AN/AAR-47 Hostile Fire Indication (HFI)
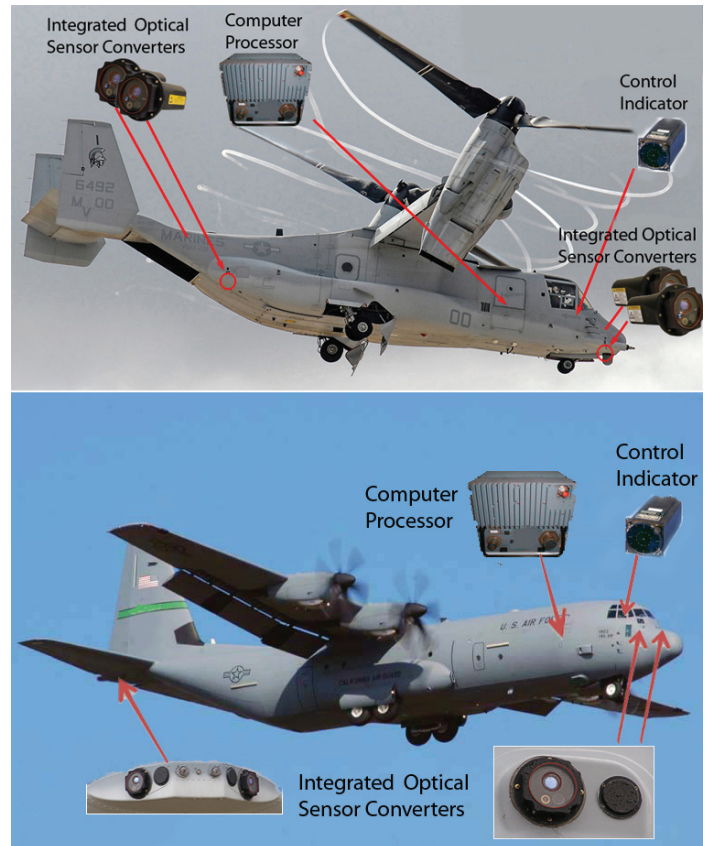# Software Upgrade

Executive Summary
- DOT&E assessed the AN/AAR-47 Hostile Fire Indication (HFI) software upgrade as operationally effective with limitations and operationally suitable, and assessed that it provides improved situational awareness for aircrew. Specific details are documented in the classified DOT&E AN/AAR-47 operational assessment report to the Navy.
- The AN/AAR-47 HFI warning capability can become degraded in certain environments. This limitation applies to all platforms on which the AAR-47 is integrated.
- The HFI software upgrade did not degrade the system's missile warning performance.
- The Navy should continue to develop HFI algorithms to improve threat detection and identification.
- The Navy accomplished testing according to the DOT&E-approved Test and Evaluation Master Plan (TEMP) and test plans.

System
- The AN/AAR-47 is a defensive system that warns pilots of missile threats and commands dispensing of flares as an infrared countermeasure. It is composed of a control indicator, a computer processor, and four Integrated Optical Sensor Converters (IOSC).
- Since full-rate production in 1987, the sensor has evolved. The current sensor upgrade, designated B(V)2, improved missile warning performance in all operational environments by adding hardware to the sensor to improve detection in the ultraviolet cluttered background environments.
- There are currently 2,900 systems that have been delivered worldwide. The platforms on which the system has been deployed are as follows: KC-130T, KC-130J, CH-35D, CH-53E, AH-1W, AH-1Z, UH-1N, P-3C, MV-22B, MH-60R, MH-60S, UC-12W, CH-46E, SH-60B, and HH-60H.
- The HFI capability is a software upgrade only with no changes to hardware.

Mission
Combatant commanders utilize the AN/AAR-47 to enhance survivability of several types of fixed- and rotary-wing aircraft against shoulder-fired, vehicle-launched, and other portable infrared-guided missile threats. The HFI capability enhances survivability by providing aircrew situational awareness of small arms fire and rockets near the aircraft so the aircrew can take appropriate action.

Major Contractor
Alliant Techsystems Inc. Defense Electronics Systems – Clearwater, Florida

Activity
- The Commander, Operational Test and Evaluation Force was the responsible operational test agency for the AN/AAR-47 operational assessment, which included the following test activities:
  - Simulation runs at the Naval Research Laboratory, Washington, DC, and at the Electronic Warfare Software Support Activity hardware-in-the-loop facility at Point Magu, California, from June through December 2010.

- Live fire testing at the Weapons Survivability Laboratory, China Lake, California, in June and November 2010.
- Human Factor evaluations at the Manned Flight Simulator, Patuxent River, Maryland, in November 2010.
- Open-air flight testing at the Marine Corps Air Station, New River, North Carolina, in July and October 2010 and from January through February 2011.
- Open-air flight testing at the Naval Air Warfare Center, China Lake, California, from December 2010 through February 2011.

- The Navy conducted these test activities in accordance with the DOT&E-approved TEMP and test plans.
- The Navy is upgrading the current HFI software (version 30.41) to improve HFI information displayed in the cockpit and to simplify system menus accessed by aircrew and maintenance.

Assessment

- DOT&E assessed the AN/AAR-47 HFI software upgrade as operationally effective with limitations and suitable, and determined that it provides improved situational awareness for aircrew. Specific details are documented in the October 18, 2011, classified DOT&E AN/AAR-47 operational assessment report to the Navy.

- The AN/AAR-47 HFI warning capability can become degraded in certain environments. This limitation applies to all platforms on which the AN/AAR-47 is integrated.
- The HFI software upgrade did not degrade the system's missile warning performance.
- The false alarm rate for hostile fire is currently below the classified requirement and is therefore satisfactory.
- The missile warning prioritization functionality was satisfactory (because incoming missiles are more lethal than small arms hostile fire, the system is designed to give higher priority to missile warning than to hostile fire warning).
- The operational flight program 230.1 for the AN/APR-39 display configuration functions properly and provides improved situational awareness.

Recommendations

- Status of Previous Recommendations. The Navy has resolved all previous annual report recommendations.
- FY11 Recommendations. The Navy should:
  1. Develop tactics, techniques, and procedures to mitigate AN/AAR-47 HFI limitations.
  2. Continue to develop algorithms to address system limitations and improve overall performance.