Rolling Airframe Missile (RAM) Weapon System

The Rolling Airframe Missile (RAM) program provides surface ships with a low-cost, lightweight, self-defense system to defeat anti-ship cruise missiles (ASCMs). RAM Block 0 uses dual mode, passive radio frequency (RF)/ infrared guidance. RAM Block 0 enhances ship self defense against several RF-radiating ASCMs while RAM Block I extends that defense against non-RF radiating missiles. The launching system and missiles comprise the weapon system.

Most current RAM weapon system installations are integrated with the AN/SWY-2 or -3 combat systems. RAM is integrated with the Ship Self Defense System (SSDS) Mark 1 on the LSD 41/49-class of amphibious ships. AN/SWY-2 installations use RAM as the only hard-kill weapon. AN/SWY-3 installations use both RAM and NATO Seasparrow systems as hard-kill weapons. RAM will be integrated with the SSDS Mark 2 on LPD 17-class, LHD 1-class, and CVN 68-class ships (the NATO Seasparrow is also on the latter two ship classes).

The United States and the Federal Republic of Germany jointly developed RAM. Commander, Operational Test and Evaluation Force (COMOPTEVFOR) completed RAM Block 0 IOT&E in FY90. COMOPTEVFOR conducted the RAM Block 1 operational evaluation on the Self Defense Test Ship (SDTS) and on a fleet ship in 1999. In 1997, the resource sponsor requested that the program manager determine what RAM capability existed against helicopters, slow aircraft, and surface targets (HAS). This request stipulated that Block 1 anti-ASCM capability was to be retained, but was not accompanied by operational requirements for the additional target set.

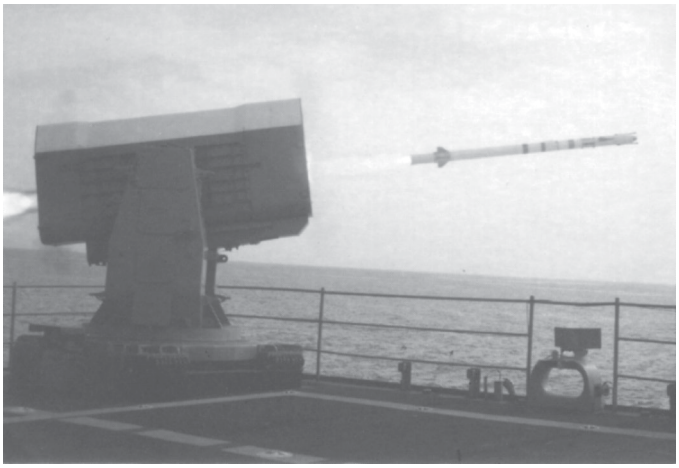
TEST & EVALUATION ACTIVITY

DOT&E approved the RAM Block 1A (RAM Block 1 with HAS software) Test and Evaluation Master Plan and Operational Test Plan. Combined Developmental Test/Operational Test (DT/OT) started in June 2003 and extended into FY04, using the existing SDTS to ensure operationally realistic tests for determining that RAM with the new HAS software retained capability against ASCMs and to carry out deferred testing from the FY99 operational evaluation.

TEST & EVALUATION ASSESSMENT

RAM Block 1. RAM Block 1, as supported by an LSD 41-class combat system, is operationally effective against most current ASCMs . RAM Block 1 is operationally suitable and is lethal against most current ASCMs. Follow-on test & evaluation for Block 1 (or Block 1A) still needs to address missile capability against the threat category that was not tested during the operational evaluation, against ASCMs under conditions of electronic jamming of the combat system sensors, in low visibility (high aerosol) environments, and in the presence of other infrared sources.

For the threat category not tested during the operational evaluation, the Navy's subsonic target upgrade program may deliver targets by FY06 that may be adequately representative of the threat for some acquisition programs. Unfortunately, the Navy's target developers did not accord high priority to providing the characteristics required to make the target adequately threat representative for RAM program testing. The program manager considers examining missile capability against ASCMs under conditions of electronic countermeasures against the combat system sensors to be an area beyond his control and his sponsor does not wish to fund such T&E. Overall testing of RAM will not be adequate without such testing, and the fleet users of the system will not be informed about their self-defense capability in that environment.



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RAM HAS Mode. The program sponsor has not issued detailed performance goals for RAM HAS. From an OT&E perspective, the absence of operational requirements undermines objective assessment of operational test results and hampers the program manager's ability to understand the impact of performance trades on mission accomplishment and operational effectiveness against HAS targets. In addition to the combined DT/OT against ASCMs in FY03/FY04 on the SDTS, developmental testing is planned in FY04 with the same Block 1A rounds against a small number of representative HAS targets from an upgraded RAM launcher operated in a standalone mode. The Navy will conduct DT/OT from a manned ship against an aerial target drone in FY05/FY06, accompanied by a maintenance demonstration and evaluation of the Mod 3 launcher.

During the initial flight tests of the combined DT/OT of Block 1A, a defect in microcircuitry of the guidance system was discovered. Isolating the problem and locating missiles containing the defective components delayed completion of DT/OT until FY04. However, the value of operationally realistic operational testing conducted with the SDTS was reaffirmed during later tests in September 2003. Problems with SSDS Mark 1 and with the RAM HAS software were discovered during a realistic test against ASCMs that could not have been conducted with a manned ship.

In November 2002, the Navy discovered that the seeker-focus shifts over time which could reduce missile performance after extended storage. The problem is understood and a fix is being implemented.

RAM Block 0 and Block 1 LFT&E evaluated lethality against various ASCMs. RAM HAS was designated for lethality LFT&E oversight based on its new target set. There is little data on RAM warhead lethality against those targets. Additional tests are needed for information on the lethality of the weapon and for the development of simulations that can be used to predict lethality/effectiveness against threats under a variety of scenarios. The LFT&E strategy for RAM HAS includes ground testing of the warhead against whole targets and/or components, flight testing, and simulation-based analyses.

As with any shipboard combat system required to provide self defense with short range weapons such as RAM and the Evolved Sea Sparrow Missile, safe and effective OT&E requires the use of an SDTS. The current SDTS, Ex-*Decatur*, is nearly 50 years old and evidences severe deterioration. The current combined DT/OT is probably the last testing that will be conducted with this ship. The first was in 1994 and several important weapons and combat system elements have been realistically tested over the years. The replacement SDTS, a decommissioned *Spruance*-class destroyer, is at Port Hueneme, California, awaiting conversion for the next testing. As DOT&E has noted in the discussion of the LPD 17 and the SSDS, the adequacy of the OT&E for both programs (and approval of the test plans) hinges on having an LPD 17-representative combat system on the new SDTS, along with funded resources, including RAMs and targets, for the testing. This should be funded in time to support the LPD 17 FY06/FY07 operational evaluation before the ships are ready for deployment.