

# Aegis Modernization Program

In August 2021, the Navy conducted three live Evolved Sea Sparrow Missile (ESSM) Block 2 fire events against adversary anti-ship cruise missile surrogates using the Baseline 9.2.2 variant of the Aegis Combat System's Advanced Capability Build 16 (ACB 16). Preliminary evaluation of Baseline 9.2.2 testing suggests anti-air and anti-surface warfare performance is consistent with legacy Aegis capability. While the Navy expects to complete the ACB 16 testing on all delivered Baseline 9.2 variants in FY23, the assessment of ACB 16 operational effectiveness and suitability is at risk due to a lack of an approved Test and Evaluation Master Plan (TEMP). Additionally, the Navy has yet to conduct any operational testing on Baseline 9.2.1.



## 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 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, Standard Missiles-2, -3, and -6, ESSMs, and Vertical Launch Anti-Submarine Rockets, and 5) an AN/SQQ-89 undersea warfare suite, which includes 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 to advance their support to anti-air warfare in self-defense and defense of carrier strike groups or expeditionary strike groups, anti-surface warfare, anti-submarine warfare, strike warfare, and integrated air and missile defense.

## Program

The Aegis Modernization Program is not an acquisition program. The Navy has updated Aegis through quadrennial ACBs that comprise 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. The evaluation of ACB 16 will be accomplished as a cumulative collection of operational test data from all baseline variants, with completion expected in FY23. The ACB 16 evaluation will inform deployment decisions and determine delivered capability for ACB 16 and its variants.

The Navy developed an Aegis TEMP revision in FY19 in coordination with DOT&E, which included the test strategy for the first three ACB 16 baselines, but the Navy never provided it for DOT&E approval. The Navy now intends to incorporate an additional phase of development, Capability Package 22-1 (previously referred to as Baseline 9.2.3), into the TEMP revision for DOT&E approval.

The Navy intends to deliver initial capability of the next Aegis ACB, ACB 20, in FY24 in coordination with the DDG 51 Flight III ship's IOT&E. Operational testing of ACB 20 will continue until at least FY27 due to the lack of availability to test some capabilities, including integrated air and missile defense.

## Major Contractors

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

## Test Adequacy

In August 2021, the Navy conducted three live ESSM Block 2 fire events against adversary anti-ship cruise missile surrogates using the Baseline 9.2.2. Additional testing included Baseline 9.2.2 tracking capability against small boats in both day and night conditions, and a live fire event that utilized the Close-In Weapon System, 5-inch diameter gun, and 25mm gun systems to defeat small boats in a night exercise. All testing was conducted in accordance with the DOT&E-approved test plan. The Navy intends to complete Baseline 9.2.2 testing in FY22. The Navy cancelled planned operational testing of Baseline 9.2.1 in FY20 due to the unavailability of the test ship, with the plan to conduct an operational test

on Baseline 9.2.1 and Capability Package 22-1 in FY22-23.

In November 2020, the Navy canceled an Adversarial Assessment, the subsequent test in a cybersecurity evaluation to the Cooperative Vulnerability and Penetration Assessment completed in FY19, on Baseline 9.2.0 due to emergent ship repairs on the test ship. The Navy is working to reschedule this Adversarial Assessment in FY22. Additionally, the Navy needs to evaluate differences in subsequent ACB 16 Baselines to determine the scope of their cyber survivability evaluation.

An adequate evaluation of the ACB 16 operational effectiveness, suitability, and survivability is at risk. While the Navy has been coordinating with DOT&E, it has yet to provide the ACB 16 test strategy within an Aegis TEMP update for DOT&E approval. Additionally, the Navy has yet to conduct any operational testing on Baseline 9.2.1.

## Performance

### Effectiveness

Not enough data are yet available to assess ACB 16 operational 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. Preliminary assessment will be summarized in a classified Early Fielding Report in FY22 after the completion of Baseline 9.2.2 testing, and the final assessment will be published in an ACB 16 OT&E report in FY23 after completion of Baseline 9.2.1 and Capability Package 22-1 testing.

### Suitability

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

## Survivability

Not enough data are yet available to assess cyber survivability of any Baseline variant of ACB 16. Survivability assessment of the Baseline 9.2.0 as installed on the CG 47-class Aegis guided missile cruiser in a cyber-contested environment will be published upon completion of the Adversarial Assessment.

resources to assess the operational effectiveness and suitability of ACB 16, including additional capabilities provided in each software delivery.

2. Schedule an Adversarial Assessment on an ACB 16 Baseline 9.2.0 ship as soon as feasible to identify and mitigate any cyber vulnerabilities on ships currently employing ACB 16 in the Fleet.
3. Determine and correct cause of reliability issues with the Aegis Display System.

## Recommendations

The Navy should:

1. Submit, for DOT&E approval, a revised TEMP that details an adequate test strategy and test