

ALR-69A Radar Warning Receiver (RWR)

Executive Summary

- The Air Force Operational Test and Evaluation Center (AFOTEC) accomplished IOT&E from May 18 through July 16, 2012. The flight tests were flown at the Fallon Range Training Complex, Nevada, and the Multi-Spectral Test and Training Environment at Eglin AFB, Florida, resulting in a total threat exposure time of 12 hours. The system logged a total of 204 hours of operating time during IOT&E.
- DOT&E assessed the system as not operationally effective but operationally suitable. The system was not operationally effective because it did not consistently provide the aircrew timely and accurate threat information and the system demonstrated a random threat symbol splitting deficiency. Threat symbol splitting occurs when one threat signal received by the system produces multiple threat symbols at different azimuths on the cockpit display. This degrades the aircrew's situational awareness as to which displayed threats are "real" and where those real threats are located and inhibits the aircrew's ability to appropriately react to the threat(s) in a timely manner. The details of the DOT&E assessment are presented in DOT&E's classified IOT&E report, dated October 2012.
- Although the Air Force System Program Office (SPO) and Raytheon conducted hardware-in-the-loop (HWIL) tests to demonstrate the threat signal splitting deficiency has been resolved, DOT&E does not think HWIL testing by itself is adequate to verify the deficiency has been resolved and that the software update did not induce any other adverse system performance.

System

- The ALR-69A is a Radar Warning Receiver (RWR) that detects, identifies, and locates threat electronic signals.
- The Core ALR-69A RWR is designed to improve performance over the Air Force's primary RWR system, the ALR-69, by enhancing:
 - Detection range and time
 - Accuracy of threat identification
 - Location of threat emitter systems
 - Performance in a dense signal environment
 - Reliability and maintainability

Activity

- The Air Combat Command 413th Flight Test Squadron issued a Developmental Test and Evaluation (DT&E) report in February 2012 to the SPO at Warner Robins Air Force Base, Georgia. The report covered testing accomplished between



Digital Radar Warning Receiver Replaces Legacy Systems with Modern Wideband Digital Receiver Technology

- 1 - Legacy ALR-69 Components 3 - Radar Receiver
2 - Primary ALR-69 Components 4 - Countermeasure Signal Processor

- The system integrates with transport and fighter aircraft. The lead platform is the C-130H, with other platforms possibly to be added at a later date.
- Core ALR-69A RWR components include:
 - Radar receivers (previously the digital quadrant receivers)
 - Modular Countermeasures Signal Processor (previously the countermeasures computer)
 - Control indicator
 - Azimuth indicator

Mission

- Combatant Commanders will use ALR-69A to enhance the survivability of transport, fighter, and Special Operations aircraft on missions that penetrate hostile areas.
- Aircrews use the ALR-69A to provide indication of ground and airborne radar threats in order to support threat avoidance maneuvers and/or timely use of defensive countermeasures.

Major Contractor

Raytheon, Space and Airborne Systems – Goleta, California

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and revised Test and Evaluation Master Plan (TEMP) on February 16, 2012.

- AFOTEC began suitability flights in April 2012, and held IOT&E test crew training in early May 2012, with several suitability flight tests occurring shortly afterwards.
- AFOTEC began operational flight testing on May 18, 2012, at the Fallon Range Training Complex, Nevada. As a result of weather and competing range priorities, the system was only exposed to range threats for approximately 4 hours. In response, AFOTEC flew three additional missions on June 12, 13, and 15 at the Multi-Spectral Test and Training Environment at Eglin AFB, Florida. The combination resulted in a total threat exposure time of 12 hours. The system logged a total of 204 hours of operating time during IOT&E.
- AFOTEC conducted the final test of IOT&E on July 16, 2012. It was a ground-based test designed to evaluate the system's reprogramming capability.
- On August 1, 2012, the Air Force SPO and Raytheon conducted a HWIL test comparing the performance of the ALR-69A software that was used during IOT&E to updated software generated to correct a threat symbol splitting deficiency observed throughout IOT&E.
- AFOTEC did not execute testing in accordance with the DOT&E-approved test plan. AFOTEC deviated from the test plan in the following areas: AFOTEC pre-briefed aircrews about the type and location of threats, which reduced DOT&E's ability to determine the contribution the ALR-69A made to the aircrew's situational awareness; several missions lacked operational realism; and aircrew questionnaires did not incorporate inputs from DOT&E to improve the quality of the data generated from the questionnaires.

Assessment

- DOT&E assessed the ALR-69A system as not operationally effective but operationally suitable. The system was not operationally effective because it did not consistently provide

the aircrew timely and accurate threat information and the system demonstrated a random threat symbol splitting deficiency. Threat symbol splitting occurs when one threat signal received by the system produces multiple threat symbols at different azimuths on the cockpit display. This degrades the aircrew's situational awareness as to which displayed threats are "real" and where those real threats are located and inhibits the aircrew's ability to appropriately react to the threat(s) in a timely manner. The details of the DOT&E assessment are presented in DOT&E's classified IOT&E report, dated October 2012.

- Although the SPO and Raytheon conducted HWIL tests to demonstrate the threat signal splitting deficiency has been resolved, HWIL testing by itself is not adequate to verify the deficiency has been resolved and that the software update did not induce any other adverse system performance.

Recommendations

- Status of Previous Recommendations. DOT&E last reported on this program in FY09. The Air Force has satisfactorily addressed previous recommendations.
- FY12 Recommendations. The Air Force should:
 1. Correct aircrew threat audio warnings so that the appropriate tone is associated with the correct status of the threat.
 2. Improve the timeliness and accuracy of threat information provided to the aircrew to improve the aircrew's situational awareness.
 3. Conduct flight testing to verify the system is operationally effective and that the software upgrade implemented by the SPO and Raytheon corrects the threat symbol splitting deficiency and did not degrade system performance in any other area.