

US Navy's Aegis 9 emerging as a centerpiece of regional missile defense cooperation

China's is on the path to rapid military modernization, and building immense inventory of land-based missiles consisting of new generations of advanced, long-range ASCMs, PLAN surface combatants equipped with YJ-8A or YJ-62 ASCMs, and the CSS-5 Mod 5 (DF-21D) anti-ship ballistic missile. The CSS-5 Mod 5 gives the PLA the capability to attack large ships, including aircraft carriers, at ranges greater than 1,000 nautical miles and with a maneuverable warhead.

The United States, its allies and partners throughout the Western Pacific have stepped up regional missile defense cooperation across the Western Pacific with Aegis Weapon emerging as centerpiece for cooperation. "The Aegis Combat System Baseline 9.C1 offers unprecedented capabilities, including simultaneous air and ballistic missile defense," said Jim Sheridan, Lockheed Martin director of Aegis programs. "This Aegis baseline also improves Aegis networking capabilities, allowing Aegis vessels to automatically coordinate defense with input from satellite and ground-based radar assets—forming a true shield of defense over a wide area."

The U.S. Navy and Missile Defense Agency, supported by Lockheed Martin, successfully conducted a series of Ballistic Missile Defense (BMD) tests in the Atlantic Ocean during Formidable Shield 2017 (FS-17) from Sept. 24 – Oct. 17, 2017. Naval forces from eight NATO nations participated in the exercise. Formidable Shield is designed to demonstrate and improve allied interoperability in an integrated air and missile defense environment, using NATO command-and-control reporting structures and datalink architecture.

In one event, a U.S. Navy ship operating with the BMD 4.0.3 Aegis Combat System conducted a simulated SM-3 Blk IB TU engagement of a live short-range ballistic missile (SRBM) target using remote track data provided by a Spanish F-100 class ship. In the same event, another U.S. Navy ship, operating with the Baseline 9.C1 integrated air and missile defense capability, launched SM-2 missiles against cruise missile targets while simultaneously tracking the SRBM.

The nine Future Frigates to be acquired by the Royal Australian Navy (RAN) will be equipped with Lockheed Martin's Aegis combat management system (CMS), Prime Minister Malcolm Turnbull announced on 3 October. "This decision will maximise the Future Frigate's air warfare capabilities, enabling these ships to engage threat missiles at long range, which is vital, given [that] rogue states are developing missiles with advanced range and speed," he stated.

The US State Department has approved a possible Foreign Military Sale to Japan for DDG 7 and 8 AEGIS Combat System, Underwater Weapon System, Cooperative Engagement Capability and associated equipment, parts and logistical support for an estimated cost of \$1.5 billion. The addition of two new AEGIS DDGs to Japan's fleet will afford more flexibility and capability to counter regional threats and continue to enhance stability in the region

Japan has six Aegis-equipped ships in its fleet in mid-2014, of which four are BMD-capable. In December 2013, the government issued new National Security Guidelines that call for the acquisition of two additional BMD-capable destroyers during the next decade.

The US Navy (USN) deployed the Ticonderoga-class guided-missile cruiser USS Chancellorsville (CG 62) to Yokosuka, Japan, which was recently modernized with the Aegis Baseline 9 Combat System. The forward deployment of an Aegis Baseline 9-capable cruiser to Asia-Pacific continues the US Navy's recent

focus on sending its newest platforms and systems to the region; write Ridzwan Rahmat and IHS Jane's Navy International editor Dr Lee Willett.

South Korea has already deployed Aegis on all three of its KDX-III King Sejong the Great-class destroyers, which at more than 11,000 tons are the largest ships equipped with Aegis. South Korean Navy officials have announced plans to procure three additional Aegis-equipped destroyers in the 2020-2025 timeframe.

Aegis baseline 9.C1

The U.S. Navy and Missile Defense Agency (MDA) certified the latest evolution of the Aegis Combat System – called Baseline 9.C1 – for the U.S. destroyer fleet. The Aegis baseline, built by Lockheed Martin offers advanced defense capabilities and enhanced integration with other systems external to the ship. Aegis Baseline 9.C1 provides the U.S. Navy surface fleet with the most advanced air defense capability ever. Under this baseline configuration, Aegis merges BMD and anti-air warfare into its Integrated Air and Missile Defense (IAMD) capability using commercial-off-the-shelf and open architecture technologies.

Baseline 9.C1, also includes the most current generation of ballistic missile defense programming, known as BMD 5.0 Capability Upgrade, which offers the proven capability to shoot down ballistic missiles in both the exo-atmosphere (upper atmosphere) and endo-atmosphere (lower atmosphere). The BMD capabilities of Baseline 9.C1 are also present in Aegis Ashore, the ground-based missile defense program that is the second phase of the U.S. Phased Adaptive Approach to protect Europe from ballistic missile attack.

Over the summer, the U.S. Navy and MDA conducted the Multi-Mission Warfare (MMW) tests to verify performance of recent

BMD upgrades and are a critical part of the baseline certification process. Over the course of the four test events aboard USS John Paul Jones (DDG 53), Aegis flawlessly detected, tracked, and engaged two Ballistic Missile and two air warfare targets. Each event resulted in the successful intercept of a single target.

Lockheed Martin secured a \$428m, ten year contract to continue to modernise Aegis hardware and software onboard the US Navy vessels. Navy's existing destroyers the new USS John Finn or DDG 113 and all follow-on destroyers will receive the Aegis Baseline 9 upgrade, which includes NIFC-CA and other enabling technologies. "This same capability is being back-fitted onto earlier ships like USS Arleigh Burke or DDG 51 that were built with the core Aegis capability.

The Navy successfully executed four flight tests of the surface-to-air Standard Missile-6 Block I (SM-6 Blk I) off the Hawaiian coast April 6-13. These tests marked the next step toward the SM-6 Blk I's achievement of Full Operational Capability. In addition, these are the first tests with the latest SM-6 Blk I software that includes air warfare, ballistic missile sea based terminal defense, and anti-surface warfare capabilities. The SM-6 provides an over-the-horizon engagement capability when launched from an Aegis warship and uses the latest in hardware and software missile technology to provide needed capabilities against evolving air threats.

The central component of the Lockheed Martin-developed Aegis BMD Combat System is the SPY-1 radar, deployed on more than 100 ships worldwide – the most widely fielded naval phased array radar in the world. SPY-1 capability has been greatly enhanced with the introduction of a new Multi-Mission Signal Processor (MMSP). Baseline 9.C1 improves radar resolution and discrimination abilities.

The next step in this continuum of modernization is equipping the next-generation DDG Flight III destroyers with the SPY-6

Air and Missile Defense Radar, Rear Adm. Ronald Boxall, director of surface warfare said. The Navy's new SPY-6 is 35-times more powerful than existing ship-based radar. Compared to the legacy SPY-1 radar, Air and Missile Defense Radar will be able to see an airborne object half as big and twice as far – and testing is proceeding apace at Pacific Missile Range Facility, where we have radiated at full power and cycle, Boxall added.

Boxall added that all new construction DDG Flight IIA ships, beginning with DDG-113, will be delivered with Aegis Baseline 9C. This includes “identification Friend or Foe Mode 5, Close-In Weapons System Block 1B, Surface Electronic Warfare Improvement Program Block II, and the SQQ-89A (V) 15 Integrated Undersea Warfare Combat System Suite. Delivery of these capabilities will extend into the mid-term (2020-2030) and beyond,” Boxall said

Integrated Air and Missile Defence

Earlier U.S. Pacific Command and the Missile Defense Agency (MDA) successfully demonstrated the integrated air and missile defense capability of AEGIS Combat System aboard guided-missile destroyer USS John Paul Jones (DDG 53). It engaged three successful near-simultaneous target shots over the Pacific Ocean; one short-range ballistic missile target was intercepted by a Standard Missile-3 Block IB guided missile, while two low-flying cruise missile targets were engaged by Standard Missile-2 Block IIIA guided missiles.

The cruise missiles have always been a major threat to air defense as they provide a significant standoff range and because of difficulty in detecting, tracking and killing a small and often very low flying target. This test showcases the U.S.'s ability to defend against numerous ballistic and cruise missile threats in 'raid' scenarios.

The Navy and Raytheon had earlier test-fired a Standard Missile-6 against a low-flying subsonic cruise missile target over land. It offers long range air defense against fixed and rotary wing aircraft and unmanned aerial vehicles (UAVs), anti-ship missiles operating at very high altitudes to sea-skimming cruise missiles.

Aegis Combat management system

The Aegis weapon system is an advanced combat, control, and information system that uses powerful computers and radars to track and destroy enemy targets. It is the most advanced modern combat system and is the first fully integrated combat system built to defend against air, surface, and subsurface threats. The Aegis combat system is America's most capable surface launched missile system.

Aegis ship combat system is an integrated collection of sensors, computers, software, displays, weapon launchers, and weapons for defending ships against aircraft, anti-ship cruise missiles (ASCMs), surface threats, and subsurface threats. Because of its advanced computer system, the Aegis combat system can track over 100 targets. Some Aegis equipped ships can track even more targets at one time.

It can guide weapons to destroy almost any kind of threat including attacks from subsurface, surface, and the air. SM-6 receives midcourse flight control from the Aegis combat system via ship's radar, whereas terminal flight control is autonomous via the missile's active seeker or supported by the Aegis combat system via the ship's illuminator.

The Aegis Weapons System comprises the SPY-1 Radar, MK 99 Fire Control System and ORTS, MK 41 VLS, the Command and Decision Suite, and SM-2 Standard Missile systems. The Aegis Weapons System is controlled by an advanced, automatic detect-and-

track, multi-function three-dimensional passive electronically scanned array radar, the AN/SPY-1. Known as “the Shield of the Fleet”, the SPY high-powered (four megawatt) radar is able to perform search, tracking, and missile guidance functions simultaneously with a track capacity of well over 100 targets at more than 100 nautical miles (190 km).

The Baseline 9C version, leveraging the SM-6 missile, is being rolled out to DDG 51 Flight I and II destroyers with an integrated air and missile defence (IAMD) capability, integrating BMD capabilities into the legacy Aegis anti-air warfare (AAW) computer program, thereby bringing those two separate missions into a single, fully integrated computer program and equipment suite.

NIFC-CA

US Navy has developed Naval Integrated Fire Control-Counter Air (NIFC-CA) technology can be used for both defensive and offensive operations under Anti-Access/Area-Denial environment. NIFC-CA could enable surface ships, for example, to operate more successfully closer to the shore of potential enemy coastlines without being deterred by the threat of long-range missiles.

“NIFC-CA presents the ability to extend the range of your missile and extend the reach of your sensors by netting different sensors of different platforms – both sea-based and air-based together into one fire control system,” Capt. Mark Vandroff, DDG 51 program manager, told Scout Warrior in an interview. SM-6 will also be able home in on a target too distant for the ship that launched it to detect, using data relayed from other ships or aircrafts.

Defensive applications of NIFC-CA battle network allow destroyers to download targeting information from assets

outside of the range of their SPY-1D radars to attack air and BMD threats with the Raytheon Standard Missile 6 (SM-6). Whereas offensive uses might include efforts to detect and strike high-value targets from farther distances than previous technologies in line with the Navy's emerging "distributed lethality" strategy.

So far, NIFC-CA has been integrated and successful in testing with both E2-D Hawkeye surveillance aircraft and F-35 Joint Strike Fighters. The US Navy's (USN's) Baseline 9C Aegis Combat System has completed a series of exercises designed to demonstrate the over-the-horizon Naval Integrated Fire Control-Counter Air (NIFC-CA) capability.

Distributed Lethality

Distributed lethality is the condition gained by increasing the offensive power of individual components of the surface force (cruisers, destroyers, littoral combat ships [LCSs], amphibious ships, and logistics ships) and then employing them in dispersed offensive formations known as "hunter-killer surface action groups (SAGs.)" It is the motive force behind offensive sea control. Both parts of the definition are critical; raising the lethality of the force but operating it the same way sub-optimizes the investment. Operating hunter-killer SAGs without a resulting increase in offensive power creates unacceptable risk, write Vice Admiral Rowden , Rear Admiral Gumataotao is Commander, Naval Surface Force Atlantic and Rear Admiral Fanta, Director, Surface Warfare (N96).

Hunter-killer SAGs seize maritime-operations areas for subsequent activities (including power projection), perform screening operations for larger formations, and hold adversary land targets at risk. Additionally, by distributing power across a larger number of more geographically spaced units, adversary targeting is complicated and attack density is

diluted. Hunter-killer SAGS are capable of defending themselves against air and missile attack, and extend that protection to expeditionary forces conducting offensive operations of their own. These hunter-killer SAGs will be networked and integrated to support complex operations even when not supported by the carrier air wing and land-based patrol aircraft.

References and Resources also include:

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