

Aegis Modernization Program

Executive Summary

- The Navy is modernizing the Aegis Weapon System (AWS) on Aegis-guided missile cruisers and destroyers via Advanced Capability Build (ACB)-12, ACB-16, and ACB-20 hardware and software baseline upgrades.
- DOT&E issued a final report on ACB-12 Baselines 9.A0 and 9.C1 in FY19. The live fire area air defense flight test events on Baselines 9.A0 and 9.C1 indicate that performance against single subsonic and supersonic high-diving targets remains consistent with historical results against comparable threats. Testing against more stressing target presentations is planned for FY20-22 ACB-16 operational testing.
- In FY19, the Navy continued operational testing of ACB-16 Phase 0 (Baseline 9.A2A cruiser). Analyses of this testing is ongoing. DOT&E will issue a report on ACB-16 Phase 0 in FY20.
- The Navy plans to conduct ACB-16 Phase 1 and Phase 2 (Baseline 9.2 cruiser and destroyer) integrated and operational test events in FY20-22.
- The Navy conducted the initial phase of cyber survivability testing on ACB-16 Baseline 9.A2A in FY19. The Navy postponed the August 2019 Adversarial Assessment phase of cyber survivability testing to FY20 due to test asset availability. This potentially will result in Baseline 9.A2A deployment with cyber survivability operational testing only partially completed.
- The Navy must provide an accredited modeling and simulation (M&S) suite of the Aegis Combat System (ACS) in order to adequately 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:
 - AWS 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.C2 and 9.A2A upgrades will be installed on modernized Flight IIA DDG 51 destroyers and Service Life Extension Program for SPY-1B-equipped cruisers and Baseline 8 SPY-1A CG 47 cruisers, respectively.
 - ACB-20 Baseline 10 upgrades for Flight III DDG 51 destroyers.

Mission

The Joint Force Commander/Strike Group Commander employs AWS-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

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Activity

- ACB-16 Phase 0 (Baseline 9.A2A cruiser) testing began in FY18 and continued in FY19 with Cooperative Vulnerability and Penetration Assessment cyber survivability tests in January 2019; the Adversarial Assessment phase of cyber survivability testing was postponed to FY20 due to test asset availability. A maintenance demonstration was performed in June 2019.
- The Navy deferred a pair of supersonic anti-ship cruise missile integrated test events planned for an ACB-16 Phase 1 destroyer in FY19 to FY20 because of ship schedule and target availability constraints.
- The Navy is developing an M&S suite to supplement live testing and facilitate a more thorough evaluation of air defense performance 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 (Baseline 9.C2) in FY22.
- The Navy is developing the Test and Evaluation Master Plan (TEMP) for DDG 51 Flight III/ACB-20 (Baseline 10). This document will incorporate the air and missile defense radar program testing into the DDG 51 Flight III/ACB-20 TEMP.
- The Navy and the Missile Defense Agency are merging Aegis Baseline 5.3 and Ballistic Missile Defense baseline 4.1 (21 destroyers and 2 cruisers) to add select air and ballistic missile defense capabilities. While operational testing is planned for FY20, this upgrade is neither covered by an Aegis TEMP nor has the Navy developed an Integrated Evaluation Framework.
- DOT&E issued its final report on Baselines 9.A0 and 9.C1 in FY19.
- Operational testing of Aegis Baselines 9.A0 and 9.C1 indicate that air defense performance against single subsonic and supersonic high-diving anti-ship cruise missile presentations is consistent with historical performance. A more detailed assessment of air defense and surface warfare can be found in the DOT&E classified AWS ACB-12 Baseline 9 and Cooperative Engagement Capability FOT&E Report of June 2019.
- Aegis Baseline 9.A0 and 9.C1 is operationally suitable.
- Range safety considerations impose limitations on air warfare self-defense data that can be collected in manned ship testing. Consequently, testing to-date is insufficient to fully assess this mission area for all Aegis variants. The Navy is improving the flight termination system on its supersonic anti-ship cruise missile targets with the intention of partially mitigating manned ship testing limitations; however, this capability has not yet been demonstrated in the relevant manned ship environment. Therefore, no assessment of its efficacy or ability to mitigate test limitations or its contribution to accrediting the M&S suite is possible now. An accredited M&S suite is central to the test strategy for DOT&E to assess the self-defense Probability of Raid Annihilation requirement for the Flight III destroyers and ACB-20.
- Results of previous Aegis Baseline 9.A0 (cruisers) cyber survivability testing can be found in the July 2015 DOT&E AWS Early Fielding Report. DOT&E's cybersecurity assessment remains unchanged. Subsequent to this report, and the cyber survivability testing of Aegis Ashore installation (Baseline 9.B), the Navy canceled cyber survivability testing of Baseline 9.C1. The Navy will continue to evaluate cyber survivability during ACB-16 operational testing.

Assessment

- Analysis of FY19 test events for ACB-16 Phase 0 is ongoing. Surface warfare events demonstrated improvement from past combat system versions, but is not sufficient to assess ACB-16 surface warfare performance. DOT&E will report on ACB-16 Phase 0 testing in FY20.

Recommendation

1. The Navy needs an accredited M&S suite of the ACS to adequately assess the Probability of Raid Annihilation requirement for the self-defense mission for Flight III DDG 51 destroyers/ACB-20.