

Standard Missile-6 (SM-6)

Executive Summary

- The Navy completed the remaining FY10 missions during combined developmental/operational testing of the Standard Missile-6 (SM-6) in January 2011.
- The Navy completed SM-6 IOT&E flight testing in July 2011. In IOT&E, SM-6 demonstrated significant new capabilities against maneuvering targets, low-altitude targets, and targets with electronic countermeasures, successfully completing 7 of 12 intercept attempts. SM-6 also demonstrated the longest engagement range for a Standard Missile to-date. Nonetheless, the results of testing currently available do not yet demonstrate the SM-6 is operationally effective or suitable. During 12 attempted missions, initial analysis indicates seven missions were successful. Two missions failed due to fuze-related anomalies, two missions failed due to in-flight material (hardware) failures, and another mission failed due to improper functioning of the missile navigation system. A thirteenth mission was a no-test due to a target failure.
- The Navy is conducting failure analysis and determining the corrective action needed to address the failures. Re-testing to verify the corrective actions has not been scheduled.
- The SM-6 program is in low-rate initial production.

System

- SM-6 is the latest evolution of the Standard Missile family of fleet air defense missiles that incorporates components from two existing Raytheon product lines: the SM-2 Block IV and the Advanced Medium-Range Air-to-Air Missile (AMRAAM).
- SM-6 is employed from cruisers and destroyers equipped with Aegis combat systems.
- The SM-6 seeker and terminal guidance electronics derive from technology developed in the AMRAAM program. SM-6 retains the legacy Standard Missile semi-active radar homing capability.
- SM-6 receives midcourse flight control from the Aegis combat system via ship's radar; terminal flight control is autonomous via the missile's active seeker or supported by the Aegis combat system via the ship's illuminator.



Mission

- The Joint Force Commander/Strike Group Commander will use SM-6 for fleet air defense against fixed-/rotary-winged targets and anti-ship missiles operating at altitudes ranging from very high to sea-skimming.
- The Joint Force Commander will use SM-6 as part of the Naval Integrated Fire Control – Counter Air (NIFC-CA) concept to provide extended-range, over-the-horizon capability against at-sea and overland threats.

Major Contractor

Raytheon Missile Systems – Tucson, Arizona

Activity

- DOT&E approved the operational test plan in June 2011.
- In January 2011, the Navy completed at-sea developmental testing/operational testing (DT/OT) at the Pacific Missile Range Facility, Kauai, Hawaii. The Navy successfully executed two of the three planned missions. The Navy carried the failed mission forward to the IOT&E.
- In July 2011, the Navy completed the IOT&E Phase 1, at-sea live missile firing, at the Pacific Missile Range Facility, Kauai, Hawaii. This phase of testing consisted of 13 planned missions. The Navy conducted 12 flight missions. The thirteenth mission was a no-test due to a target failure prior to intercept. The Navy will conduct the remaining mission during FOT&E.
- The Navy plans to complete Phase 2 of the IOT&E in April 2012. Phase 2 is an extensive modeling and simulation effort that intends to explore fully the SM-6 battlespace within the performance demonstrated in Phase 1.

Assessment

- In IOT&E, SM-6 demonstrated significant new capabilities against maneuvering targets, low-altitude targets, and targets with electronic countermeasures, successfully completing 7 of 12 intercept attempts. SM-6 also demonstrated the longest downrange engagement range for a Standard Missile to-date.
- The results of testing currently available do not yet demonstrate SM-6 is operationally effective and suitable. In the IOT&E, several anomalies occurred that influence SM-6 effectiveness and suitability assessments. Based upon combined data from the IOT&E and DT/OT flight tests, the SM-6 does not meet the flight reliability criteria established by USD(AT&L) for full-rate production.
- The continuing discovery of performance and reliability issues at IOT&E is a concern. Overall, these results reinforce the importance of a reliability growth program during development.
 - There were two performance anomalies in IOT&E that a more rigorous developmental testing program may have discovered earlier.
 - One anomaly discovered in developmental testing (uplink/downlink antenna insulation debris) carried forward to IOT&E without corrective action fully implemented on all missiles; there were additional occurrences during IOT&E on this configuration.
 - One anomaly discovered in developmental testing (Mk 54 Safe-Arm Device) carried forward into IOT&E and remains under investigation; additional occurrences were experienced during IOT&E. This anomaly could degrade SM-6 lethality.
- The Navy has not tested the SM-6 in its objective operational environment. Because of employment limitations of the current Aegis “legacy” baseline, the IOT&E did not address the full capability of SM-6 as outlined in its validated requirements; the Naval Integrated Fire Control-Counter Air (NIFC-CA) capability will be required to fully demonstrate SM-6 requirements. In this “legacy” mode, SM-6, engagements are limited to being conducted within the firing ship’s radar horizon. The full over-the-horizon capability of SM-6 will not be demonstrated until Aegis Capability Baseline 12 and the NIFC-CA sensors are fielded after FY14.

Recommendations

- Status of Previous Recommendations. The Navy is addressing the previous recommendations to develop a test strategy for the SM-6 in the NIFC-CA role and to accelerate testing against the full anti-ship cruise missile set in order to address the gap in the fleet’s ability to defend itself against fielded anti-ship cruise missiles.
- FY11 Recommendations. The Navy should:
 1. Prior to fielding the SM-6, conduct additional flight testing to demonstrate corrective actions for the anomalies that occurred during the IOT&E.
 2. Develop an IOT&E-level test strategy for NIFC-CA capability to assess fully the effectiveness and suitability of SM-6 in its objective operational environment.
 3. Investigate and identify the root cause of the Safe-Arm Device anomaly and take corrective measures to eliminate it.