

F-15 Eagle Passive Active Warning and Survivability System (EPAWSS)



The Air Force continues to integrate software, firmware, and hardware fixes to improve performance of the F-15 Eagle Passive Active Warning and Survivability System (EPAWSS) and address deficiencies uncovered in ground and flight testing. In June 2022, the program successfully completed a Milestone C Decision Point (DP) 2 authorizing the start of operational aircraft retrofits, and DOT&E approved an update to the Test and Evaluation Master Plan in preparation for dedicated IOT&E in FY23.

SYSTEM DESCRIPTION

The AN/ALQ-250(V)1 EPAWSS is a self-protection system intended to enable the F-15 aircrew to detect, identify, locate, deny, degrade, disrupt, and defeat air and surface-to-air threats during operations within highly contested environments. EPAWSS replaces three functionally obsolete F-15 legacy Tactical Electronic Warfare System components: the AN/ALR-56C Radar Warning Receiver, the AN/ALQ-135 Internal Countermeasures Set, and the AN/ALE-45 Countermeasures Dispenser Set. The EPAWSS radar warning function scans the radio frequency environment and provides the aircrew with identification and location information of potential threat signals. When necessary, the system can respond with countermeasures (jamming or expendables) to defeat a threat radar or missile. EPAWSS integrates with the F-15 AN/APG-82(V)1 radar and mission computer.

MISSION

The Air Force employs the F-15E Strike Eagle as a dual-role fighter, designed to perform air-to-air and air-to-ground missions. EPAWSS provides the primary defensive suite to protect the F-15E during the conduct of both offensive and defensive missions.

The Air Force plans to employ the F-15EX in an air-to-air role

similar to the F-15C aircraft it will replace. The expectation is to be an air superiority fighter, flown by active duty and Air National Guard units, to perform both offensive and defensive air-to-air missions. EPAWSS will provide the defensive suite to protect the F-15EX during counter-air missions.

PROGRAM

F-15 EPAWSS is an Acquisition Category IC program that tailored Milestone C into two Decision Points (DPs) to take long-lead hardware procurement off the critical path and deliver the capability as soon as possible. The Air Force Service Acquisition Executive approved Milestone C DP 1 (Production Decision) on December 1, 2020, authorizing the procurement of low-rate initial production aircraft retrofit kits and installation hardware, and DP 2 (Installation Decision) on June 23, 2022, authorizing the start of fleet aircraft modifications. DOT&E approved the Milestone B Test and Evaluation Master Plan in 1QFY18 and an Air Force update on June 16, 2022. The Air Force started modification of the first 2 of a planned 217 F-15Es. Additionally, EPAWSS will field on production deliveries of F-15EX aircraft.

» MAJOR CONTRACTORS

- The Boeing Company – St. Louis, Missouri
- BAE Systems – Nashua, New Hampshire

TEST ADEQUACY

During FY22, the Air Force completed a series of ground and flight test events as part of EPAWSS T&E. All developmental testing was conducted in accordance with the DOT&E approved Test and Evaluation Master Plan, and observed by DOT&E. Ground testing of an uninstalled system at the Integrated Demonstrations and Applications Laboratory (IDAL), Wright-Patterson AFB, Ohio, provided data to evaluate the radar warning function against most radio frequency emitters the system is required to engage in the presence of background emitters. The Air Force tested the jamming effectiveness against a sample of required threats at two government hardware-in-the-loop test facilities: The Electronic Combat Simulation and Evaluation Laboratory, Point Mugu, California, and a test facility at Wright-Patterson AFB, Ohio. The Air Force conducted installed-system testing in the Benefield Anechoic Facility at Edwards AFB, California, to assess integration with F-15E avionics and weapons, as well as installed radar warning performance. The Air Force plans to conduct operationally oriented Integrated Demonstrations and Applications Laboratory and Electronic Combat Simulation and Evaluation Laboratory testing as part of the IOT&E.

The Air Force's 96th Test Wing conducted flight testing of the incremental EPAWSS software releases, each integrating new capabilities with the hardware/

firmware and correcting deficiencies. Operational testers participated in these developmental flights and the aforementioned ground tests. Test data available in early-FY22 were adequate to support DP 2. Dedicated IOT&E ground and flight test events will be conducted in FY23.

In June 2022, the Air Force conducted the final of the three planned developmental cybersecurity assessments in the Boeing Electronic Systems Integration Lab. The Air Force plans to conduct on-aircraft operational cybersecurity testing as part of the IOT&E.

PERFORMANCE

» EFFECTIVENESS

The data collected indicate a low risk to EPAWSS demonstrating operational effectiveness as it proceeds to IOT&E. During FY22, the Air Force continued to mature the software and hardware to address the deficiencies identified during developmental testing, and the additional effectiveness data collected indicate further progress. DOT&E published an interim assessment on September 13, 2022 and will continue to monitor the EPAWSS program as the program conducts an IOT&E in FY23.

» SUITABILITY

The available data indicate risk that EPAWSS will not demonstrate operational suitability as it proceeds to IOT&E. Hardware failure data during flight operations to date indicate the system potentially can meet the requirement for mean time between unscheduled maintenance; however, the very high incidence of built-in test (BIT) failure indications is a significant concern. Correction of the BIT performance and indications prior to entry into IOT&E could ameliorate this risk assessment. Failure to address the BIT performance may drive unscheduled flight line and depot-level maintenance actions. In addition, the aircrew may not have confidence in EPAWSS or may not be aware of an actual failure due to the lack of accurate system status. This may have a negative impact on operations of F-15 units equipped with EPAWSS.

Currently, Air Force aircrews and maintainers (with substantial Boeing assistance) operate and support EPAWSS during flight test using the following contractor-provided elements: training, preliminary technical orders, and support equipment. Technical order changes are being incorporated and should be available for use during the

IOT&E. Additionally, Air Force maintainers completed the second of two planned maintenance demonstrations that confirmed their ability to remove and replace each EPAWSS line-replaceable unit and line-replaceable module, and reprogram the EPAWSS software. The Air Force plans to conduct an operationally oriented maintenance demonstration as part of the IOT&E.

» SURVIVABILITY

The available data from cybersecurity testing indicate a low risk to EPAWSS proceeding into operational survivability testing. The Air Force completed planned developmental cybersecurity assessments, and the EPAWSS program continues to improve the EPAWSS cybersecurity posture by implementing and validating corrective actions, based on the susceptibilities and vulnerabilities found during the developmental cybersecurity assessments. The Air Force plans to conduct on-aircraft operational cybersecurity testing as part of the IOT&E.

RECOMMENDATION

The Air Force should:

1. Correct BIT performance and indications prior to entry into IOT&E.