

Aegis Modernization Program



In July 2022, the Navy conducted three Standard Missile 2 (SM-2) live fire events against adversary anti-ship cruise missile surrogates using the Capability Package 22-1 variant of the Aegis Combat System's Advanced Capability Build 16 (ACB 16). DOT&E expects to release an ACB 16 Early Fielding Report in 1QFY23 because the Navy intends to field Capability Package 22-1 ships before operational testing is complete. The Navy expects to complete the ACB 16 testing in FY24. DOT&E will issue a final ACB 16 report at the completion of all ACB 16 testing, but test adequacy is at risk because the program lacks an approved Test and Evaluation Master Plan (TEMP)

SYSTEM DESCRIPTION

The Aegis Combat System is an advanced weapon control system comprised of sensors,

control elements, and weapons to detect, track, engage, and destroy adversary targets. The Aegis Combat System's key components include: 1) an Aegis Weapon System that includes the AN/SPY-1 three-dimensional multi-function

radar; 2) a Phalanx Close-In Weapon System; 3) a 5-inch diameter gun system; 4) the Vertical Launch System that can launch Tomahawk missiles, SM-2, SM-3, and SM-6, Evolved Sea Sparrow Missiles, and Vertical Launch Anti-Submarine

Rockets; and 5) an AN/SQQ-89 undersea warfare suite, which also incorporates integration with the MH-60R helicopter. The Navy's Aegis Modernization Program updates the Aegis Weapon System to improve Aegis Combat System integration and capabilities on CG 47-class Aegis guided missile cruisers and DDG 51-class Aegis guided missile destroyers.

MISSION

The Joint Force Commander/Strike Group Commander employs Aegis-equipped DDG 51-class guided missile destroyers and CG 47-class 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; and
- Operations independently or in concert with carrier or expeditionary strike groups and with other joint or coalition partners.

PROGRAM

The Aegis Modernization Program is not an acquisition program. The Navy has updated Aegis through quadrennial ACBs comprised of hardware and software modifications to improve capability. The latest upgrade is the ACB 16. The Navy intends four incremental deliveries within ACB

16: Baseline 9.2.0, Baseline 9.2.1, Baseline 9.2.2, and Capability Package 22-1 (previously referred to as Baseline 9.2.3). The evaluation of ACB 16 will be accomplished as a cumulative collection of operational test data from all baseline variants, with completion expected in FY24. The ACB 16 evaluation will inform deployment decisions and determine delivered capability for ACB 16 and its variants.

In coordination with DOT&E in FY19, the Navy developed an Aegis TEMP revision, which included the test strategy for the first three ACB 16 baselines, but the Navy never provided it for DOT&E approval. The Navy has subsequently updated the draft TEMP to incorporate an additional phase of development, Capability Package 22-1, but has not yet finalized or submitted the TEMP for DOT&E approval.

The Navy intends to deliver initial capability of the next Aegis ACB, ACB 20, in FY24 and in coordination with the DDG 51 Flight III ship's IOT&E. IOT&E will continue until at least FY27 due to the delayed ability of the Navy to test some capabilities, including integrated air and missile defense. The Navy, in coordination with DOT&E, developed a single TEMP describing the initial testing strategy for ACB 20 (Baseline 10), DDG 51 Flight III, and the Air and Missile Defense Radar (AN/SPY-6(V)1). DOT&E approved the combined TEMP on September 23, 2022. Another Aegis TEMP is planned to capture additional ACB 20 test events in FOT&E.

» MAJOR CONTRACTORS

- Lockheed Martin Rotary and Mission Systems – Moorestown, New Jersey
- Raytheon Missiles and Defense – Tucson, Arizona
- General Dynamics Marine Systems Bath Iron Works – Bath, Maine
- Huntington Ingalls Industries – Pascagoula, Mississippi

TEST ADEQUACY

In FY22, the Navy elected to add Capability Package 22-1, in which the Navy intends to resolve technical issues with certain hardware configurations and provide additional capabilities, to ACB 16. Capability Package 22-1 creates additional testing requirements and new combat-system-related deficiencies, such as operator training and documentation, have been observed.

In July 2022, the Navy conducted two integrated live SM-2 firing events against cruise missile surrogate targets using Capability Package 22-1 and a single SM-2 Block IIIC firing event to support the Block IIIC program using Capability Package 22-1. Testing also included Capability Package 22-1 tracking capability against aircraft employing electronic attack and against small boats. The test event against the small boats additionally exercised live fire of the integrated 5-inch diameter gun against the targets.

All testing was conducted in accordance with the DOT&E-approved test plans, and observed by DOT&E. The Navy intends to complete the remaining Capability Package 22-1 testing in FY23.

The Navy cancelled planned operational testing of Baseline 9.2.1 in FY20, due to the unavailability of the test ship, and plans to conduct operational testing on Baseline 9.2.1 in FY23 and FY24. The Navy intends to complete Baseline 9.2.2 testing in FY23.

The Navy has yet to schedule cyber survivability testing to include a cooperative vulnerability and penetration assessment and an adversarial assessment. Adequate test depends upon the completion of this cyber security evaluation, as well as the remaining operational tests for Baseline 9.2.1, 9.2.2, and the Capability Package 22-1. The lack of an approved TEMP risks the availability of required resources to execute the remaining test.

PERFORMANCE

» EFFECTIVENESS

The assessment of the Baseline 9.2.0 capability is summarized in a classified Early Fielding Report published in March 2020. Preliminary evaluation of Baseline 9.2.2 testing suggests anti-air and anti-surface warfare performance is consistent with legacy Aegis capability. Initial assessments of Baseline 9.2.2 and Capability Package 22-1 will be summarized in a classified Early Fielding Report

in FY23. The determination of ACB-16 operational effectiveness of ACB 16 is expected in FY24 after completion of Baseline 9.2.1, 9.2.2, and Capability Package 22-1 testing, and will be published in an ACB 16 OT&E report.

» SUITABILITY

Not enough data are yet available to assess ACB 16 operational suitability. Preliminary analysis highlights reliability concerns with the Aegis Display System and the SPY-1 radar.

» SURVIVABILITY

Not enough data are yet available to assess cyber survivability of any baseline variant of ACB 16.

RECOMMENDATIONS

The Navy should:

1. Submit, for DOT&E approval, an ACB 16 TEMP that details an adequate test strategy and test resources to assess the operational effectiveness and suitability of ACB 16.
2. Schedule ACB 16 cyber testing to include cooperative vulnerability and penetration assessments and adversarial assessments for ACB 16 variants as soon as feasible to identify and mitigate any cyber vulnerabilities, especially for ships currently employing ACB 16 in the fleet.
3. Determine and correct the cause of reliability issues with the Aegis Display System and SPY-1 radar.

4. Identify the cause of deficiencies found during Capability Package 22-1 testing and prioritize the correction of those deficiencies for deploying ships.
5. Submit, for DOT&E approval, an Aegis TEMP to adequately test ACB 20 capabilities not covered in the combined DDG 51 FLT III, Baseline 10, and Air and Missile Defense Radar TEMP.
6. Complete the ACB 16 operational test campaign.