

AN/AAR-47 (V)2 Missile and Laser Warning System

SUMMARY

- AAR-47 is in full-rate production and fielded on many different aircraft types in both the Navy and Air Force.
- It has demonstrated effectiveness in numerous situations, but both Services are seeking multiple improvements to reduce performance problems.

SYSTEM DESCRIPTION AND MISSION

The original AN/AAR-47, first fielded in the late 1980s, provides passive warning of infrared guided missiles directed at its host aircraft. In addition to providing warning to the aircrew, it cues an onboard expendables dispenser to eject countermeasure flares to defeat infrared guided missiles. Approximately 2,750 were produced before production ended. The system consists of four ultra-violet (UV) single-pixel quadrant sensors oriented about the aircraft to provide 360-degree azimuth protection; a processor that analyzes the signals received by the sensors declares an incoming threat, warns the aircrew, and initiates dispensing of flares; and a control/indicator unit that provides warning indications to the aircrew and allows control of the system.

The AAR-47(V)2 upgrade has improved UV single-pixel quadrant sensors that eliminated sensor blackening (a known failure mode), increased temperature tolerance, provided a more uniform sensitivity, and added a new spectral filter to improve missile warning performance and reduce false alarms.

Additionally, the new sensor has laser detectors that allow the AAR-47(V)2 to provide the functionality of the AVR-2/2A laser warning system in detecting and declaring laser rangefinders, designators, and beam-rider missiles. This added functionality allows the Navy to retire approximately 300 AVR-2/2A laser warning systems at a considerable cost savings, and provide laser warning for aircraft that did not have the AVR-2/2A installed.

Operational testing of the AAR-47(V)2 on helicopters was completed in FY03, and the system is currently in full-rate production. Approximately 1,500 AAR-47(V)2 systems have been ordered, of which 600 have been delivered. The rest are scheduled for delivery through 2007 and more orders are anticipated. Navy aircraft that have the AAR-47(V)2 include the AH-1W, UH-1N, H-1 upgrades (UH-1Y and AH-1Z), CH-46E, CH-53E, H60 family, MV-22, P-3C, and KC-130. Air Force aircraft that have the AAR-47(V)2 include the C-130, C-141, C-5, H-60, and H-53.

During developmental/operational testing, the AAR-47(V)2 demonstrated satisfactory performance of the missile warning function, but only partially satisfactory performance of the laser warning function. The missile and laser warning false alarm rates were acceptably low. The decision was made to go to production even though the performance against one class of laser threat was not equivalent to the AVR-2A.

After operational testing was completed, the Air Force identified several problems on the C-130 and other transport aircraft including short-term missile warning sensitivity; degradation due to some types of counter measure flares; field-of-view limitations on one type of aircraft; and algorithm shortfalls for some missile types, atmospheric conditions, and clutter backgrounds. The Air Force initiated a program to address these shortfalls, including installing "smart cables" to



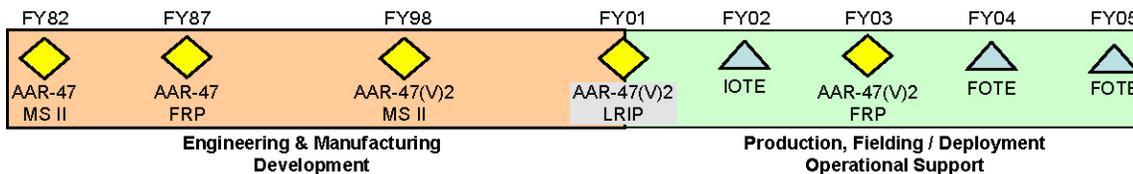
The AAR-47(V)2 upgrade is designed to improve missile warning performance and reduce false alarms.

NAVY PROGRAMS

eliminate sensor degradation from counter measure flares, changing sensor orientation on one aircraft type, and developing a new software algorithm.

The Navy identified short term missile warning sensitivity degradation resulting from some types of counter measure flares. The Navy is pursuing an alternate approach, (V)2 Plus, for reducing this degradation. The Navy also identified an integration problem on the P-3 involving an onboard high-power radar inducing false laser warning alerts. Similar concerns have been raised as to whether the laser onboard the MH-60R might also potentially induce false laser warning alerts. The Navy is developing a new version of the program software to address a number of other minor problems identified during integration testing on Navy and Air Force platforms. The new software is scheduled for release in the late 2004.

TEST AND EVALUATION ACTIVITY



Although operational testing was completed in FY03, a number of additional tests were conducted during FY04 and more are planned for FY05.

Navy FY04 AAR-47(V)2 tests included integration testing on the P-3 at Patuxent River Naval Air Station (NAS), integration testing of the Integrated Self Defense Suite on the MH-60R at Patuxent River NAS, and KC-130J follow-on test and evaluation (OT-IIIC(1)) at China Lake. Additional Navy FY04 tests were the Air Force “smart cables” tests on the KC-130F/R/T and KC-130J at Patuxent River NAS, and prototype testing of the (V)2 Plus on the KC-130 at Patuxent River NAS.

Air Force FY04 AAR-47(V)2 testing included C-17 prototype “smart cable” flight testing at Edwards Air Force Base (AFB), C-141 prototype “smart cable” flight testing at Wright-Patterson AFB, and Marine KC-130J and UK C-130J prototype “smart cable” flight testing Patuxent River NAS. Additional FY04 Air Force testing included C-130 and C-17 Large Aircraft Infrared Countermeasures piggy-back flight testing (multiple locations) and live fire testing of AAR-47(V)0 and (V)2 at Tonapah during enhanced Laser Infrared Fly-out Experiment Test.

Navy FY05 AAR-47(V)2 testing will include continued P-3 integration testing at Patuxent River NAS, continued MH-60R testing at Patuxent River NAS, and continued prototype testing of (V)2 Plus at Patuxent River NAS.

Air Force FY05 AAR-47(V)2 testing will include operational flight testing of “smart cable” on the C-130J and C-17; operational ground testing of “smart cable” on C-130EH, C-141, and C-5; and live missile firing test of new algorithm at Aerial Cable Range (initially AAR-47(V)0 only). Additionally, the Air Force plans to conduct sensor orientation testing on C-130EH and Testing of a prototype (V)2 Plus on the C-17 at Eglin or Edwards AFB.

TEST AND EVALUATION ASSESSMENT

AAR-47(V)2 operational testing was completed in FY03 and the system is in full-rate production. The system is relatively inexpensive, available, and has successfully protected aircraft in theater. However, questions have been raised regarding system performance and false alarm rate. Additional testing is required to better evaluate upgrades and quantify performance. The Navy and Air Force need to continue to coordinate testing and their efforts to improve system performance.