Aegis Modernization Program

Executive Summary

- The Navy continues to modernize the Aegis Weapon System (AWS) on Aegis-guided missile cruisers (CG) and destroyers (DDG) via Advanced Capability Build (ACB)-16 and ACB-20 hardware and software baseline upgrades.
- The Navy continues to test ACB-16 without a DOT&E-approved Test and Evaluation Master Plan (TEMP).
- DOT&E issued an early fielding report on the Navy's FY19 testing of ACB-16 Phase 0 (Baseline 9.A2A cruiser) in March 2020. This report found that the Navy followed the DOT&E-approved test plan and found the 9.A2A cruiser air-defense performance was no better than the performance of previously evaluated Baseline 9 ships; surface warfare performance remains consistent with historical performance. Baseline 9.A2A cruisers were also found to be less suitable than previously evaluated Baseline 9 ships.
- The program delayed ACB-16 Phase 1 (Baseline 9.2.1 destroyer) integrated testing planned for FY20 due to shipyard delays and coronavirus (COVID-19) pandemic travel restrictions. The Navy plans to conduct ACB-16 Phase 1 and Phase 2 (Baseline 9. 2 cruiser and destroyer) operational test events in FY22.
- The Navy continues to develop a modeling and simulation (M&S) suite of the Aegis Combat System in order to assess the Probability of Raid Annihilation requirement for the self-defense mission for Flight III DDG 51 destroyers/ ACB-20.

System

- The Navy Aegis Modernization program provides updated technology and systems for CG 47-class Aegis-guided missile cruisers and DDG 51-class Aegis-guided missile destroyers. This planned, phased program provides similar technology and systems for new construction destroyers.
- The AWS integrates the following components:
  - AN/SPY-1 three-dimensional (range, altitude, and azimuth) multi-function radar
  - AN/SQQ-89 undersea warfare suite that includes the AN/SQS-53 sonar, SQR-19 passive towed sonar array (DDGs 51 through 78, CGs 52 through 73), and the SH-60B or MH-60R helicopter (Flight IIA DDGs 79 and newer have a hangar to allow the ship to carry and maintain its own helicopter)
  - Close-In Weapon System
  - A 5-inch diameter gun
  - Harpoon anti-ship cruise missiles (DDGs 51 through 78, CGs 52 through 73)
  - Vertical Launch System that can launch Tomahawk land-attack missiles, Standard Missile (SM)-2 and SM-6 surface to-air missile variants, Evolved Sea Sparrow Missiles, and Vertical Launch Anti-Submarine Rockets

- The AWS is upgraded through quadrennial ACBs. The Navy is currently upgrading the AWS to ACB-16. ACB 16 Baseline 9.2 upgrades will be installed on modernized and new construction Flight IIA DDG 51 destroyers and Service Life Extension Program for SPY-1B-equipped cruisers and Baseline 8 SPY-1A CG 47 cruisers, respectively. Flight III DDG 51 destroyers will receive ACB-20 Baseline 10.

Mission

The Joint Force Commander/Strike Group Commander employs Aegis-equipped DDG 51-guided missile destroyers and CG 47-guided missile cruisers to conduct:

- Area and self-defense anti-air warfare in defense of the Strike Group
- Anti-surface warfare and anti-submarine warfare
- Strike warfare, when armed with Tomahawk missiles
- Integrated Air and Missile Defense, to include simultaneous offensive and defensive warfare operations
- Operations independently or in concert with Carrier or Expeditionary Strike Groups and with other joint or coalition partners

Major Contractors

- General Dynamics Marine Systems Bath Iron Works – Bath, Maine
- Huntington Ingalls Industries (formerly Northrop Grumman Shipbuilding) – Pascagoula, Mississippi
- Lockheed Martin Rotary Mission Systems – Moorestown, New Jersey

Activity

- DOT&E issued the classified AWS ACB-16 Phase 0 Baseline 9.A2A Early Fielding Report in March 2020.
- The program delayed the FY19-deferred integrated test events within the air warfare mission for ACB-16 variants due to shipyard delays and COVID-19 travel restrictions.
- The Navy continued development of the M&S suite to supplement live testing in order to assess the Probability of Raid Annihilation requirement for the self-defense mission for DDG 51 Flight III ships in FY23-24. As part of the overall M&S development strategy, the Navy plans to make limited use of the M&S suite for operational testing of the ACB-16 in FY23.
- Navy ACB-16 Phase 1 testing schedules shifted, with operational testing of ACB-16 Phase 1 capabilities now delayed until 2022.
- The updated Navy Aegis Modernization TEMP covering ACB-16 Phases 0, 1, and 2 testing is currently in the Navy staffing process for review and approval.
- ACB-16 9.A2A cybersecurity testing continues to be delayed into 2QFY21.

Assessment

- Operational testing of ACB-16 9.A2A on Navy cruisers indicates that air-defense performance was no better than the performance of previously evaluated Baseline 9 ships; surface warfare performance remains consistent with historical performance. The Navy 9.A2A cruisers were found to be less suitable than previously evaluated Baseline 9 ships. A more detailed assessment of air-defense, surface warfare, and suitability can be found in the March 2020 DOT&E Early Fielding Report.
- Results of previous Aegis Baseline 9.A (cruisers) cyber survivability testing are in the July 2015 DOT&E AWS Early Fielding Report. Assessment of the 9.A2A cybersecurity posture is incomplete pending completion of the cybersecurity operational test. DOT&E's cybersecurity assessment remains unchanged.
- Final assessment of software capabilities incorporated into ACB-16 to increase ships' air warfare performance against closely spaced threat raids is pending completion of additional phases of ACB-16 testing.
- The Aegis Modernization TEMP is currently out of date with respect to the Navy's Aegis fielding plans and test strategy.

Recommendations

The Navy should:

1. Complete update and staffing of the Aegis Modernization TEMP covering ACB-16 testing for final review and approval.
2. Complete the ACB-16 Phase 0 (9.A2A) cybersecurity testing, which is now scheduled to be conducted in 2QFY21.
3. Complete remaining planned ACB-16 testing.
4. Document test strategies and resources for future Aegis upgrades beyond ACB-16 to include Capability Package software updates.
5. Continue development efforts to provide an accredited M&S suite of the Aegis Combat System to adequately assess the Probability of Raid Annihilation requirement for the self-defense mission for Flight III DDG 51 destroyers and ACB-20.