

## Aegis Modernization Program

### Executive Summary

- The Navy is modernizing the Aegis Weapon System (AWS) installed on Baseline 3 USS *Ticonderoga* (CG 47) class cruisers and the Flight I USS *Arleigh Burke* (DDG 51) destroyers to the AWS Advanced Capability Build 2012 (Baseline 9A and 9C, respectively). New construction DDGs, beginning with USS *John Finn* (DDG 113), will be equipped with Baseline 9C as well.
- In September 2014, the Navy completed cruiser integrated air defense and Undersea Warfare developmental and operational testing on USS *Normandy* and USS *Chancellorsville*. Data from these tests will supplement data from the dedicated operational test in FY15.
- During developmental testing, a BQM-74E anti-ship cruise missile (ASCM) target drone struck USS *Chancellorsville*. The time required to repair the ship delayed the start of cruiser operational testing, originally planned for 4QFY14, until 2QFY15.
- The lack of an adequate modeling and simulation (M&S) suite of the Aegis Combat System, as well as the lack of an Aegis-equipped Self-Defense Test Ship (SDTS) where the ship's full self-defense kill chain can be tested, precludes assessment of the Baseline 9 Probability of Raid Annihilation (PRA) requirement.
- The Navy will not fully assess Aegis Integrated Air and Missile Defense (IAMD) until a validated M&S test bed is developed and validated. The test bed is planned to be available by 2020, but there is no agreed upon strategy to validate the model to support assessment of the close-in, self-defense battle space. A limited IAMD assessment will be made during Baseline 9C operational testing on DDGs. One live firing event is planned to include live firing of Standard Missile-2 (SM-2) and SM-3 missiles against threat representative targets in an IAMD engagement.
- During developmental testing in June 2014, the Navy successfully conducted three, at-sea live fire tests of the Naval Integrated Fire Control – Counter Air From-the-Sea (NIFC-CA FTS) Increment I capability. The Navy will field the NIFC-CA FTS Increment I capability when it deploys the first E-2D and Aegis Baseline 9-equipped Carrier Strike Group in FY15. NIFC-CA FTS Increment I has demonstrated a basic capability, but its effectiveness under operationally realistic conditions is undetermined.

### System

- The Navy's Aegis Modernization program provides updated technology and systems for existing Aegis guided missile cruisers (CG 47) and destroyers (DDG 51). This planned, phased program provides similar technology and systems for new construction destroyers.



- The AWS, carried on DDG 51 guided missile destroyers and CG 47 guided missile cruisers, 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 (DDGs 79 Flight IIA and newer have a hangar to allow the ship to carry and maintain its own helicopter)
  - Close-In Weapon System
  - Five-inch diameter gun
  - Harpoon ASCMs (DDGs 51 through 78, CGs 52 through 73)
  - Vertical Launch System that can launch Tomahawk land-attack missiles, Standard surface-to-air missiles, Evolved SeaSparrow Missiles, and Vertical Launch Anti-Submarine Rocket missiles
- The AWS on Baseline 3 USS *Ticonderoga* (CG 47) class cruisers and Flight I USS *Arleigh Burke* destroyers is being upgraded to Baseline 9A and 9C, respectfully. Baseline 9 will provide the following new capabilities:
  - Full SM-6 integration
  - IAMD to include simultaneous Air Defense and Ballistic Missile Defense missions on Aegis destroyers equipped with the new Multi-Mission Signal Processor
  - NIFC-CA FTS capability
  - Starting with USS *John Finn* (DDG 113), the AWS on new construction Aegis guided missile destroyers is Baseline 9C

# FY14 NAVY PROGRAMS

## 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
- Offensive and defensive warfare operations simultaneously
- Independent operations or with Carrier or Expeditionary Strike Groups, as well as 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 Maritime Systems and Sensors – Moorestown, New Jersey

## Activity

- In June 2014, the Navy successfully conducted three NIFC-CA FTS Increment I engineering demonstration tests on USS *John Paul Jones* (DDG 53). Although not part of a DOT&E-approved test plan, DOT&E observed and collected performance data on the NIFC-CA FTS Increment I capability.
- The Navy successfully conducted the Baseline 9A Cruiser integrated air defense and Undersea Warfare developmental and operational testing on USS *Normandy* (CG 60) and USS *Chancellorsville* (CG 62) in accordance with the DOT&E-approved test plan. Data from these tests will supplement data from the dedicated operational test in FY15.
- During developmental testing, a BQM-74E ASCM target drone struck USS *Chancellorsville* (CG 62). The time required to repair the ship delayed that start of operational testing, originally planned for 4QFY14, until 2QFY15.
- Aegis Destroyer Baseline 9C dedicated operational testing is scheduled for FY16.
- The Navy conducted Baseline 9A cybersecurity operational testing onboard USS *Chancellorsville* (CG 62) in November and December 2014.

## Assessment

- Baseline 9A and 9C testing completed to date is not sufficient to support an assessment of operational effectiveness or suitability before the first ship deploys in FY15. Operational testing is planned to continue throughout FY15/16. Upon the decision to deploy Baseline 9A in FY15, DOT&E will submit an Early Fielding Report.
- The Navy will not fully assess Aegis IAMD until a validated M&S test bed is developed and validated. The test bed is planned to be available by 2020, but there is no agreed upon strategy to validate the model to support assessment of the close-in, self-defense battle space. A limited IAMD assessment will be made during Baseline 9C operational testing on DDGs. One live firing event managed by the Missile Defense Agency is planned to include live firing of SM-2 and SM-3 missiles against threat representative targets in an IAMD engagement in FY15.
- As appropriate, and until the full capability may be operationally tested, DOT&E will provide periodic capability

assessments to inform Navy and OSD leadership, as well as Congress, on the progress of test and evaluation of the IAMD mission area.

- Until an Aegis-equipped SDTS is available for testing, it is neither possible to characterize the self-defense capabilities of the Aegis cruisers and destroyers, nor possible to accredit an M&S suite to determine if the ships satisfy their PRA requirements.
- The Navy's FY14 NIFC-CA FTS Increment I events were sufficient to demonstrate basic capability; however, these demonstrations were not conducted under operationally realistic conditions or against aerial targets representative of modern threats. Additionally, the executed scenarios were not sufficiently challenging to demonstrate the NIFC-CA requirements defined in the Navy's September 2012 NIFC-CA Testing Capability Definition Letter.
- Combined Aegis Baseline 9 and SM-6 FOT&E test events to date have been successful with no integration issues revealed. The Navy plans to conduct six SM-6/Baseline 9 test flights in FY15.
- The Navy's Aegis Baseline 9A cybersecurity testing revealed significant problems, which are classified. The nature of these problems is such that they could pose significant risk to the cybersecurity for the FY15 deployment.

## Recommendations

- Status of Previous Recommendations. The Navy has not addressed two of the three previous recommendations. The Navy still needs to:
  1. Continue to improve Aegis ships' capability to counter high-speed surface threats in littoral waters.
  2. Synchronize future baseline operational testing and reporting with intended ship-deployment schedules to ensure that testing and reporting is completed prior to deployment.
- FY14 Recommendations. The Navy should:
  1. Continue to develop an end-to-end M&S suite of the Aegis Combat System that may be used, in conjunction with operationally realistic testing conducted on an

## FY14 NAVY PROGRAMS

- Aegis-equipped SDTS, to assess the PRA requirements of the Aegis cruisers and destroyers.
2. Provide the necessary funding to support the procurement of an Advanced Air and Missile Defense Radar and Aegis-equipped SDTS that is needed to support Aegis Modernization, Advanced Air and Missile Defense Radar, DDG 51 Flight III, and Evolved SeaSparrow Missile Block 2 operational testing.
3. Characterize Aegis Baseline 9A/C and soon-to-be-deployed NIFC-CA FTS Increment I capability against operationally realistic ASCM threats as soon as possible.
4. Continue to improve Aegis ship's capability to counter high-speed, surface threats in littoral waters.
5. Submit, for DOT&E approval, a Test and Evaluation Master Plan that describes and resources adequate operational testing of future NIFC-CA FTS increments before such capabilities are deployed.
6. For Baseline 9A, develop and deploy necessary cybersecurity corrective actions and verify correction with a follow-on operational cybersecurity test.

# FY14 NAVY PROGRAMS