

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

F-15 Eagle Passive Active Warning and Survivability System (EPAWSS) development continued in FY21 and the program successfully completed Milestone C in December 2020. The Air Force continues to integrate software, firmware, and hardware fixes to improve performance and address deficiencies uncovered in ground and flight testing. The Air Force needs to complete an update to the Test and Evaluation Master Plan (TEMP) to support Decision Point (DP) 2 authorizing aircraft retrofits and preparations for dedicated IOT&E in FY23.



## System Description

The AN/ALQ-250 EPAWSS is a self-protection system intended to enable F-15 aircrew to detect, identify, locate, deny, degrade, disrupt, and defeat air and surface-to-air threats during operations in 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 on potential threat signals. If necessary, the system can respond with countermeasures (jamming or expendables) to defeat a threat radar or missile. EPAWSS integrates with the AN/APG-82(V)1 radar and F-15 mission computer.

## Program

EPAWSS is an Acquisition Category IC program. The Air Force Service Acquisition Executive approved Milestone C DP 1 on December 1, 2020, authorizing the procurement of low-rate initial production aircraft retrofit kits and installation hardware. DP 2, scheduled to occur in May 2022, authorizes the start of fleet aircraft modifications. DOT&E approved the Milestone B TEMP in 1QFY18 and is working with the Air Force to update the TEMP for DP 2. Assuming authorization at DP 2, the Air Force plans to start retrofitting 217 F-15Es and equipping all F-15EXs as they are produced (144 planned). The first operational unit will receive EPAWSS-equipped aircraft in late CY23. The Air Force intends to start fielding EPAWSS on F-15E aircraft in FY23 and F-15EX aircraft in FY24.

## Major Contractors

The Boeing Company – St. Louis, Missouri. BAE Systems is the major subcontractor.

## Test Adequacy

During FY21, the Air Force completed a series of developmental ground and flight test events as part of EPAWSS Integrated T&E. Ground testing of an uninstalled system at the Integrated Demonstrations and Applications Laboratory, Wright-Patterson Air Force Base (AFB), Ohio provided data to evaluate the radar warning function against most radio frequency emitters required by the system to engage in the presence of background emitters. The Air Force tested the jamming effectiveness against a sample of required threats at several government ground-mount and hardware-in-the-loop test facilities: the Multi-Spectral Test and Training Environment, Eglin AFB, Florida; the Advanced Threat Simulator System, Point Mugu, California; and a test facility at Wright-Patterson AFB, Ohio. Installed system testing in the Benefield Anechoic Facility at Edwards AFB, California assessed integration with F-15E avionics and weapons, as well as installed radar warning performance.

The Air Force 96th Test Wing conducted flight testing of the incremental software releases, each integrating new capabilities with the hardware/firmware and correcting deficiencies. Operational testers participated in these developmental flights and will participate in the additional ground and flight testing that will occur before DP 2. Test data available by mid-FY22 should be adequate to support DP 2, which will be followed by dedicated IOT&E in FY23.

In August, 2020 and March 2021, the Air Force conducted two of the three planned developmental test cybersecurity assessments in the Boeing Electronic Systems Integration Lab. The last assessment is planned for 1QCY22. The Air Force plans to conduct platform-level, on-aircraft operational cybersecurity testing later in CY22.

## Performance

### Effectiveness

Not enough data are currently available to assess the risk to EPAWSS demonstrating operational effectiveness as it proceeds to IOT&E. Since DP 1, the Air Force has continued to mature the software and hardware to address the deficiencies identified during

early developmental testing, and significant additional effectiveness data have been collected, indicating further progress. DOT&E will submit an Operational Assessment report prior to DP 2 in 2QCY22 and will continue to monitor the development of the EPAWSS program as the program prepares to conduct an IOT&E in 2QCY23.

### Suitability

Not enough data are currently available to assess the risk to EPAWSS demonstrating operational suitability as it proceeds to IOT&E. Currently, Air Force aircrews and maintainers (with substantial Boeing assistance) operate and support EPAWSS during flight testing using contractor-provided training and preliminary technical orders. Air Force maintainers have identified a problem replacing the Low-Band Antenna line-replaceable unit. The four antenna cables must be phase-matched after the unit has been replaced, which is time-consuming. A potential solution being implemented includes a redesign of the cables with a built-in phase adjustment. Air Force maintainers will evaluate this redesign in CY22.

Air Force maintainers completed one of two planned maintenance demonstrations to assess the removal and replacement of each EPAWSS line-replaceable unit and the adequacy of the technical orders. Their report is pending completion of analysis. Scored reliability data currently include only hardware failures; software failures will be included starting in 1QFY22. Hardware failure during flight operations data to date indicate the system can potentially meet the required 24 hours mean time between unscheduled maintenance; however, the high incidence of unscored software failure indications in prior software versions is a concern. Preliminary assessment of the EPAWSS operational suitability will be provided in time to support DP 2.

### Survivability

Not enough data are currently available to assess the EPAWSS survivability in a cyber-contested environment. The Air Force continues to improve the EPAWSS cybersecurity posture by implementing and validating corrective actions based on the vulnerabilities found during the first cybersecurity assessment.

## Recommendations

The Air Force should:

1. Score all failure indications (hardware and software) and track all operational suitability metrics, including contractual suitability metrics, to support DP 2 and entry into IOT&E.
2. Continue to plan and execute the F-15 platform-level cybersecurity testing.