

## F-15E Radar Modernization Program (RMP)

### Executive Summary

- F-15E Radar Modernization Program (RMP) developmental flight testing began in January 2011 and IOT&E was expected to begin in late FY12. Although the RMP continued to make progress towards operational effectiveness, suitability, and mission capability during FY12, unanticipated software performance challenges in air-to-ground mapping, precision velocity update, and air-to-air target detection and tracking led to developmental test delays. As a result, the program will not begin IOT&E until mid-FY13.
- The Air Force resolved electromagnetic interference between the APG-82(V)1 Active Electronically Scanned Array (AESA) transmitter/receiver and the radios through the incorporation of software changes.
- The Air Force made progress in overcoming aircraft Environmental Control System (ECS) component failures and in-flight cautions noted in FY11 flight testing. RMP hardware performed nominally throughout FY12 developmental testing.

### System

- The F-15E is a twin engine, tandem seat, fixed wing, all weather, multi-role fighter aircraft. The F-15E has a fully missionized cockpit and a multimode air intercept and air-to-ground radar, giving the aircrew the capability to employ air-to-air and air-to-ground munitions, a 20-millimeter cannon, and countermeasures for evading enemy fire.
- The RMP replaces the F-15E legacy APG-70 mechanically scanned radar with an AESA system designated the APG-82(V)1. The RMP is designed to retain functionality of the legacy radar system while providing expanded mission employment capabilities to include:
  - Near-simultaneous interleaving of selected air-to-air and air-to-ground functions
  - Enhanced air-to-air and air-to-ground combat identification capabilities
  - Longer range air-to-air target detection and enhanced track capabilities
  - Longer range and higher resolution air-to-ground radar mapping
  - Improved ground moving target track capability
- The RMP upgrade is also intended to address legacy F-15E radar system suitability shortfalls including: poor reliability,



- parts obsolescence, and high sustainment costs. The Air Force intends to retrofit the RMP across the existing F-15E fleet.
- The RMP APG-82(V)1 design leverages capabilities from currently fielded AESA radar systems. The APG-82(V)1 antenna and power supply are currently in use on the F-15C APG-63(V)3 program, and the radar receiver/exciter and Common Integrated Sensor Processor are based on the F/A-18E/F APG-79 AESA system.
- Other hardware and software modifications comprising the RMP effort include a more powerful ECS, updates to the aircraft Operational Flight Program and Electronic Warfare software, a new radio frequency tunable filter, and aircraft modifications to include a new wideband radome and wiring changes.

### Mission

A unit equipped with the F-15E conducts all weather, day and night missions to include:

- Offensive and Defensive Counterair
- Conventional Air Interdiction and Nuclear Strike
- Close Air Support and Strike Coordination and Reconnaissance
- Suppression of Enemy Air Defenses
- Combat Search and Rescue

### Major Contractors

- The Boeing Company – Saint Louis, Missouri
- Raytheon – El Segundo, California

### Activity

- The Air Force conducted F-15E RMP testing in accordance with the DOT&E-approved Test and Evaluation Master Plan.
- Developmental flight testing begun in January 2011 extended throughout FY12. The planned FY12 IOT&E start did not

- occur due to challenges in maturing system software to meet the user's functional requirements.
- The Air Force resolved electromagnetic interference between the APG-82(V)1 AESA transmitter/receiver and the radios

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through the incorporation of software changes. The Air Force verified the effectiveness of the corrective actions in subsequent FY12 developmental flight testing.

- The program experienced developmental challenges in maturing the integrated air-to-air and air-to-ground capabilities throughout FY12. Unanticipated software performance challenges in air-to-ground mapping, precision velocity update, and air-to-air target detection and tracking led to development delays. The Air Force has rescheduled IOT&E for March through July 2013.

## Assessment

- The RMP continued to demonstrate incremental progress towards achieving the system's operational performance and suitability goals during FY12 developmental testing. However, the program experienced software maturation challenges and was unable to complete developmental testing in FY12. Unanticipated software performance shortfalls led to multiple radar OFP releases and associated regression testing to mature radar mode functionality. At the end of FY12, RMP performance had not yet met the user's requirements.
- Progress was made in overcoming aircraft ECS component failures and in-flight cautions noted in FY11 flight testing.

Additionally, RMP hardware performed nominally throughout FY12.

- As noted in the DOT&E FY11 Annual Report, achieving the Air Force RMP software stability requirement by IOT&E may not be feasible. Multiple radar OFP version releases to correct system functionality shortfalls throughout FY12 precluded focus on stability requirements. As highlighted in the FY11 Annual Report, DOT&E continues to assess that the Air Force is not likely to meet the 30-hour Mean Time Between Software Anomaly requirement.

## Recommendations

- Status of Previous Recommendations. The Air Force continues to address all previous recommendations.
- FY12 Recommendation.
  1. The Air Force should consider either amending the RMP 30-hour Mean Time Between Software Anomaly requirement or structuring the program (in particular, adding time and resources for additional development) such that it is able to achieve the desired performance measure.