at or below the cost of "brown" or traditional sources of energy), large-scale (defined as ten megawatt or greater), renewable energy projects that leverage private sector financing.

Status

HED EPS is on schedule for initial fielding and installation in late FY 2016 on the USS Stockdale (DDG 106) and USS Truxtun (DDG 103). Stern flaps are installed on all guided-missile cruisers (CGs) and destroyers (DDGs) and select amphibious ships (LHAs/LHDs). Scheduled installations of stern flaps include the USS Bataan (LHD 5) in FY 2015, USS Boxer (LHD 4) in FY 2018, and USS Bonhomme Richard (LHD 6) in FY 2020. In October 2014, the USS America (LHA 6) was commissioned with an auxiliary propulsion system. In FY 2015, bow bulb testing will commence on the USS Kidd (DDG 100). Energy Dashboards were installed on eight DDGs in FY 2014, with an additional eight DDG installations

in FY 2015 and five in FY 2016. Combustion Trim Loops are now installed on nine amphibious ships—the seven-ship *Wasp* (LHD 1) class, the USS Makin Island (LHD 8), and USS Peleiliu (LHA 5). The Navy's FY 2015 energy investment maintains FY 2014 initiatives, including funds to address shore energy legislative requirements and tactical efforts that target energy efficiency, reduce energy consumption, and complete alternative fuel test and certification to lay the foundation for increased use of alternative fuel.

Developers

Cebrowski Institute	Monterey, California
Naval Air Systems Command	Patuxent River, Maryland
Naval Facilities Command	Washington, D.C.
Naval Sea Systems Command	Washington, D.C.

Navy Enterprise Resource Planning (Navy ERP)

Description

Enterprise Resource Planning is a generic term for comprehensive management systems used to manage an organization's crucial business functions. The Navy ERP solution allows the Navy to unify, standardize, and streamline all of its business activities into one system that delivers information that is secure, reliable, accessible, and current. The solution enables sustained Navy compliance with the Chief Financial Officers Act of 1990 and the Department of Defense Information Assurance Certification and Accreditation Process. Navy ERP was delivered in two releases.

The Finance/Acquisition Solution (Release 1.0) provides the Navy with unprecedented financial transparency that can be leveraged across the Navy as a common cost-management framework. This release provides the Navy with an enterprise solution that supports budgeting, billing, external procurement, period closeout, business warehousing, and cost planning.

The Single Supply Solution (Release 1.1) delivers enterprise visibility and process standardization of the Navy Supply Chain. The Single Supply Solution provides an integrated capability from global planning to local inventory handling, enabling the Navy to optimize positioning of stock which improves fleet readiness and maximizes the use of supply funds and assets. More specifically, the Single Supply Solution supports such functions as order fulfillment, inventory management, consignment, warehouse management, provisioning, carcass tracking, supply outfitting, and supply and demand planning.

Navy ERP combines Business Process Reengineering and industry best practices, supported by commercial off-the-shelf software to integrate all facets of Navy business operations, using a single database to manage shared common data.

Status

Navy ERP Finance/Acquisition Solution has been deployed to the following commands: Naval Air Systems Command (2007); Naval Supply Systems Command (2008); Space and Naval Warfare

Command (2009); Naval Sea Systems (NAVSEA) Command General Fund (2010); NAVSEA Working Capital Fund (2011); Office of Naval Research (2012); and Strategic Systems Programs (2012). Initial operational capability was achieved in May 2008. In October 2008, the Assistant Secretary of the Navy (Financial Management and Comptroller) designated Navy ERP as the Navy's Financial System of Record. The Navy ERP Single Supply Solution deployment began in February 2010; and has been successfully deployed to the Naval Supply Systems Command (NAVSUP) Weapon Systems Support at Philadelphia and Mechanicsburg, Pennsylvania. The regional implementation of the Single Supply Solution to the NAVSUP Fleet Logistics Centers was completed in August 2012. Navy ERP attained full deployment declaration by the Under Secretary of the Navy in December 2013. Navy ERP is deployed to approximately 71,000 users and manages approximately 51 percent of the Navy's Total Obligation Authority.

Developers

IBM Armonk	New York, New York
SAP America, Inc.	Newtown Square, Pennsylvania

T-AH 19 *Mercy*-Class Hospital Ship

Description

The Navy's two *Mercy*-class hospital ships—the USNS Mercy (T-AH 19) and USNS Comfort (T-AH 20)—are national strategic assets employed in support of combatant commander (COCOM) requirements. Hospital ships provide a mobile, highly capable medical facility and are configured and equipped to meet their primary mission as a large-scale trauma center for combat operations. Each ship has 12 operating rooms and up to 1,000 beds (100 acute care, 400 intermediate care, and 500 minor care). As powerful enablers of stability, security, and reconstruction efforts around the globe, hospital ships serve as cornerstones for peacetime shaping and stability operations. Hospital ships provide a highly visible, engaged, and reassuring presence when deployed for Theater Security Cooperation (TSC) or when called to respond to humanitarian-assistance or disaster-relief missions. Assigned to the Military Sealift Command, these ships are maintained in a reduced operating status (ROS) when not required for scheduled mission tasking or emergent COCOM requests. Generally, one hospital ship is scheduled for a 120-150 day TSC deployment per year. Periodic maintenance is performed to ensure both ships are able to meet full operational capability within a few days when activated from ROS. A civilian mariner crew, with military medical staff augmentation when activated, mans these ships.

Status

The two hospital ships—Mercy (homeported in San Diego, California) and Comfort (homeported in Norfolk, Virginia)—have expected service lives to 2020 and 2021, respectively.

Developers

National Steel and Shipbuilding Company	San Diego, California

T-AKE 1 *Lewis and Clark*-Class Dry Cargo and Ammunition Ship

Description

The ability to continually sustain ships on station at sea is a key enabler of the Navy's unmatched ability to project and maintain power forward. The 14 *Lewis and Clark* (T-AKE 1)-class dry cargo and ammunition ships are one of the cornerstones of this critical capability. T-AKEs provide at-sea delivery of dry cargo and ordnance directly to "customer" ships and other station ships, providing continuous support to combat forces and other naval vessels. With their large, easily reconfigurable cargo holds, T-AKEs replaced three previous classes of fleet auxiliaries with a single hull form. As a secondary mission, T-AKEs can act in concert with a fleet replenishment oiler (T-AO) to fill the carrier strike group station ship role. Assigned to the Military Sealift Command, the T-AKEs are built to commercial standards and are manned by civilian mariners. A Navy aviation detachment or contracted commercial equivalent embarked on board provides vertical-replenishment capability.

Status

Twelve T-AKEs support the Combat Logistics Force and two T-AKEs support Maritime Prepositioning Force program requirements. The final ship in the class—the USNS Cesar Chavez (T-AKE 14)—delivered in October 2012.

Developers

National Steel and
Shipbuilding Company — San Diego, California

T-AO 187 *Kaiser*-Class and T-AO(X) Replenishment Oiler

Description

The Navy has 15 *Henry J. Kaiser*-class fleet replenishment oilers in the Combat Logistics Force. The ships are part of the Naval Fleet Auxiliary Force assigned to Military Sealift Command and are manned by civilian mariners. Along with the T-AKE, they form the foundation of the Navy's ability to project power forward indefinitely through replenishment at sea, and shuttling dry cargo and fuel from resupply bases to Navy combatants and task forces or station ships in forward areas of operation. The T-AO primarily provides bulk petroleum (diesel fuel marine and JP5 jet fuel) to forces afloat. Additionally, they have a limited capacity for providing stores, packaged cargo, refrigerated cargo and mail. The T-AO(X) is the Navy's next-generation replenishment oiler, featuring increased dry and refrigerated cargo capacity and double-hulled construction. They are scheduled to replace the current *Kaiser*-class oilers as they reach the ends of their 35-year expected service lives beginning in 2021.

Status

Seventeen T-AO(X) ships are planned with the first contract award programmed for FY 2016 and delivery in FY 2020.

Developers

To be determined.

T-AOE 6 *Supply*-Class Fast Combat Support Ship

Description

The Navy has three *Supply*-class fast combat support ships in the Combat Logistics Force. These ships are assigned to the Naval Fleet Auxiliary Force operated by the Military Sealift Command and manned by civilian mariners. Capable of maintaining higher sustained speeds than other Navy replenishment ships and carrying the full spectrum of afloat replenishment requirements (fuel, ordnance, and dry cargo), these ships provide "One Stop Shopping" to aircraft carrier and expeditionary strike groups. Working in concert with *Lewis and Clark* (T-AKE)-class dry cargo and ammunition ships and *Kaiser* (T-AO)-class replenishment oilers, the T-AOE is a key enabler of the Navy's ability to project power forward indefinitely through replenishment at sea. A Navy aviation detachment or contracted commercial equivalent embarked on board provides vertical-replenishment capability.

Status

The USNS Bridge (T-AOE 10) was inactivated in FY 2014, and the USNS Rainier (T-AOE 7) is scheduled for inactivation in FY 2015. The two remaining fast combat support ships, USNS Supply (T-AOE 6) and USNS Arctic (T-AOE 8), have expected service lives out to 2034 and 2035, respectively.

Developers

National Steel and
Shipbuilding Company — San Diego, California

T-ATS(X) Towing, Salvage and Rescue Ship

Description

The Navy has four *Powhatan* (T-ATF)-class fleet ocean tugs and four *Safeguard* (T-ARS)-class salvage ships to support towing, diving, and rescue operations. The primary missions of the T-ATF and T-ARS include emergency towing of battle-damaged ships, providing firefighting assistance, and supporting submarine-rescue and portable self-sustaining deep-diving operations. The Towing, Salvage and Rescue Ship (T-ATS(X)) will replace T-ATF and T-ARS tugs with a common hull ship able to conduct all towing, salvage, and rescue missions.

Status

Two T-ATFs and two T-ARSs are scheduled to be inactivated in FY 2016. Eight T-ATS(X)s are planned, with the initial contract award programmed for FY 2017 and delivery in FY 2019. These new ships are expected to enter service in the early 2020s.

Developers

To be determined.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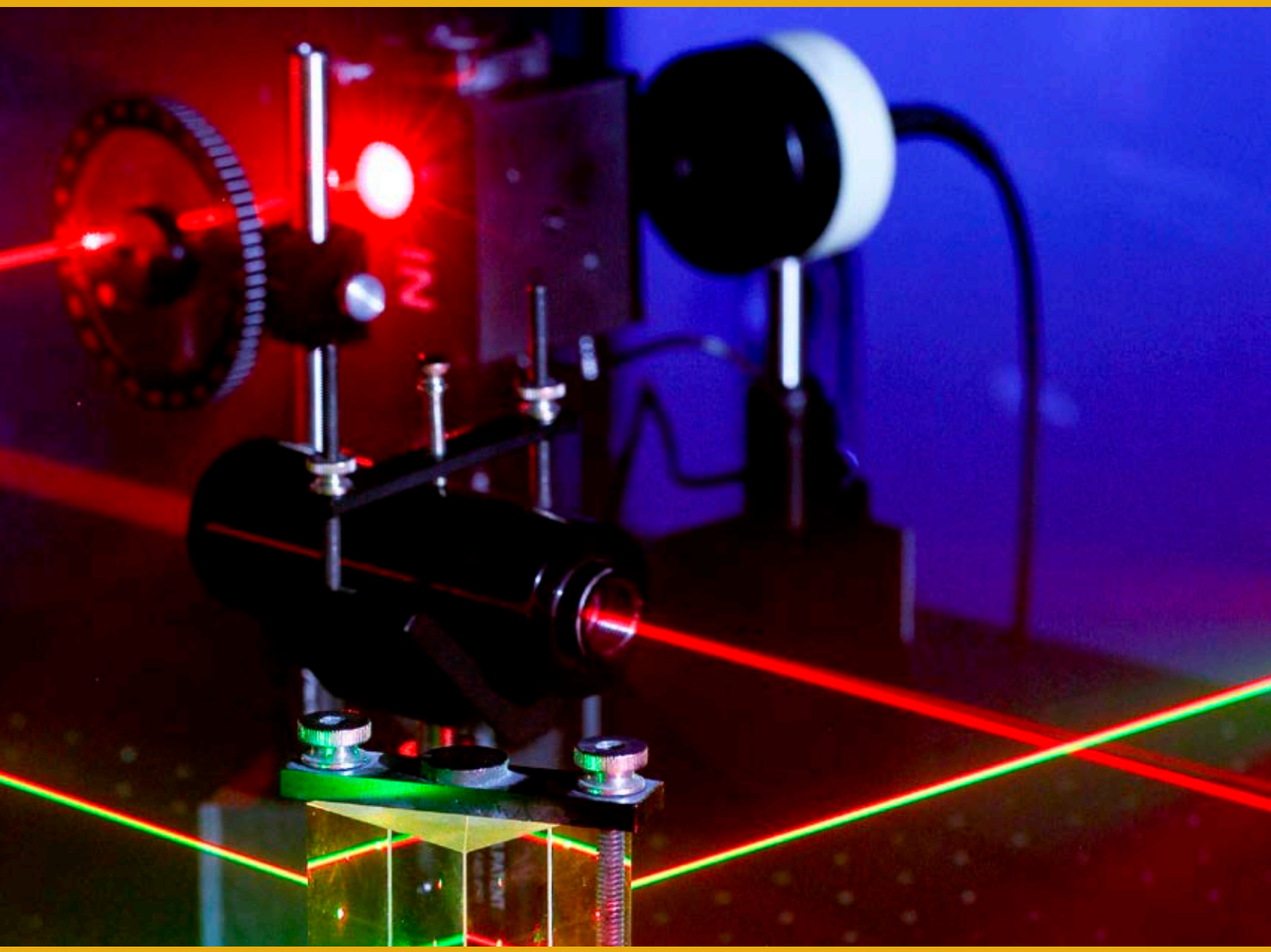


SECTION 7

SCIENCE AND TECHNOLOGY

Naval science and technology (S&T) delivers new capabilities to the Navy and Marine Corps that ensure continued superiority of U.S. naval forces today and warfighters in the future. In keeping with its mandate, the Office of Naval Research plans, fosters, and encourages scientific research in recognition of its paramount importance to future naval power and national security. The Naval S&T objective is to support a Navy and Marine Corps that are capable of prevailing in any environment by focusing on S&T areas with big payoffs, encouraging innovative thinking and business processes, and striving to improve the transition of S&T into acquisition programs in the most cost-effective means possible—striking the right balance between responsive near-term technology insertion and long-term basic research.

SCIENCE AND TECHNOLOGY

Autonomous Aerial Cargo/Utility System (AACUS)

Description

The Office of Naval Research (ONR) Autonomous Aerial Cargo/Utility System Innovative Naval Prototype (INP) explores advanced autonomous rotary-wing capabilities for reliable resupply/retrograde and, in the longer term, casualty evacuation by an unmanned air vehicle under adverse threat and weather conditions. Key features of the AACUS include a vehicle autonomously avoiding obstacles while finding and landing at an unprepared landing site, operated by a field individual possessing no special training. AACUS represents a substantial leap compared to present-day operations as well as other more near-term Cargo Unmanned Aerial Systems (CUASs) development programs. AACUS focuses on autonomous obstacle avoidance and unprepared landing site selection, with precision-landing capabilities that include contingency management until the point of landing. AACUS includes a control component such that any field personnel can request and negotiate a desired landing site. Moreover, AACUS will communicate with ground personnel for seamless and safe loading and unloading. The program embraces an open-architecture approach for global management of mission planning data, making AACUS technologies platform-agnostic and transferable to new as well as the CUASs. AACUS-enabled CUASs will rapidly respond to requests for support in degraded weather conditions, launch from sea and land, fly in high and/or hot environments, and autonomously detect and negotiate precision landing sites in potentially hostile settings.

Status

The Autonomous Aerial Cargo/Utility System is an ONR INP program with a FY 2012 start, sponsored through the ONR's Office of Technology.

Developers

Office of Naval Research — Arlington, Virginia

Autonomous Swarmboats

Description

With autonomous swarmboats, unmanned Navy vessels can overwhelm an adversary. The Office of Naval Research (ONR) Control Architecture for Robotic Agent Command and Sensing (CARACaS), a first-of-its-kind technology, enables a swarming capability that gives our naval warfighters a decisive edge. CARACaS is a hardware and software package that can be installed on any unmanned surface vehicle (USV) to allow for autonomous operation and seamless operations with multiple USVs. CARACaS enables new levels of unmanned USV autonomy, allowing multiple USVs to operate at unprecedented levels of coordinated autonomous operation—including moving in sync with other USVs, choosing their own routes, swarming on enemy vessels, escorting ships and protecting ports. A combination of hardware and software,

CARACaS is the result of a decade of research and development between ONR and partners across the U.S. Navy, academia and industry. Some of the system's components were adapted for use on small combatant craft from technology originally developed by NASA for the Mars Rover spaceflight programs. CARACaS represents a quantum leap forward from remote control, enabling new capabilities in USV operations, including the ability for multiple USVs autonomously to swarm adversaries' ships and act in defense of high-value U.S. Navy assets.

Status
Autonomous swarmboats enabled by CARACaS technology is an ONR program demonstrated in FY 2014 and is sponsored through the ONR's Office of Disruptive Technology.

Developers
Office of Naval Research Arlington, Virginia

Discovery and Invention (D&I) Research

Description
Research provides the foundation for future breakthroughs in advanced technology. The Office of Naval Research (ONR) Discovery and Invention research portfolio represents more than 40 percent of the Navy's science and technology (S&T) budget. It consists of basic and early applied research that fund a wide variety of scientific and engineering fields with a goal of discovering or exploiting new knowledge to enhance and transform future naval technological capabilities.

With its broad focus, the D&I portfolio aims for development of high-risk and high-impact projects with a long time span of maturity, from five-to-20 years for transition. D&I investments are the essential foundation required for advanced technology and leveraging other defense, government, industry, international, and general research community investments. In many cases, ONR's investments were the first to seed new research performed by many of the world's leading scientists and engineers at universities, federal laboratories, and private industry. Thousands of scientists, including more than 60 Nobel Prize winners, have been supported by ONR. Breakthroughs in precision time and timekeeping, with applications to the global positioning system, have generated Nobel Prizes for ONR-funded researchers in 1997, 2001, 2005, and 2012. Together, ONR-funded investigators have had significant influence on advances in cell phones, life-saving vaccines, lasers, fiber optics, radars, blood-clotting agents, semiconductors, nanotechnologies, and more. For example, early D&I investments in Gallium Nitride devices led to a Wide Bandgap Semiconductor program and ONR's Sea Shield Future Naval Capabilities programs. These efforts have resulted in high-performing radar systems in the next-generation E-2D *Hawkeye* aircraft and for ship radar via the Integrated Topside (InTop) Innovative Naval Prototype program.

The D&I research in autonomous sciences has yielded autonomous systems in use today that cost-effectively extend aircraft,

ship, and submarine capabilities. A bio-inspired science effort has produced a microbial fuel cell capable of powering small undersea sensors. Recognizing the need to network advancements in all warfighting capabilities, the D&I portfolio contains a substantial investment in information technology sciences. The breakthroughs in this arena include Composable FORCEnet, space-based microwave imagery and enhanced weather forecasting and storm prediction capability. The D&I portfolio also includes multi-discipline exploration of materials where efforts encompass acoustic meta-materials projects, which have produced advances in sensors, noise reduction, and stealth coatings; and Integrated Computational Materials Engineering, which is accelerating implementation of advanced materials for naval systems, platforms, and power and energy applications. ONR D&I searches out the most innovative scientific research with potential for valuable navy applications.

Over the years, ONR has supported investigators for Nobel prize-winning research, most recently in 2014 for the development of super-resolved fluorescence microscopy (nanoscopy), in 2013 for the development of multi-scale models for complex chemical systems, and in 2010 for the development of the new single-atomic-layer material graphene. Five ONR-sponsored researchers have received the prestigious MacArthur Foundation award, the most recent in 2014 for nanotechnology with application to smaller and more powerful electronic devices for advanced surveillance, communications, solar power, and health-monitoring systems.

Status

Investments in basic and applied research across multiple disciplines help to mitigate risk and provide the foundation for discovering and maturing new technologies. ONR works with researchers across the country, from the Naval Research Laboratory to warfare centers, federal agencies, academia, and industry, helping to keep naval forces technologically dominant and affordable. The D&I investments also continue to expand international collaborations with strategic partners.

Developers

Office of Naval Research — Arlington, Virginia

Electromagnetic Maneuver Warfare Command & Control (EMC2)

Description

The Electromagnetic Maneuver Warfare Command & Control effort aims to develop the command and control for frequency and functional capabilities across platforms and battle groups. This is an early step towards the ultimate goal of real-time, optimized coordination and interoperability to use any part of the electromagnetic (EM) spectrum for any required function. Potential operational impacts include combined EM warfare capabilities in the sea, air, and land domains to generate enhanced combat effects, countermeasures, ultra-wide frequency coverage, and agility to ensure communications surveillance and situational awareness in congested and contested environments.

Status
The Chief of Naval Research selected EMC2 as a FY 2016 Innovative Naval Prototype New Start.

Developers
Office of Naval Research — Arlington, Virginia

Electromagnetic Railgun (EMRG)

Description
The Electromagnetic Railgun Innovative Naval Prototype is a long-range weapon that fires projectiles using electricity instead of chemical propellants. Electricity generated by the ship is stored in the pulsed power system over several seconds. The stored electric pulse is released into the railgun, creating magnetic fields that accelerate a sliding metal conductor, or armature, between two rails, launching projectiles at speeds up to Mach 7.5. The kinetic-energy projectile eliminates the hazards of high explosives in the ship and unexploded ordnance on the battlefield. When fielded, EMRG will be a flexible weapon system capable of addressing many critical missions with its long-range, persistent precision-fires and deep magazines. Low cost per engagement shifts the cost curve to Navy's advantage. This multi-mission weapon system fulfills a range of needed capabilities including naval surface fire support, anti-surface warfare, and self-defense.

Status
The EMRG effort began in FY 2005 with a focus on the barrel, power storage, and rail technology. In 2015, the Navy is testing full-scale industry advanced composite launchers for structure strength and manufacturability, and has advanced the pulsed-power system design from single-shot to actively cooled repeated rate operations. Building on the success of the first phase, the second phase started in 2012 with a focus on developing equipment and techniques to fire ten rounds per minute. Thermal-management techniques required for sustained firing rates are in development for both the launcher system and the pulsed-power system. The Office of Naval Research will develop a tactical prototype EMRG launcher and pulsed-power architecture suitable for advanced testing both afloat and ashore. Railgun demonstration has been funded to occur in FY 2016.

Developers
Naval Surface Warfare Center (NSWC) Dahlgren — Dahlgren, Virginia
Office of Naval Research — Arlington, Virginia

Energy System Technology Evaluation Program (ESTEP)

Description
The U.S. Navy has always been a leader in energy research. The Energy System Technology Evaluation Program leverages Navy prowess in combination with the best from commercial sector advances. ESTEP conducts real-world advanced-technology demonstrations to evaluate emerging energy technologies using

Navy and Marine Corps facilities as test beds. The technology focuses on innovative pre-commercial and nascent commercial energy technologies obtained from open-market sourcing, including companies from within the venture capital and small business communities. Additionally, each ESTEP project requires participation by Department of the Navy (DoN) civilians, military personnel or veterans in key technical or business project roles, thus providing real-world training and education opportunities for the future DoN energy workforce.

Status

ESTEP is an ONR program sponsored through the Sea Warfare and Weapons Department.

Developers

Naval Facilities Command	Washington, D.C.
Naval Postgraduate School	Monterey, California
Office of Naval Research	Arlington, Virginia
Space and Naval Warfare Systems Command	San Diego, California

Image courtesy of Hydroid, Inc.

Forward-Deployed Energy and Communications Outpost (FDECO)

Description

The Forward Deployed Energy and Communications Outpost Innovative Naval Prototype (INP) addresses advanced technology to provide an undersea energy and communications infrastructure necessary to assure undersea dominance. This project provides unmanned undersea vehicles the expeditionary, forward-deployed capability necessary for force multiplication in an anti-access/area-denial environment by extending their reach, situational awareness, and standoff advantage. Technology developments will focus on energy management and transfer technologies that: enable autonomous undersea operations; provide system architectures that are persistent, scalable, and mission agile; provide communication and energy support in degraded and contested environments; and provide a platform-agnostic solution that reduces development and maintenance costs. FDECO will use a phased approach to demonstrate the architecture and enabling technologies that support platforms and sensors.

Status

The FDECO INP officially starts in FY 2016. During FY 2015, the focus is on architecture planning, preparing for an industry day, identifying important technologies, and preliminary planning for Phase 1 demonstrations.

Developers

Naval Sea Systems Command	Washington, D.C.
Office of Naval Research	Arlington, Virginia
Space and Naval Warfare Systems Command	San Diego, California

Future Naval Capabilities (FNC)

Description

The Office of Naval Research (ONR) Future Naval Capabilities program is a requirements-driven science and technology (S&T) program focused on developing and transitioning advanced component technologies to programs of record or directly to the warfighter more quickly (typically three-to-four years) than a traditional acquisition program. FNCs are near-term projects and represent the requirements-driven, technologically mature, delivery-oriented portion of the naval S&T portfolio. The FNC program aims to deliver mature products for integration into platforms, weapons, sensors, or improvements to Navy and Marine Corps warfighting and support capabilities. FNCs are governed by a formal set of business rules that ensure all stakeholders are involved in program oversight, management, and execution. By design, FNCs strengthen S&T coordination between the Fleet/Fleet Marine Force, S&T, acquisition, and resource-requirements communities.

FNC products are selected annually to address specific gaps, with final prioritization approved by a three-star Technology Oversight Group. FNC products are often based on previous early research investments and are intended to transition to the Fleet/Fleet Marine Force within a four-year timeframe. FNC project selection takes into account related work in other naval centers of excellence, the Department of Defense, other government agencies, industry, and academia. The FNC program has already registered several successes, including:

- The Advanced Power Generation FNC transitioned two important technologies to the Alternative Power Sources for Communications Equipment program at the Marine Corps Systems Command. The Ground Renewable Expeditionary Energy System is a series of solar panels and rechargeable batteries that provide an average continuous output of 300 watts of power, filling the energy gap between what a large power generator and a battery provide. The other deliverable was a man-portable, JP-8-fueled, 500-1,000 watt generator. It has an auto-start capability for use in conjunction with renewable energy and storage systems. These technologies are enabling Marine Corps expeditionary forces to keep pace with increasing energy demands, while reducing the logistical footprint associated with fuel and battery usage.
- The new Axial-Flow Waterjet Mk 1, an FNC product, can move nearly half-a-million gallons of seawater per minute, providing more thrust per unit than in-service commercial waterjets. Four of the new waterjets will propel the Littoral Combat Ship (LCS) to speeds greater than 40 knots. Full-scale sea trials on the USS Milwaukee (LCS 5) are expected to occur by 2016. This new waterjet increases high-speed operational capability and availability for the LCS, which reduces total ownership cost by requiring fewer dry dockings and less propeller maintenance due to cavitation damage.

- Information Architecture for Improved Decision Making, a submarine mission-planning application, will integrate the numerous sources of reference information needed to develop mission plans into one workspace, significantly reducing operator workloads and allowing the submarine command team to focus on critical operations rather than data assembly. Although designed for transition to U.S. submarines, the application was demonstrated to Royal Australian Navy submariners at the HMAS Stirling naval base, and will now also be used there as well.

- The Large Vessel Interface Lift-on/Lift-off Crane FNC underwent final testing on the SS Flickertail State, demonstrating its ability to raise and lower containers into cell guides under Sea State 3 conditions. This crane system senses and compensates for the relative motion between two ships and stabilizes containers during transfer, enabling the rapid and safe at-sea transfer of heavy loads during adverse weather conditions.

Status

The FNC program began in FY 2002 to improve the delivery of new technological capabilities to the warfighter. Approved projects are required to have technology-transition agreements that document the commitment of ONR, the resource sponsor, and the acquisition program to develop, deliver, and integrate products into new or upgraded systems to be delivered to the operating forces. Every FNC product's technical and financial milestones are reviewed annually and must meet required transition commitment levels for S&T development to continue. Products that no longer have viable transition paths are terminated, and residual resources are used in compliance with Navy priorities, charters, business rules, and development guidelines.

Developers

Office of Naval Research — Arlington, Virginia

Integrated Topside (InTop)

Description

The Integrated Topside Innovative Naval Prototype (INP) program is developing a revolutionary way to provide radio frequency (RF) services on board naval platforms. InTop does this through an integrated, multifunction, multi-beam topside aperture construct that has a modular, open RF architecture, software-defined functionality, and the capability to synchronize and optimize RF functions for electromagnetic interference (EMI) and electromagnetic compatibility mitigation. The InTop program is designing and building a scalable family of electronic warfare (EW), radar, information operations (IO), and communication capabilities to support multiple ship classes. InTop's design facilitates best-of-breed technology and cost-effective upgrades. The InTop vision is to dominate the RF spectrum, enable innovation through RF open architecture (hardware and software), and create affordable systems that are scalable across platforms. In the past, each

new RF system was designed, developed, and procured independently. This led to a significant increase in the number of topside antennas. This created EMI and electromagnetic control issues, radar cross-section vulnerabilities, and negatively impacted the overall performance of critical ship EW, IO, and communication functions. InTop is addressing these issues through a holistic approach to designing RF systems. In addition, InTop is providing a flexible and agile RF infrastructure that will enable the Navy to maneuver within the EM spectrum, operate in an anti-access/area-denial environment, and achieve its vision for information dominance and EM maneuver warfare.

Status

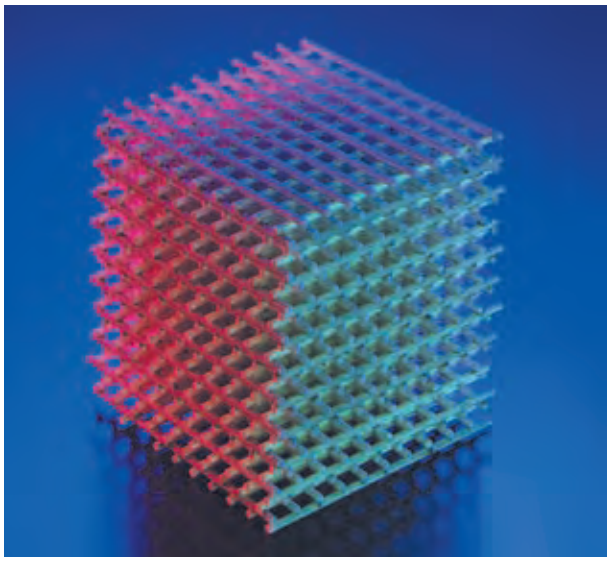
The InTop INP began in FY 2010 and as of end-FY 2014 had awarded 14 contracts. It has designed and is building a Wideband Submarine Satellite Communications Antenna that has a dual X-band uplink transmit array that is complete and tested closing a defense satellite communications system link from the Naval Undersea Warfare Center (NUWC) to Aberdeen, Maryland, in July 2013. The wideband receive array with four simultaneous links will be integrated with the transmit array and delivered to NUWC for final testing in 2015. This antenna is the technology development phase for the Submarine Advanced High Data-Rate program.

InTop has also designed and built an EW/IO/Communication advanced development model that was delivered to the Naval Research Laboratory's Chesapeake Bay Detachment. Prior to delivery to NRL, this prototype demonstrated four simultaneous line-of-sight communications missions in X- and Ku-bands concurrently with eight simultaneous electronic-attack engagements. This prototype is the technical development phase for the Surface Electronic Warfare Improvement Program Block 3 and provides the capability to support communication and IO functions through that system.

InTop is also designing a fully digital, flexible distributed array radar prototype and will begin building this prototype in FY 2015. Finally, the InTop program has developed a resource allocation manager (RAM) that enables optimization of RF resources needed to complete their missions. The RAM-improved flexibility provides "on-the-fly" resource management that generates more capability to the commander than would have been available with individual legacy systems. Additional contracts in other RF functional areas are forthcoming.

Developers

Office of Naval Research — Arlington, Virginia



Lightweight and Modern Metals Manufacturing Innovation (LM3I) Institute

Description

The Lightweight and Modern Metals Manufacturing Innovation Institute is part of the National Network for Manufacturing Innovation (NNMI) initiative launched by President Obama to strengthen the innovation, performance, competitiveness, and job-creating power of U.S. manufacturing. The LM3I Institute program is managed by the Office of Naval Research (ONR) and is focused on advancing a systems-level approach to the design and manufacturing of lightweight components and structures leading to enhanced system performance, greater energy efficiency, and lower life-cycle cost: characteristics that are of great importance to the Department of Defense. The LM3I Institute is a public/private partnership that brings government, industry, and academia together in an environment where joint development and commercialization of alloys, processes, and products can occur. The focus of the LM3I Institute is on the integrated design and manufacturing of lightweight components and structures for commercial and defense applications. The technical approach leverages Integrated Computational Materials Engineering concepts and includes the verification of designs through pilot production and validation through experimental testing. The long-term goals are to create market expansion and new consumers of lightweight products. Partnerships with automotive, aerospace, energy, defense, and recreational equipment industries will enable maturation and scale-up of modern metals to maintain global cost competitiveness for American industries and technological leadership for U.S. national security.

Status

ONR awarded the cooperative agreement for the LM3I Institute in the first quarter of 2014. The LM3I Institute stood-up its main headquarters staff, selected a headquarters site, and in early 2015 is waiting completion of the building. The LM3I Institute Board of Directors has met, and draft legal agreements for the LM3I Institute consortium are under review with the partner organizations. The LM3I Institute technical staff has worked with research and development partners to propose a first set of design and manufacturing research projects with the industrial partners; once the partner agreements are in place, the Institute will finalize initial project activities.

Developers

Edison Welding Institute	Columbus, Ohio
Office of Naval Research	Arlington, Virginia
The Ohio State University	Columbus, Ohio
University of Michigan	Ann Arbor, Michigan

Naval Research Laboratory (NRL)

Description

The Naval Research Laboratory is the Department of the Navy's (DoN) in-house, corporate laboratory. The NRL base program carries out research to meet needs identified in the Naval S&T Strategic Plan and sustains world-class skills and innovation. The broad-based core scientific research at NRL serves as a foundation that can be focused on any particular area of interest to develop technology rapidly from concept to operation when high-priority, short-term needs arise. NRL has served the Navy, Marine Corps, and the Nation for more than 90 years, with broad-breadth research that facilitates quick assimilation of critical ideas and technologies for the United States, as well as those being developed overseas for U.S. exploitation or countermeasures. NRL is the lead Navy laboratory for research in space systems, firefighting, tactical electronic warfare, microelectronic devices, and artificial intelligence.

NRL lines of business include battlespace environments, electronics and electronic warfare, information systems technology, materials, sensors, space platforms, technology transfer and undersea warfare. For example, NRL research explores naval environments with wide-ranging investigations that measure parameters of deep oceans, analyze marine atmospheric conditions, monitor solar behavior, and assess survivability of critical naval space assets. Detection and communication capabilities benefit from research that exploits new portions of the electromagnetic spectrum, extends ranges to outer space, and enables reliable and secure transfer of information. In addition, autonomous systems, bio-molecular science, engineering, firefighting, fuels, lubricants, nanotechnology, shipbuilding materials, acoustics, submarine habitability, superconductivity, and virtual reality are in NRL's research portfolio.

Status

Research and projects continue in a broad spectrum of fields.

Developers

Naval Research Laboratory	Washington, D.C.
Office of Naval Research	Arlington, Virginia

Navy Manufacturing Technology Program (ManTech)

Description

The Navy ManTech Program is an industrial-preparedness program providing for the development of enabling manufacturing technology and the transition of this technology for the production and sustainment of Navy weapon systems. Navy ManTech works with defense contractors, the naval research enterprise, Navy acquisition program offices, and research partners to develop improved processes and equipment. Project success is measured by implementation of these technologies on the factory floor. Navy ManTech's customers include acquisition

Image courtesy of Lockheed Martin.

program managers and industry partners responsible for moving major Navy weapon systems from development into production and Navy logistics managers at the naval depots and shipyards responsible for repair, overhaul, and remanufacture of these systems. Reducing the acquisition and life-cycle cost of submarine, ship, and aircraft platforms is a critical Navy goal.

Indeed, Navy ManTech is focused on affordability improvements for key acquisition programs.

Navy ManTech performs affordability assessments to measure progress toward meeting program and ManTech affordability goals. The affordability assessment on a project basis is an engineering rough order of magnitude cost-reduction estimate of dollars-per-hull or dollars-per-aircraft. These assessments are reviewed by the implementing industrial facility, forwarded to the Navy ManTech Office for analysis, and then routed to the associated program office for concurrence. ManTech helps these programs achieve their respective affordability goals by transitioning needed manufacturing technology which, when implemented, results in a cost reduction or cost avoidance.

Status

In early 2015, ManTech has affordability initiatives underway for the *Virginia* (SSN 774)-class submarine program, the *Ohio* (SSBN 726)-class replacement program, the *Ford* (CVN 78) aircraft carrier program, the *Arleigh Burke* (DDG 51)-class guided-missile warship program, the Littoral Combat Ship program, the F-35 *Lightning II* Joint Strike Fighter (JSF) program, and the CH-53K *King Stallion* heavy-lift helicopter program.

The *Virginia*-class affordability initiative has been a major success for both Navy ManTech and the SSN 774 program office and was a key contributor to the Navy's "two-for-four" cost-reduction initiative. The *Virginia*-class ManTech affordability portfolio contains approximately 70 projects with an investment of some $69.2 million and a potential cost savings of more than $37.5 million per hull. The August 2014 General Dynamics Electric Boat implementation analysis listed 32 ManTech affordability projects that had completed and had either been implemented or were being implemented. Together, these projects totaled cost-savings of $27.7 million per submarine. With two submarines procured every year, the annual *Virginia*-class affordability savings through 2014 were greater than the entire annual ManTech budget. For that, the *Virginia*-class affordability team received a Department of Defense Value Engineering award.

ManTech's F-35 Affordability Initiative is ramping up very successfully, as well. With a FY 2015 F-35 ManTech portfolio total of $27 million, the JSF Program Executive Office estimates a total DoD savings of approximately $700 million that can be allocated to reach cost goals. Two implementations include, first, the F-35 Canopy Thermoforming Automation initiative that has generated as much as $125 million in cost savings (depending on the number of spares required) on a $1.4 million Navy investment, and, second, the Controlled Volume Molding initiative that has generated more than $20 million in savings on a less than $200,000 investment.

Developers
Navy ManTech Centers of Excellence
Office of Naval Research — Arlington, Virginia

Netted Emulation of Multi-Element Signature against Integrated Sensors (NEMESIS)

Description
The Netted Emulation of Multi-Element Signature against Integrated Sensors Innovative Naval Prototype (INP) is developing a system of systems that will synchronize electronic warfare (EW) affects across a variety of distributed platforms to create coherent and consistent EW effects. NEMESIS emphasis is on the coordination and synchronization of EW capabilities and tactics against sensors in many scenarios.

Status
In 2013 the Navy approved NEMESIS as a FY 2014 INP New Start. Initial NEMESIS activity involved planning discussions among the Office of Naval Research, the Office of the Chief of Naval Operations, fleet commands and analysts, acquisition programs of record, government laboratories and warfare centers, the Defense Advanced Research Programs Agency, and federally funded research and development centers and university affiliated research centers. To ensure NEMESIS is addressing current and future threats to naval battle group operations, threat assessments were initiated with the Intelligence Community, and a Navy Warfare Development Command NEMESIS war game will be conducted in 2015.

Developers
Office of Naval Research — Arlington, Virginia

ONR Global

Description
The Office of Naval Research (ONR) Global fosters international science and technology (S&T) cooperation and facilitates the delivery of cutting-edge technology to Sailors and Marines. ONR Global connects the Navy Fleet and Marine Corps Forces, the international S&T community, and foreign military partners to ONR and the Naval Research Enterprise. ONR Global supports the full spectrum of research, development, test, and evaluation (RDT&E), from basic research to technology transition, through three programs: Science Advisor program; International Science program; and the Naval S&T Cooperation program.

The Science Advisor program includes 22 science advisors embedded in Navy and Marine Corps commander staffs to directly link with the naval warfighter and deliver S&T solutions that solve operational problems. The International Science program, executed by 23 ONR Global Associate Directors, searches the world for emerging scientific research and advanced technologies. The Associate Directors engage primarily academic institutions

and industry to develop opportunities for cooperative research that add value to naval S&T programs. And finally, a small ONR Global team coordinates ONR's partnerships with counterpart defense agencies through the Naval S&T Cooperation program. To best execute its mission, ONR Global maintains a forward presence at regional engagement offices in key locations around the world—London, United Kingdom; Prague, Czech Republic; Santiago, Chile; Sao Paulo, Brazil; Singapore; and Tokyo, Japan—as well as Joint, Navy and Marine Corps commands worldwide.

Status

ONR Global's efforts continue throughout a wide range of activities with international S&T partners, the Fleet and Marine Force and foreign military partners in support of the U.S. and allied/partner warfighters.

Developers

Office of Naval Research Global London, England

Science, Technology, Engineering and Mathematics (STEM)

Description

Successful naval operations rely on having access to the best people and technologies to effectively handle changing and increasingly diverse threat environments in the reality of finite resources. To ensure continuing security of the United States and allies/partners, while practicing prudent stewardship of resources, the Department of the Navy (DoN) continues to evolve a STEM strategy of education and workforce vertical integration, horizontal integration, and effectiveness evaluation.

Vertical integration of education and workforce strategically integrates education and exposure to STEM across pre-kindergarten through post-doctoral studies, with noted attention to military families and Veterans.

Horizontal integration focuses on education and workforce across local schools in the United States and abroad, in-person and in virtual environments.

Effectiveness evaluation systematically examines the costs and impacts of existing projects, programs, and policies, and builds effectiveness assessment and evaluation into future undertakings.

Actions to ensure access to needed STEM capabilities are based on understandings of current workforce demographics and STEM-proficient workers who might be attracted to other STEM settings because of greater personal and family benefits, among other reasons. The Department of the Navy's actions to recruit and grow workers with needed STEM skills are complemented by proven and innovative approaches to inform and involve students

and members of the public in all locations and at all ages and stages of life with exciting STEM work, training, and education opportunities. The Office of Naval Research (ONR) manages the coordination of the DoN's STEM efforts and coordinates interactions with STEM efforts across the government through interagency working groups.

Status

The Navy and Marine Corps STEM tool kit of education, workforce, grants, contracts, and collaborative interactions incorporates vertical and horizontal integration and effectiveness evaluation, to ensure access to workers with needed STEM capabilities. ONR's STEM portfolio addresses laboratory workforce initiatives, naval-level STEM coordination, ONR-level STEM initiatives, and execution of the naval portions of several Secretary of Defense-level STEM programs. Examples of particular projects cover young students (e.g., SeaPerch) through graduate students (e.g., Naval Research Enterprise Internship Program), and others with potential to contribute to naval STEM capabilities.

Developers

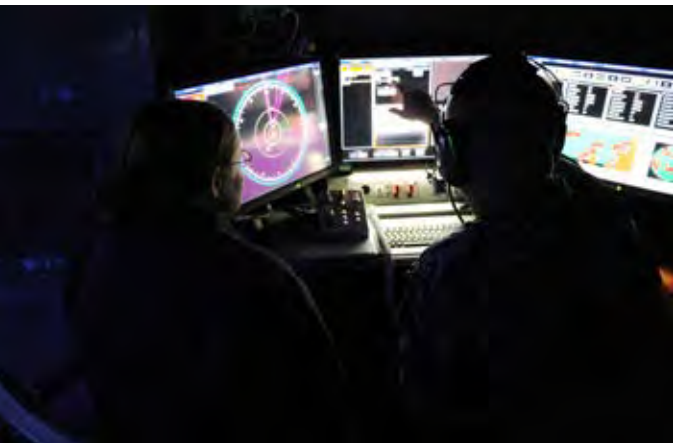
Office of Naval Research — Arlington, Virginia

Solid State Laser Quick-Reaction Capability (SSL-QRC) and Technology Maturation (SSL-TM)

Description

The Solid State Laser Quick-Reaction Capability and Technology Maturation are leap-ahead programs that provide naval surface platforms with a highly effective and affordable point-defense capability against surface and air threats, including asymmetric threats such as swarms of small boats and armed unmanned aerial vehicles (UAVs). The SSL provides discrimination, sensing, deterrence, and destructive capabilities that complement gun and missile kinetic-energy weapons. Generating high-intensity laser light from the ship's power, and a deep non-explosive magazine, the SSL focuses speed-of-light energy delivery through a beam director against multiple inbound threats. The SSL is already proven to be an effective alternative to expensive missile systems against low-cost targets.

The SSL program is transitioning directed-energy weapons technology from science laboratories and commercial applications to a ship self-defense weapon system. This revolutionary technology provides multiple payoffs to the warfighter. The ability to control and point the laser beam with pinpoint accuracy at long ranges allows for operation in any maritime environment. This concept has been proven through live-fire, at-sea demonstrations with the Maritime Laser Demonstration and Laser Weapon System (LaWS) on naval test ranges. The variability and adaptability of the beam director provide a graduated lethality capability, with minimal collateral damage. The program expects to generate low cost-per-engagement coupled with a very low lifecycle cost when compared to traditional kinetic munitions. Logistics support



costs compared to that of conventional explosive munitions are reduced.

Status

The SSL program began in FY 2012 to design, develop, fabricate, integrate, and test a 100-150 kilowatt SSL advanced development prototype intended for *Arleigh Burke* (DDG 51) Aegis guided-missile destroyers and Littoral Combat Ships. In 2013, the SSL program expanded with a quick-reaction capability effort for deployment of the 30kw LaWS EQ- 3(XN-1) laser weapon system on the USS Ponce (LPD/AFSB-I 15) in the Arabian Gulf. Efforts are underway to develop this technology into a formal program of record for ship self-defense, with lessons learned shaping a longer-term, higher-power, SSL-Technology Maturation program.

Developers

Office of Naval Research	Arlington, Virginia
Naval Sea Systems Command	Washington, D.C.
Space Warfare Systems Command	San Diego, California

SwampWorks

Description

The Office of Naval Research (ONR) SwampWorks program explores innovative, high-risk, and disruptive technologies and concepts. Due to the portfolio's high-risk nature, SwampWorks conducts short exploratory studies to examine the maturation of a proposed technology before making substantial investments. Efforts are smaller in scope than Innovative Naval Prototypes (INPs) and are intended to produce results in less than three years. SwampWorks projects are not limited to any set of technology areas; rather, SwampWorks invests in innovative technology development and experimentation that will ultimately provide a dramatic improvement for the warfighter. Successful SwampWorks efforts include:

- The eXperimental Fuel Cell Unmanned Aerial System (XFC UAS). The XFC UAS is a fully autonomous, all-electric fuel cell-powered, folding-wing UAS with an endurance of greater than six hours. The non-hybridized power plant supports the propulsion system and payload for a flight endurance that enables relatively low-cost, low-altitude intelligence, surveillance, and reconnaissance missions. The XFC UAS uses an electrically assisted takeoff system that lifts the plane vertically out of its very small-footprint container, which enables launch from a variety of platforms, even pickup trucks or small surface vessels.
- High-Temperature Superconducting (HTS) Minesweeping Testing on unmanned surface vehicles (USVs). This project designed, built and tested a HTS magnetic/acoustic minesweeping system for a 40-foot USV. ONR conducted two successful on-the-water demonstrations of the HTS minesweeping system to demonstrate the system performance and robustness of this technology. The system was tested during a September 2013 fleet

experiment in California for a total of 46 hours (557 nautical miles) of simulated on-water minesweeping with no significant issues. The extended underway operations of the HTS minesweeping system have proven the technology is reliable during long periods of operation including night operations. The data collected by Versatile Exercise Mine Systems Mk-74/75 show that the HTS minesweeping system is capable of producing a magnetic dipole moment to activate magnetic-influence mines at standoff distances. This activation method coupled with the performance of the USV craft will produce assured access with minimal risk.

- The Advanced Port Security Barrier (APSB). Waterside security for ships is a top priority for naval force protection. The current port security barrier is a net-capture barrier that has been deployed since 2001, but is proving to be cost-prohibitive in operations, maintenance, and sustainment. The goal of the APSB project is to test and experiment with passive water barrier replacement systems that will include a completely remote gate opening and closing capability (with a mechanical backup), reducing or eliminating the cost for manpower to execute that function. HALO Maritime Defense Systems has produced a truly innovative water-barrier system based on a catamaran, double-wall barrier configuration to stop an attacking boat on impact. It does this by transferring the kinetic energy of the force into the water mass that is trapped between the barrier walls. The anchoring system, unlike with the in-service PSB, is used for station keeping only and not for stopping power. As a result, the HALO barrier is designed for uniform strength and stopping power across the length of the barrier.

Image courtesy of HALO Maritime Defense Systems.

Status

SwampWorks has substantial flexibility in planning and execution. Its streamlined approval process allows for the shortest possible technology development and fielding timeframe.

Developers

HALO Maritime Defense Systems — Newton, New Hampshire
Office of Naval Research — Arlington, Virginia

TechSolutions

Description

TechSolutions is a transformational business process created by the Office of Naval Research to provide Sailors and Marines with a web-based, Internet tool for bringing technology needs to the attention of the naval science and technology (S&T) community for rapid response and delivery. The Internet connection enables TechSolutions to receive and act on recommendations and suggestions from Navy and Marine Corps personnel working at the deckplate and ground levels on ways to improve mission effectiveness through the application of technology. It is focused solely on delivering needed technology to the Navy and Marine Corps and moving the sea services toward increased technology

need awareness. TechSolutions uses rapid prototyping of technologies to meet specific requirements with definable metrics and includes appropriate Systems Command elements in an integrated product team concept. While neither a substitute for the acquisition process nor a replacement for the systems commands, TechSolutions aims to provide the Fleet and Marine Force with a prototype demonstration that is a 60- to 80-percent solution addressing immediate needs and can be easily transitioned by the acquisition community. Examples include:

- Improved Flight Deck Clothing. This project provides an upgrade to the in-service cotton flight deck jersey and trousers. The new jerseys are made of moisture-wicking fabric and the new trousers have secure pockets with stitching to prevent objects from falling out and posing a hazard to flight operations. The redesigned trousers fit better and are less expensive to manufacture. The new high-tech fabric is durable, provides better fire protection, and resists the absorption of petroleum products.

- Multiple Weapon Control Sight (MWCS). The sight provides Marines with an improved day/night fire-control capability for several infantry weapon systems, such as mortars and automatic grenade launchers. This allows Marines to engage targets effectively during day and night operations. This multi-weapon capability decreases the number of different sighting systems that warfighters are required to learn and lessens the burden on the supply and maintenance infrastructure. The Marines have tested and evaluated the upgraded sight in the field' and their response has been positive.

- The Catapult Capacity Selector Valve (CSV) Calculator. The calculator is a handheld electronic personal digital assistant (PDA) device with custom software that allows catapult officers to accurately and quickly compute the proper CSV setting for an aircraft carrier steam catapult. The legacy CSV procedure required catapult officers to calculate the proper CSV setting by performing a series of manual lookups in paper reference tables. The PDA has a touch screen that is operable with gloved hands, a tethered stylus, and a large navigation button. It is readable in the sunlight, is weather tolerant, and has a battery life of approximately 14 hours.

Status

To succeed in its S&T mission, TechSolutions needs active involvement and participation by the operating forces. Every query will be answered, and if a demonstration is performed or prototype developed, the submitter will be invited to participate in the process from the start through final delivery of the technology. TechSolutions aims to deliver a demonstration or prototype within 12 months.

Developers

Office of Naval Research — Arlington, Virginia

APPENDIX A
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APPENDIX B
GLOSSARY

A2/AD	Anti-Access/Area-Denial
AACUS	Autonomous Aerial Cargo/Utility System
AADC	Area Air Defense Commander
AADS	Amphibious Assault Direction System
AAG	Advanced Arresting Gear
AAI	Airborne ASW Intelligence
AAMDTC	Aegis Ashore Missile Defense Test Complex
AARGM	Advanced Anti-Radiation Guided Missile
AAW	Anti-Air Warfare
ABMD	Aegis Ballistic Missile Defense
ABNCP	Airborne Command Post
ABS	Assault Breaching System
ACAT	Acquisition Category
ACB	Amphibious Construction Battalion, or, Advanced Capability Build
ACCES	Advanced Cryptologic Carry-on Exploitation System
ACDS	Advanced Combat Direction System
ACINT	Acoustic Intelligence
ACS	Aerial Common Sensor, or, Aegis Combat System
ACTD	Advanced Concept Technology Demonstration
ACU	Assault Craft Unit
AD	Air Defense
ADCAP	Advanced Capability
ADM	Acquisition Decision Memorandum
ADNS	Automated Digital Network System
ADP	Automated Data Processing
ADS	Advanced Deployable System
AE	Assault Echelon
AEA	Airborne Electronic Attack
AEHF	Advanced Extremely-High Frequency
AEL	Authorized Equipage List
AEM/S	Advanced Enclosed Mast/Sensor
AESA	Active Electronically Scanned Array
AESOP	Afloat Electromagnetic Spectrum Operations Program
AFATDS	Advanced Field Artillery Tactical Data System
AFB	Air Force Base
AFG	Airfoil Group
AFFF	Aqueous Film Forming Foam
AFOE	Assault Follow-On Echelon
AFQT	Armed Forces Qualification Test
AFSB	Afloat Forward Staging Base
AG	Aerographer's Mate [enlisted classification]
AGF/LCC	Amphibious Command Ship
AGS	Advanced Gun System
AHE	Advanced Hawkeye
AIEWS	Advanced Integrated Electronic Warfare System
AIP	Anti-Submarine Warfare Improvement Program
AIS	Automatic Identification System
AISR&T	Airborne Intelligence, Surveillance, Reconnaissance, and Targeting
ALCS	Airborne Launch Control System
ALFS	Airborne Low-Frequency Active Sonar
ALMDS	Airborne Laser Mine Detection System
AMCM	Airborne Mine Countermeasures
AMDR	Air and Missile Defense Radar
AMF	Airborne Maritime Fixed
AMNS	Airborne Mine Neutralization System
AMOD	Aegis Modernization
AMPIR	Airborne Polarmetric Microwave Imaging Radiometer
AMRAAM	Advanced Medium-Range Air-to-Air Missile
ANDVT	Advanced Narrow-Band Digital Voice Terminal
AOA	Amphibious Objective Area, or, Analysis of Alternatives
AOE	Fast Combat Support Ship
AOR	Area of Responsibility
APB	Advanced Processor Build, or, Acquisition Program Baseline
APS	Air Force Prepositioning Ships
APSB	Advanced Port Security Barrier
APTS	Afloat Personal Telephone Service
ARCI	Acoustic Rapid COTS Insertion
ARG	Amphibious Ready Group
ARI	Active Reserve Integration
ARM	Anti-Radiation Missile
AS	Submarine Tender, or, Acquisition Strategy
ASDS	Advanced SEAL (or swimmer) Delivery System
ASCM	Anti-Ship Cruise Missile
ASO	Automated Shipboard Weather Observation System
ASROC	Anti-Submarine Rocket
ASUW	Anti-Surface Warfare
ASW	Anti-Submarine Warfare
ASWC	Anti-Submarine Warfare Commander
AT	Advanced Targeting
ATA	Automatic Target Acquisition
ATC	Air Traffic Control
ATD	Advanced Technology Demonstration, or, Aircrew Training Device
ATDLS	Advanced Tactical Data Link System
ATF	Fleet Ocean-going Tug
ATFLIR	Advanced Targeting Forward-Looking Infrared
ATFP	Anti-Terrorism and Force Protection
ATM	Asynchronous Transfer Mode
ATSM	Active Target Strength Measurement
ATT	Anti-Torpedo Torpedo
ATW	Advanced Threat Warning
ATWCS	Advanced Tomahawk Weapon Control
AURE	All-Up Round Equipment
AUWS	Assessment Underwater Work System
AWACS	Airborne Warning and Control System
AWS	Aegis Weapon System
BAH	Basic Allowance for Housing, or, Booz Allen Hamilton
BAMS	Broad Area Maritime Surveillance
BCA	Broadcast Control Authority
BCO	Base Communications Office
BDI	Battle Damage Intelligence
BDII	Battle Damage Indication Imagery
BEWL	Biometrics Enabled Watchlist
BFCAPP	Battle Force Capability Assessment and Programming Process
BFEM	Battle Force Email
BFTN	Battle Force Tactical Network
BFTT	Battle Force Tactical Trainer
BLAST	Blast Load Assessment Sense and Test
BLII	Base-Level Information Infrastructure
Blk	Block
BLOS	Basic Line of Sight
BLU	Bomb Live Unit
BMC4I	Battle Management Command, Control, Communications, Computers, and Intelligence
BMD	Ballistic Missile Defense
BMDS	Ballistic-Missile Defense System
BMU	Beach Master Unit
BMUP	Block Modification Upgrade Program

BPI	Business Process Improvement
BPR	Business Process Re-Engineering
BRAC	Base Realignment and Closure
BSAR	Broadband Sonar Analog Receiver
BWA	Biological Warfare Agent
C2BMC	Command, Control, Battle Management, and Communications
C2OIX	Command and Control Information Exchange
C2P	Command and Control Processor
C4I	Command, Control, Communications, Computers, and Intelligence
C4ISR	Command, Control, Communication, Computers, Intelligence, Surveillance, and Reconnaissance
C4N	Command, Control, Communications, Computers, and Navigation
C3F	Commander, Third Fleet
C5F	Commander, Fifth Fleet
C6F	Commander, Sixth Fleet
C7F	Commander, Seventh Fleet
CAC	Common-Access Cards
CAD	Component Advanced Development
CADRT	Computer-Aided Dead-Reckoning Table
CAL/VAL	Calibration and Validation
CANES	Consolidated Afloat Networks and Enterprise Services (CANES)
CAS	Close Air Support
CATM	Captive Air Training Missiles
CB	Chemical, Biological
CBASS	Common Broadband Advanced Sonar System
CBMU	Construction Battalion Maintenance Units
CBR	Chemical, Biological, and Radiological
CBRND	Chemical, Biological, Radiological, Nuclear Defense
CBRNE	Chemical, Biological, Radiological, Nuclear, and Enhanced explosive
CBSP	Commercial Broadband Satellite Program
CCD	Center for Career Development
CCE	Common Computing Environment
CCG	Computer Control Group
CCP	Common Configuration Program
CCS	Combat Control System
CDA	Commercially Derived Aircraft
CDD	Capability Development Document
CDHQ	Central Command Deployable Headquarters
CDLMS	Common Data Link Management System
CDL-N	Common Data Link, Navy
CDLS	Common Data Link System
CDR	Critical Design Review
CDS	Combat Direction System, or, Common Display System
CEB	CNO Executive Board
CEC	Cooperative Engagement Capability
CENTRIXS	Combined Enterprise Regional Information Exchange System
CFFC	Commander, Fleet Forces Command
CG	Guided-Missile Cruiser
CIB	Common Interactive Broadband
CIE	Collaborative Information Environment
CIO	Chief Information Officer
CIU	Control Indicator Unit
CIWS	Close-In Weapon System
CJF	Commander, Joint Forces
CLF	Combat Logistics Force
CLFA	Compact Low-Frequency Active (sonar)
CLIP	Common Link Integration Processing
CM	Cryptographic Modernization
CMC	Common Missile Compartment
CMCO	Counter Mine Counter Obstacle
CMF	Common Message Format
CNATRA	Commander, Air Naval Air Training Command
CND	Computer Network Defense
CNIC	Commander, Naval Installations Command
CNO	Chief of Naval Operations
CNRC	Commander, Naval Recruiting Command
CNRRR	Commander, Naval Reserve Recruiting Region
CNS	Communication/Navigation System
CNVA	Computer Network Vulnerability Assessment
COBRA	Coastal Battlefield Reconnaissance and Analysis
COE	Common Operating Environment
COLDS	Cargo Offload and Discharge System
COMINT	Communications Intelligence
COMSATCOM	Commercial Satellite Communications
COMSEC	Communications Security
COMSUBGRU	Commander, Submarine Group
CONOPS	Concept of Operations
CONUS	Continental United States
COP	Common Operational Picture
CORIVRON	Coastal Riverine Squadron
COS	Class of Service
COTS	Commercial-Off-The-Shelf, or, Cargo Offload and Transfer System
CPD	Capability Production Document
CPS	Common Processor System
C-RAM	Counter-Rocket, Artillery, and Mortar
CRF	Coastal Riverine Force
CSAR	Combat Search and Rescue
CSC	Computer Sciences Corporation
CSDTS	Common Shipboard Data Terminal Set
CSEA	Combat System Engineering Agent
CSF	Consolidated Storage Facility
CSG	(Aircraft) Carrier Strike Group
CSIT	Combat System Integration and Test
CSL	Common Source Library
CSRR	Common Submarine Radio Room
CSV	Catapult Capacity Selector Valve calculator
CSWP	Commercial Satellite Wideband Program
CTAPS	Contingency Tactical Automated Planning System
CTE	Continuous Training Environment
CTF	Component Task Force, or, Commander Task Force
CTOL	Conventional Takeoff and Landing
CTP	Common Tactical Picture
CUAS	Cargo Unmanned Aerial Systems
CUP	Common Undersea Program
CV	Carrier Variant aircraft, or, Conventionally (oil-fired) Powered Aircraft Carrier
CVBG	Aircraft Carrier Battle Group
CVIC	Aircraft Carrier Intelligence Center
CVN	Nuclear-Powered Aircraft Carrier
CWSP	Commercial Wideband Satellite Program
CY	Calendar Year
D5E	Destruction, degradation, denial, disruption, deceit, and exploitation
DAB	Defense Acquisition Board
DAMA	Demand Assigned Multiple Access
DAMTC	Direct-Attack Moving Target Capability
DAPS	Dorsal Auxiliary Protective Systems
DARPA	Defense Advanced Research Projects Agency
DBR	Dual-Band Radar
DCA	Defensive Counter-Air
DCC	Data Center Consolidation
DCGS–N	Distributed Common Ground System–Navy
DCGS	Distributed Common Ground System
DCID	Director, Central Intelligence Directive

DCL	Detection, Classification, and Localization
DCMS	Director, Communications Security Material Systems
DCNO	Deputy Chief of Naval Operations
DDG	Guided-Missile Destroyer
DECC	Defense Enterprise Computing System
DEIP	Dynamic Enterprise Integration Platform
DEM/VAL	Demonstration/Validation
DF	Direction Finding
DFU	Dry Filter Unit
DIB	Distributed Common Ground System Integration Backbone
DiD	Defense-in-Depth
DIF	Database Integration Framework
DII COE	Defense Information Infrastructure Common Operating Environment
DIMHRS	Defense Integrated Military Human Resource System
DIMUS	Digital Multi-beam Steering
DIO	Defensive Information Operations
DIRCM	Directed Infrared Countermeasures
DISA	Defense Information Systems Agency
DISN	Defense Information Systems Network
DJC2	Deployable Joint Command and Control
DMLGB	Dual-Mode Laser-Guided Bomb
DLS	Decoy Launching System
DMR	Digital Modular Radar, or, Digital Modular Radio
DMS	Defense Message System
DMSP	Defense Meteorology Satellite Program
DNM	Dynamic Network Management
DNS	Director, Navy Staff
DoD	Department of Defense
DoN	Department of the Navy
DOTMLPF	Doctrine, Organization, Training, Materiel, Leadership, Personnel, and Facilities
DPRIS/EMPRS	Defense Personnel Record Imaging System/ Electronic Military Personnel Record System
DRPM	Direct-Reporting Program Manager
DRSN	Defense Red Switch Network
DSCS	Defense Satellite Communications System
DSMAC	Digital Scene-Matching Area Correlation
DSN	Defense Switch Network
DSRV	Deep-Submergence Rescue Vehicle
DT	Developmental Testing
DTH	Defense Message System Transitional Hubs
EA	Electronic Attack
EAM	Emergency Action Message
EB	Electric Boat
EBEM	Enhanced Bandwidth Efficient Modem
ECCM	Electronic Counter-Countermeasures
ECIDS-N	Electronic Chart Display and Information System–Navy
ECM	Electronic Countermeasures
ECP	Engineering Change Proposal
ECR	Electronic Combat/Reconnaissance
ECS	Exterior Communication System
EDM	Engineering Development Model
EDS	Electronic Data Systems
EHF	Extremely High Frequency
EIS	Environmental Impact Statement
EKMS	Electronic Key Management System
ELC	Enhanced Lethality Cartridge
ELINT	Electronic Intelligence
EMALS	Electromagnetic Aircraft Launch System
EMCON	Emissions Control
EMD	Engineering and Manufacturing Development
EMI	Electro-Magnetic Interference
EMIO	Expanded Maritime Interception Operations
EMPRS	Electronic Military Personnel Record System
EMRG	Electromagnetic Rail Gun
EMS	Electromagnetic Spectrum
EMW	Expeditionary Maneuver Warfare
EO/IR	Electro-Optical/Infrared
EOC	Early Operational Capability
EOD	Explosive Ordnance Disposal
EOID	Electro-Optic Identification
EPLRS	Enhanced Position Location Reporting System
ER	Extended Range
ERAAW	Extended-Range Anti-Air Warfare
ERAM	Extended-Range Active [homing] Missile
ERM	Extended-Range Munition
ERNT	Executive Review of Navy Training
ERP	Enterprise Resource Planning
ESAPI	Enhanced Small Arms Protective Inserts
ESE	Electronic Surveillance Enhancement
ESG	Expeditionary Strike Group
ESL	Enterprise Software Licensing, or, Expected Service Life
ESM	Electronic Support Measures
ESSI	Enhanced Special Structural Inspection
ESSM	Evolved SeaSparrow Missile
ESU	Expeditionary Support Unit
ETC	Echo Tracker Classifier
EUCOM	U.S. European Command
EURCENT	European Central Command
EW	Electronic Warfare
FARP	Forward Arming and Refueling Point
FBE	Fleet Battle Experiment
FBM	Fleet Ballistic Missile
FDS	Fixed Distributed System
FDS-C	FDS-COTS
FEL	Free Electron Laser
FFG	Guided-Missile Frigate
FFSP	Fleet and Family Support Program
FHLT	Fleet High-Level Terminal
FIE	Fly-In Echelon
FITC	Fleet Intelligence Training Center
FLEX	Fatigue Life Extension
FLIR	Forward-Looking Infrared
FLMP	Fatigue Life Management Program
FLO/FLO	Float-On/Float-Off
FLTSAT	Fleet Satellite
FNC	Future Naval Capabilities
FOB	Forward Operating Base
FOC	Full Operational Capability
FORCEnet	Navy web of secure communications and information links
FOT	Follow-On Terminal
FOT&E	Full Operational Test and Evaluation
FP	Full Production
FRP	Full-Rate Production, or, Fleet Response Plan
FTS	Federal Telephone System, or, Full-Time Support
FUE	First Unit Equipped
FY	Fiscal Year
FYDP	Future Years Defense Plan
GBS	Global Broadcast Service
GBTS	Ground-Based Training System
GCCS	Global Command and Control System
GCCS-N	Global Command and Control System-Navy
GCS	Ground Control Station
GCSS	Global Command Support System
GDAIS	General Dynamics Advanced Information Systems
GDIS	General Dynamics Information Systems
GENDET	General Detail (personnel)
GENSER	General Service

GFE	Government-Furnished Equipment
GHMD	Global Hawk Maritime Demonstration system
GIG	Global Information Grid
GIG-BE	Global Information Grid-Bandwidth Expansion
GIG-ES	Global Information Grid Enterprise Services
GLTA	Guardian Laser Tracker Assemblies
GMF	Ground Mobile Force (Air Force)
GMM	[LCS] Gun Mission Module
GMS	Griffin Missile System, or, Guided-Missile System
GOTS	Government-Off-The-Shelf
GPNTS	GPS-based Positioning, Navigation, and Timing
GPS	Global Positioning System
GT	Gas Turbine
GTLC	Gryphon Technologies LC
GWS	Gun Weapon System
HA/DR	Humanitarian Assistance/Disaster Relief
HARM	High-Speed Anti-Radiation Missile
HCI	Human Computer Interface
HD/LD	High-Demand/Low-Density
HDR	High Data-Rate
HED	Hybrid Electric Drive
HEFA	Hydro-treated Esters and Fatty Acids
HF	High Frequency
HFI	Hostile Fire Indication
HFIP	High-Frequency Internet Protocol
HGHS	High-Gain High Sensitivity
HII	Huntington Ingalls Industries
HM&E	Hull, Mechanical, and Electrical (systems)
HMH	Heavy-Lift (helicopter) Squadron
HMI	Human-Machine Interface
HOLC	High Order Language Computer
HPC	Human Performance Center
HSI	Human Systems Integration
HTS	High-Temperature Superconducting
HUD	Heads Up Display
HWDDC	Hazardous Weather Detection and Display Capability
I&W	Indications and Warning
IA	Information Assurance
IAAS	Infrastructure as a Service
IAMD	Integrated Air and Missile Defense
IATF	IA Technical Framework
IBA	Interceptor Body Armor
IBS	Integrated Broadcast Service
IBS/JTT	Integrated Broadcast Service/ Joint Tactical Terminal
ICAO	International Civil Aviation Organization
ICAP	Improved Capability
ICD	Initial Capabilities Document
ICOP	Intelligence Carry-On Program
ICP	Integrated Common Processor
ICSTF	Integrated Combat Systems Test Facility
ICWI	Interrupted Continuous-Wave Illumination
IDECMS	Integrated Defensive Electronic Countermeasures System
IDIQ	Indefinite Delivery/Indefinite Quantity (contract)
IDS	Identity Dominance System
IDSN	Integrated Digital Switching Network
IDTC	Inter-Deployment Training Cycle
IED	Improvised Explosive Device
i-ENCON	Incentivized Energy Conservation
IET	Intelligence Exploitation Team
IETM	Interactive Electronic Technical Manual
IFF	Identification, Friend or Foe
ILS	Instrument Landing System
IMINT	Imagery Intelligence
INLS	Improved Navy Lighterage
INP	Innovative Naval Prototype
INS	Inertial Navigation System
IO	Information Operations
IOC	Initial Operational Capability
IP	Internet Protocol
IPARTS	Improved Performance Assessment and Readiness Training System
IPDS	Improved Point Detector System
IPPD	Integrated Product and Process Development
IPOE	Intelligence Preparation of Environment
IPR	Interim Program Review
IPS	Integrated Power System
IPT	Integrated Process Team
IR	Infrared
IRCCM	Infrared Counter-Countermeasures
IRST	Infrared Search and Track
IS	Information Systems
ISC	Integrated Ship's Control
ISDN	Integrated Services Digital Network
ISNS	Integrated Shipboard Network System
ISO	Investment Strategy Options
ISPP	Integrated Sponsor's Program Proposal
ISR	Intelligence, Surveillance, Reconnaissance
ISRT	Intelligence, Surveillance, Reconnaissance, and Targeting
ISS	Installation Subsystem
ISS	Information Superiority/Sensors
ISSP	Information Systems Security Program
IT	Information Technology
ITAB	Information Technology Acquisition Board
IU	Interface Unit
IUSS	Integrated Undersea Surveillance System
IW	Indications and Warning
IWS	Integrated Warfare Systems
J&A	Justification and Approval
JASA	Joint Airborne SIGINT Architecture
JASSM	Joint Air-to-Surface Standoff Missile
JATAS	Joint and Allied Threat Awareness System
JBAIDS	Joint Biological Agent Identification and Diagnostic System
JBTDS	Joint Biological Tactical Detection System
JC2-MA	Joint Command and Control-Maritime Applications
JCC	Joint Airborne SIGINT Architecture Modification Common Configuration
JCIDS	Joint Capabilities Integration and Development System
JCM	Joint Common Missile
JCREW	Joint Counter RCIED Electronic Warfare
JDAM	Joint Direct-Attack Munition
JDISS	Joint Deployable Intelligence Support Service
JDN	Joint Data Network
JFC	Joint Force Commander
JFCOM	Joint Forces Command
JFCOM JPO	Joint Forces Command Joint Program Office
JFMCC	Joint Forces Maritime Component Commander
JFN	Joint Fires Network
JFNU	Joint Fires Network Unit
JHDA	Joint Host Demand Algorithm
JHMCS	Joint Helmet Mounted Cueing System
JHSV	Joint High-Speed Vessel
JIC	Joint Intelligence Center
JICO/JSS	Joint Interface Control Officer Support System
JIE	Joint Information Environment
JIFC	Joint Integrated Fire Control
JLENS	Joint Land-Attack Cruise Missile Defense Elevated Netted Sensor
JMAST	Joint Mobile Ashore Support Terminal
JMCIS	Joint Maritime Command Information System

JMCOMS	Joint Maritime Communications Strategy
JMLS	Joint Modular Lighterage System
JMOD	Joint Airborne SIGINT Architecture Modification
JMPS	Joint Mission Planning System
JMPS-M	Joint Mission Planning System-Maritime
JNIC	Joint National Integration Center
JNMS	Joint Network Management System
JOA	Joint Operations Area
JOTBS	Joint Operational Test Bed System
JPACE	Joint Protective Aircrew Ensemble
JPALS	Joint Precision Approach and Landing System
JPATS	Joint Primary Aircraft Training System
JPEO	Joint Program Executive Office
JROC	Joint Requirements Oversight Council
JSF	Joint Strike Fighter
JSIPS	Joint Service Imagery Processing System
JSMO	Joint Systems Management Office
JSOW	Joint Standoff Weapon
JSPO	Joint System Program Office
JTA	Joint Tactical Architecture
JTAMDO	Joint Theater Air and Missile Defense Organization
JTDLMP	Joint Tactical Data Link Management Plan
JTIDS	Joint Tactical Information Distribution System
JTRS	Joint Tactical Radio System
JTT	Joint Tactical Terminal
JUWL	Joint Universal Weapon Link
JWICS	Joint Worldwide Intelligence Communications System
KDP	Key Decision Point
KPP	Key Performance Parameter
KSA	Key Systems Attribute
LAIRCM	Large Aircraft Infrared Countermeasures
LAN	Local Area Network
LANT	Atlantic
LANTIRN	Low-Altitude Navigation and Targeting Infrared At Night
LBSF&I	Littoral Battlespace Sensing, Fusion and Integration
LBS-UUV	Littoral Battlespace Sensing-Unmanned Undersea Vehicles
LCAC	Landing Craft, Air Cushion vehicle
LCC	Amphibious Command Ship
LCCA	Low-Cost Conformal Display
LCGR	Launch Control Group Replacement
LCS	Littoral Combat Ship
LCT	Landing Craft Tank vessel
LCU	Landing Craft Utility vessel
LD/HD	Low-Density/High Demand
LDR	Low Data Rate
LDUUV	Large-Diameter Unmanned Undersea Vehicle
LEAD	Launched Expendable Acoustic Decoy
LEAP	Lightweight Exo-Atmospheric Projectile
LEASAT	Leased Satellite
LFA	Low-Frequency Active
LGB	Laser-Guided Bomb
LHA	Amphibious Assault Ship
LHA(R)	Amphibious Assault Ship-Replacement
LHD	Amphibious Assault Ship
LHT	Lightweight Hybrid Torpedo
LIDAR	Light Detection and Ranging System, or, Light Detection and Ranging
LiOH	Lithium Hydroxide
LJDAM	Laser Joint Direct-Attack Munition
LMS	Local Monitor Station
LMSR	Large Medium-Speed Roll-On/Roll-Off
LOS	Line of Sight, or, Length of Service
LOTS	Logistics-Over-The-Shore
LPD	Amphibious Transport Dock ship
LPI	Low-Probability-of-Intercept
LPMP	Launch Platform Mission Planning
LPWS	Land-Based [Phalanx] Weapons System
LRIP	Low-Rate Initial Production
LRLAP	Long-Range Land-Attack Projectile
LRS&T	Long-Range Surveillance and Tracking
LSD	Dock Landing Ship
LSO	Landing Signal Officer
LSS	Littoral Surveillance System
LVT	Low-Volume Terminal
LX(R)	Dock Landing Ship Replacement
LWH	Lightweight Helmets
M/BVR	Medium/Beyond Visual Range missile
MA	Maritime Applications
MAGTF	Marine Air-Ground Task Force
MAMDJF	Maritime Air and Missile Defense of Joint Forces
MARCEMP	Manual Relay Center Modernization Program
MASINT	Measurement and Signature Intelligence
MAST	Mobile Ashore Support Terminal
MATT	Multi-mission Airborne Tactical Terminal
MAWS	Missile Approach Warning System
MCAS	Marine Corps Air Station
MCAST	Maritime Civil Affairs and Security Training
MCAT	Maritime Civil Affairs Teams
MCEN	Marine Corps Enterprise Network
MCM	Mine Countermeasures
MCP	Mission Capability Package
MCPON	Master Chief Petty Officer of the Navy
MCS	Mine Countermeasures Command, Control, and Support Ship, or, Mission Computer System
MCS-21	Maritime Cryptologic System for the 21st Century
MCU	Mission Computer Upgrade
MDA	Maritime Domain Awareness, or, Missile Defense Agency
MDR	Medium Data Rate
MDS	Multi-function Display System, or, Mobile Diving and Salvage
MDSU	Mobile Diving and Salvage Unit
MEB	Marine Expeditionary Brigade
MEDAL	Mine Warfare and Environmental Decision Aids Library
MEF	Marine Expeditionary Force
MESF	Maritime Expeditionary Security Force
METMF(R)	Meteorological Mobile Facility Replacement
NEXGEN	Next Generation
METOC	Meteorological and Oceanographic Sensors
MEU	Marine Expeditionary Unit
MEU(SOC)	Marine Expeditionary Unit (Special Operations Capable)
MF	Medium Frequency
MFL	Multi-Frequency Link
MFOQA	Military Flight Operations Quality Assurance
MFR	Multi-Function Radar
MFTA	Multi-Function Towed Array (sonar)
MGS	Machine Gun System
MHIP	Missile Homing Improvement Program
MICFAC	Mobile Integrated Command Facility
MID	Management Initiative Decision
MIDS	Multi-Function Information Distribution System
MIDS-LVT	Multi-Function Information Distribution System Low-Volume Terminal
MILDET	Military Detachment
MILSTAR	Military Strategic and Tactical Relay Satellite
MIO	Maritime Interception Operations
MIPS	Maritime Integrated Air and Missile Defense

	Planning System
MIR	Multi-sensor Image Reconnaissance
MIRV	Multiple Independently Targeted Reentry Vehicle
MIUW	Mobile Inshore Undersea Warfare
MIW	Mine Warfare
MIWC	Mine Warfare Commander
Mk	Mark
MLP	Mobile Landing Platform
MLS	Multi-Level Security
MM	[LCS] Mission Module
MMA	Multi-mission Maritime Aircraft
MMRT	Modified Miniature Receiver Terminal
MMSP	Multi-Mission Signal Processor
MNS	Mission Need Statement, or, Mine Neutralization System
MOA	Memorandum of Agreement
MOC	Maritime Operations Center
MOCC	Mobile Operational Command Control Center
MOD	Modification
MOPP	Mission-Oriented Protective Posture
MOU	Memorandum of Understanding
MP	[LCS] Mission Package
MPA	Maritime Patrol Aircraft
MPF(F)	Maritime Prepositioning Force (Future)
MPG	Maritime Prepositioning Group
MPRF	Maritime Patrol and Reconnaissance Force
MPS	Maritime Prepositioning Ship, or, Mission Planning System
MRMS	Maintenance Resource Management System
MRMUAS	Medium-Range Maritime Unmanned Aerial System
MR-TCDL	Multi-Role Tactical Common Data Link
MRUUV	Mission-Reconfigurable Unmanned Undersea Vehicle
MSC	Military Sealift Command
MSD	Material Support Dates
MSO	Maritime Security Operations
MTI	Moving Target Indicator
MTOC	Mobile Tactical Operations Center
MUOS	Mobile User Objective System
MWCS	Multiple Weapon Control Sight
MWR	Morale, Welfare, and Recreation
N/JCA	Navy/Joint Concentrator Architecture
NADEP	Naval Aviation Depot
NAF	Naval Air Facility
NALCOMIS	Naval Aviation Logistics Command Management Information System
NAOC2	Naval Air Operations Command and Control
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NATOPS	Naval Aviation and Training Operating Procedures Standardization
NAVAIRSYSCOM	Naval Air Systems Command
NAVCENT	U.S. Naval Forces, Central Commmand
NAVFLIR	Navigation, Forward-Looking Infrared
NAVMAC	Navy Modular Automated Communications
NavMPS	Naval Mission Planning Systems
NAVSEA	Naval Sea Systems Command
NAVSECGRU	Naval Security Group
NAVSSI	Navigation Sensor System Interface
NAVSUP	Naval Supply Systems Command
NAVWAR	Navigation Warfare
NCB	[Seabee] Naval Construction Battalion
NCDP	Naval Capabilities Development Process
NCES	Net-Centric Enterprise Services
NCFS	Naval Fires Control System
NCHB	Navy Cargo Handling Battalion
NCIS	Naval Criminal Investigative Service
NCO	Network-Centric Operations
NCP	Naval Capability Pillar, or, Naval Capability Plan
NCR	Naval Construction Regiment
NCTAMS	Naval Computer and Telecommunications Area Master Stations
NCTF	Naval Component Task Force
NCTS	Naval Computer and Telecommunications Station
NCUSW	Net-Centric Undersea Warfare
NCW	Network-Centric Warfare, or, Navy Coastal Warfare
NCWES	Network-Centric Warfare Electronic Support
NDI	Non-Developmental Item
NEC	Naval Enlistment Classification
NECC	Naval Expeditionary Combat Command
NEIC	Navy Expeditionary Intelligence Command
NELR	Navy Expeditionary Logistics Regiment
NEO	Non-Combatant Evacuation Operations
NEP	Navy Enterprise Portal
NEPLO	National Emergency Preparedness Liaison Officer
NESP	Navy Extremely High Frequency Satellite Program
NETC	Naval Education and Training Command
NETWARCOM	Network Warfare Command
NFCS	Naval Fires Control System
NFN	Naval Fires Network, and/or Joint Fires Network
NFO	Naval Flight Officer
NFS	Naval Fire Support
NGCD	Next-Generation Chemical Detection
NGC2P	Next-Generation Command and Control Processor
NGDS	Next-Generation Diagnostics System
NGEN	Next-Generation Enterprise Network
NGJ	Next-Generation Jammer
NGO	Non-Governmental Organization
NGSS	Northrop Grumman Ship Systems
NIFC-CA	Navy Integrated Fire Control–Counter Air
NII	Network Information Integration
NILE	NATO Improved Link 11
NIMA	National Imagery and Mapping Agency
NIPRNET	Unclassified-but-Sensitive Internet Protocol Router Network
NITF	National Imagery Transportation Format
NMCB	Naval Mobile Construction Battalion [Seabee]
NMCI	Navy Marine Corps Intranet
NMCP	Navy Marine Corps Portal
NMITC	Navy Maritime Intelligence Training Center
NMT	Navy Advanced Extremely High Frequency Multiband Terminal
NNOR	Non-Nuclear Ordnance Requirement
NNSOC	Naval Network and Space Command
NOAA	National Oceanographic and Atmospheric Administration
NOC	Network Operation Center
NPDC	Naval Personnel Development Command
N-PFPS	Navy Portable Flight Planning Software
NPOESS	National Polar-Orbiting Operational Environmental Satellite System
NPS	Naval Postgraduate School
NREMS	Navy Regional Enterprise Messaging System
NRF	Naval Reserve Force
NRL	Naval Research Laboratory
NRTD	Near Real-Time Dissemination
NSA	National Security Agency
NSAWC	Naval Strike Air Warfare Center
NSC	National Security Cutter
NSCT	Naval Special Clearance Team

NSFS	Naval Surface Fire Support
NSFV	Naval Security Forces Vest
NSIPS	Navy Standard Integrated Personnel System
NSPG	Navy Strategic Planning Guidance
NSSMS	NATO SeaSparrow Surface Missile System
NSTC	Naval Service Training Command
NSW	Naval Special Warfare
NSWC/DD	Naval Surface Warfare Center/Dahlgren Division
NSWC/PH	Naval Surface Warfare Center/ Port Hueneme Division
NSWG	Naval Special Warfare Group
NSWRON	Naval Special Warfare Squadron
NTCDL	Network Tactical Common Data Link
NTCS-A	Naval Tactical Command System-Afloat
NTCSS	Naval Tactical Command Support System
NTDS	Naval Tactical Data System
NTNO	Navy-Type/Navy-Owned
NUFEA	Navy Unique Fleet Essential Airlift
NUFEA-RA	Navy Unique Fleet Essential Airlift-Replacement Aircraft
NUWC	Naval Underwater Warfare Center
NWDC	Navy Warfare Development Command
OA	Operational Assessment
OAG	Operational Advisory Group
OAS	Offensive Air Support
OASD	Office of the Assistant Secretary of Defense
OASIS	Organic Airborne and Surface Influence Sweep
OBT	On-Board Trainer
OCA	Offensive Counter-Air
OCO	Overseas Contingency Operations
OCONUS	Outside Continental United States
OEF	Operation Enduring Freedom
OEO	Other Expeditionary Operations
OGB	Optimized Gun Barrel
OGC	Open Geospatial Consortium
OIF	Operation Iraqi Freedom
OIPT	Overarching Integrated Product Team
OMFTS	Operational Maneuver From The Sea
ONI	Office of Naval Intelligence
ONR	Office of Naval Research
OPAREA	Operational Exercise Area
OPEVAL	Operational Evaluation
OPNAV	Office of the Chief of Naval Operations
OPTASK COMM	Operational Tasking Communications
OPTASK EW	Operational Tasking Electronic Warfare
OPTEMPO	Operating Tempo
OPTEVFOR	Operational Test and Evaluation Force
OR	Operational Requirement
ORD	Operational Requirements Document
OSA	Open System Architecture
OSCAR	Open Systems-Core Avionics Requirements
OSD	Office of the Secretary of Defense
OSD-CAPE	Office of the Secretary of Defense, Cost Assessment and Program Evaluation
OSIS	Ocean Surveillance Information System
OSS	Operational Support System
OT	Operational Testing
OT&E	Operational Testing and Evaluation
OTH	Over the Horizon
P3I	Pre-Planned Product Improvement
PAA	Phased Adaptive Approach
PAAS	Platform as a Service
PAC	Pacific
PAS	Processing and Analysis Segment
PC	Patrol Coastal craft
PCU	Pre-Commissioning Unit
PDA	Personal Digital Assistant
PDM	Program Decision Memorandum
PDR	Preliminary Design Review
PEO	Program Executive Office (and Officer)
PEO IWS	Program Executive Office for Integrated Warfare Systems
PEO LCS	Program Executive Office for Littoral Combat Ship
PERSTEMPO	Personnel Tempo
PFPS	Portable Flight-Planning Software
PGM	Precision-Guided Munition
PHIBGRU	Amphibious Group
PHIBRON	Amphibious Squadron
PIP	Product Improvement Program, or, Pioneer [UAV] Improvement Program
PKI	Public Key Infrastructure
PLUS	Persistent Littoral Undersea Surveillance
PMA	Post-Mission Analysis
PMK	Power Management Kit
POM	Program Objective Memorandum
POR	Program of Record
PPBE	Planning, Programming, Budgeting, and Execution process
PRMS	Pressurized Rescue Module System
PSE	Physical Security Equipment
PSTN	Public Switched Telephone Network
PTAN	Precision Terrain Aided Navigation
PTW	Precision Targeting Workstation
PUMA	Precision Underwater Mapping
PVO	Private Volunteer Organization
QDR	Quadrennial Defense Review
R&D	Research and Development
RAM	Rolling Airframe Missile
RAN	Royal Australian Navy
RC	Reserve Component
RCC	Regional Combatant Commander
RCIED	Radio-Controlled Improvised Explosive Device
RCOH	Nuclear Refueling/Complex Overhaul
RD&A	Research, Development, and Acquisition
RDC	Rapid Deployment Capability
RDT&E	Research, Development, Test, and Evaluation
REPLO	Regional Emergency Preparedness Liaison Officer
RF	Radio Frequency
RFP	Request for Proposal
RIMPAC	Rim of the Pacific [exercise]
RM	Radiant Mercury [classified information sanitization program]
RMAST	Reserve Mobile Ashore Support Terminal
RMIG	Radiant Mercury Imagery Guard
RMMV	Remote Multi-Mission Vehicle
RMS Remote	Minehunting System
RO	Reverse Osmosis
ROMO	Range of Military Operations
RORO	Roll-On/Roll-Off
ROS	Reduced Operating Status
RRDD	Risk Reduction and Design Development
RSC	Radar Suite Controller
RSOC	Regional SIGINT Operations Center
RTC	Remote Terminal Component, or, Recruit Training Command
RWR	Radar Warning Receiver
S&T	Science and Technology
SA	Situational Awareness
SAASM	Selective Availability Anti-Spoofing Module
SAG	Surface Action Group
SAHRV	Semiautonomous Hydrographic Reconnaissance Vehicle
SAIC	Science Applications International Corporation
SALTS	Streamlined Alternative Logistic Transmission System

SAM	Surface-to-Air Missile
SAML	Security Assertion Markup Language
SAST	Surface ASW Synthetic Trainer
SATCOM	Satellite Communications
SBIR	Small Business Innovative Research
SBT	Special Boat Team
SCA	Software Communications Architecture
SCC	Sea Combat Commander
SCI	Sensitive Compartmented Information
SCN	Shipbuilding and Conversion Navy [appropriation]
SC(X)R	Surface Connector Replacement
SDD	System Design Document, or, System Development and Demonstration [phase]
SDS	Surface Decompression System
SDTA	System Demonstration Test Article
SDTS	Self-Defense Test Ship
SDV	Swimmer [or SEAL] Delivery Vehicle
SDVT	Swimmer [or SEAL] Delivery Vehicle Team
SEAD	Suppression of Enemy Air Defense
SEAL	Sea-Air-Land Naval Special Warfare Forces
SEAPRINT	Systems Engineering, Acquisition, and Personnel Integration
SEI	Specific Emitter Identification
SEIE	Submarine Escape Immersion Equipment
SEWIP	Surface Electronic Warfare Improvement Program
SFA MTT	Security Force Assistance Mobile Training Team
SHARP	Shared Reconnaissance Pod
SHF	Super High Frequency
SHUMA	Stochastic Unified Multiple Access
SI	Special Intelligence
SIAP	Single Integrated Air Picture
SIGINT	Signals Intelligence
SIMAS	Sonar In-situ Mode Assessment System
SINCGARS	Single Channel Ground and Air Radio System
SIPRNET	Secret Internet Protocol Router Network
SLAD	Slewing-Arm Davit
SLAM	Standoff Land-Attack Missile
SLAM-ER	Standoff Land-Attack Missile-Expanded Response
SLAP	Service Life Assessment Program
SLBM	Submarine-Launched Ballistic Missile
SLEP	Service Life Extension Program
SLR	Side-Looking Radar
SM	Standard [surface-to-air] Missile
SMCM	Surface Mine Countermeasure
SNAP	Shipboard Non-tactical ADP Program
SNR	Subnet Relay
SOA	Service Oriented Architecture, or, Sustained Operations Ashore
SOAD	Standoff Outside Area Defense
SOAP	Simple Object Access Protocol
SOC	Special Operations Capable, or, Special Operations Craft
SOF	Special Operations Forces
SOPD	Standoff Outside Point Defense
SOSUS	Sound Surveillance System
SPAWAR	Space and Naval Warfare Systems Command
SPECAT	Special Category
SPM	Soldier Power Manager
SPRITE	Spectral and Reconnaissance Imagery for Tactical Exploitation
SRAAM	Short-Range Air-to-Air Missile
SRC	Submarine Rescue Chamber
SRCFS	Submarine Rescue Chamber Fly-away System
SRDRS	Submarine Rescue Diving Recompression System
SS	Sensor Subsystem, or, conventionally powered submarine
SSBN	Nuclear-Powered Ballistic-Missile Submarine
SSC	Ship-to-Shore Connector
SSCA	Service Secretary Controlled Aircraft
SSDG	Ship Service Diesel Generators
SSDS	Ship Self-Defense System
SSEE	Ship's Signals Exploitation Equipment
SSG	Strategic Studies Group
SSGN	Nuclear-Powered Guided-Missile Submarine
SSI	Special Structural Inspection
SSI-K	Special Structural Inspection-Kit
SSIPS	Shore Signal and Information Processing Segment
SSK	Diesel-electric/Advanced Air Independent Submarine
SSL	Solid State Laser
SSMIS	Special Sensor Microwave Imager/ Sounder [Air Force]
SSMM	Surface-to-Surface Missile Module
SSN	Nuclear-Powered Submarine
SSO	Special Security Office
SS-SPY	Solid State-SPY [radar]
SSST	Supersonic Sea-Skimming Target
STANAG	[NATO] Standardization Agreement
START	Strategic Arms Reduction Treaty
STEM	Science, Technology, Engineering, and Mathematics
STEP	Standardized Tactical Entry Point
STOM	Ship-To-Objective Maneuver
STOVL	Short Take-Off and Vertical Landing
STT	Submarine Tactical Terminal
STUAS	Small Tactical Unmanned Aircraft System
STU-III/R	Secure Telephone Unit, Third Generation, Remote Control Interface
SURTASS	Surveillance Towed Array Sensor System
SUW	Surface Warfare
S-VSR	S-Band Volume Search Radar
SWAN	Shipboard Wide-Area Network
SWATH	Small Waterplane Area, Twin Hull [ship]
SYSCEN	Systems Center
TACAIR	Tactical Aircraft
TACAMO	Take-Charge-and-Move-Out
TACC	Tactical Air Command Centers
TacLAN	Tactical Local Area Network
TACS	Tactical Air Control System
TACTAS	Tactical Towed Array System
TACTOM	Tactical Tomahawk
TADIL-J	Tactical Digital Information Link–Joint Service
TADIRCM	Tactical Aircraft Directed InfraRed Countermeasure
TADIXS	Tactical Data Information Exchange Systems
T-AGOS	Ocean Surveillance Ship [MSC-operated]
T-AGS	Oceanographic Survey Ships [MSC-operated]
T-AH	Hospital Ship [MSC-operated]
T-AKE	Stores/Ammunition Ship [MSC-operated]
TAMD	Theater Air and Missile Defense
TAMPS	Tactical Automated Mission Planning System
T-AO	Oiler [MSC-operated]
TAOC	Tactical Air Operations Center [Marine Corps]
TAP	Tactical Training Theater Assessment Planning
TARPS	Tactical Airborne Reconnaissance Pod System
TASWC	Theater ASW Commander
TAWS	Terrain Awareness Warning Systems

TBMCS	Theater Battle Management Core Systems
TC2S	Tomahawk Command and Control System
TCAS	Traffic Alert and Collision Avoidance System
TCDL	Tactical Common Data Link
TCGR	Track Control Group Replacement
TCP	Transmission Control Protocol
TCPED	Tasking Collection Processing Exploitation Dissemination
TCS	Tactical Control System, or, Time-Critical Strike
TCT	Time-Critical Targeting
TDA	Tactical Decision Aid
TDCL	Torpedo Detection, Classification, and Localization
TDD	Target Detection Device
TDLS	Tactical Data Link System
TDM	Time Division Multiplex
TDMA	Time Division Multiple Access
TDP	Tactical Data Processor
TDSS	Tactical Display Support System
TECHEVAL	Technical [Developmental] Evaluation
TEMPALT	Temporary Alteration
TERCOM	Terrain Contour Mapping
TES-N	Tactical Exploitation System-Navy
TESS/NITES	Tactical Environmental Support System/ Navy Integrated Tactical Environmental Subsystem
TEU	Training and Evaluation Unit
TFCC	Task Force Climate Change
TFW	Task Force Web
TI	Technology Insertion
TIBS	Tactical Information Broadcast Service
TIC	Toxic Industrial Chemical Agent
TIDS	Tactical Integrated Digital System
TIM	Toxic Industrial Material
TIMS	Training Integrated Management System
TIS	Trusted Information System
TIS	Tactical Interface Subsystem
TJS	Tactical Jamming System
TLAM	Tomahawk Land-Attack Cruise Missile
TLR	Top-Level Requirements
TNT	Targeting and Navigation Toolset
TOA	Total Obligational Authority, or, Table of Allowance
TOC	Total Ownership Costs, or, Tactical Operations Center
TOG	Technology Oversight Group
TPPU	Task, Post, Process, Use
TRAFS	Torpedo Recognition and Alertment Functional Segment
T-RDF	Transportable-Radio Direction Finding
TRE	Tactical Receive Equipment
TRIXS	Tactical Reconnaissance Intelligence Exchange System
TS	Top Secret
TSC	Tactical Support Center
TSR	Time Slot Reallocation
TSTC	Total Ship Training Capability
TTNT	Tactical Targeting Network Technology
TTWCS	Tactical Tomahawk Weapon Control System
TUSWC	Theater Undersea Warfare Commander
TWS	Torpedo Warning System, or, Tomahawk Weapon System
TXS	Transport Services
UAV	Unmanned Aerial Vehicle
UCAS-D	Unmanned Combat Aircraft System Demonstration
UCLASS	Unmanned Carrier-Launched Airborne Surveillance and Strike
UCT	Underwater Construction Teams
UCWI/JUWL	Interrupted Continuous Wave Illumination/ Joint Universal Weapon Link
UDDI	Universal Description, Discovery, and Integration
UFO	Ultra High Frequency Follow-On
UHF	Ultra High Frequency
UISS	Unmanned Influence Sweep System
UMFO	Undergraduate Military Flight Officer
UNITAS	Annual U.S.-South American Allied Exercise
UNREP	Underway Replenishment
UOES	User Operational Evaluation System
UON	Urgent Operational Need
URC	Undersea Rescue Command
URL	Unrestricted Line
USD/AT&L	Under Secretary of Defense for Acquisition, Technology, and Logistics
USMC	United States Marine Corps
USPACOM	U.S. Pacific Command
USS	Undersea Surveillance System, and, United States Ship
USSOCOM	U.S. Special Operations Command
USSSTRATCOM	U.S. Strategic Command
USV	Unmanned Surface Vehicle
USW	Undersea Warfare
USW-DSS	Undersea Warfare-Decision Support System
UUV	Unmanned Undersea Vehicle
UWS	Underwater Segment
UXO	Unexploded Ordnance
VBSS	Visit, Board, Search, and Seize
VCNO	Vice Chief of Naval Operations
VDS	Variable-Depth Sonar
VERTREP	Vertical [underway] Replenishment
VHF	Very High Frequency
VIXS	Video Information Exchange System
VLA	Vertical-Launch Anti-Submarine Rocket
VLF/LF	Very Low Frequency/Low Frequency
VLS	Vertical-Launching System
VME	Versa Module Eurocard
VMTS	Virtual Mission Training System
VOD	Vertical Onboard [underway] Delivery
VPM	Virginia Payload Module
VPN	Virtual Private Network
VSR	Volume Search Radar
V/STOL	Vertical/Short Take-Off and Landing
VSW	Very Shallow Water
VTC	Video Teleconferencing
VTM	Video Tele-Medicine
VTOL	Vertical Take-Off and Landing
VTT	Video Tele-Training
VTUAV	Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle
VVD	Voice-Video-Data
VXX	Presidential Replacement Helicopter
WAA	Wide Aperture Array
WAN	Wide Area Network
WDL	Weapons Data Link
WEN	Web-Enabled Navy
WGS	Wideband Gapfiller Satellite
WMD	Weapons of Mass Destruction [nuclear, biological, chemical]
WMP	Wideband Modernization Plan
WPN	Weapons Procurement Navy [appropriation]
WSC	Wideband Satellite Communications
XFC UAS	eXperimental Fuel Cell Unmanned Aerial System
XML	Extensible Markup Language
ZBR	Zero-Based Review






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http://www.navy.mil/navydata/policy/seapower/npg15/top-npg15.pdf