

KC-46A Pegasus



The Air Force Operational Test and Evaluation Center (AFOTEC) continues to collect IOT&E data as Air Mobility Command certifies additional receiver aircraft for both test and operational aerial refueling (AR). The Air Force is working with Boeing to develop critical upgrades to the remote vision system (RVS), refueling boom, and defensive systems necessary for closure of IOT&E in FY24.

SYSTEM DESCRIPTION

The KC-46A tanker aircraft is a modified Boeing 767-200ER commercial airframe with military and technological upgrades. KC-46A tanker aircraft upgrades include a fly-by-wire refueling boom, centerline and wing aerial refueling pod (WARP) drogues, a dual remote Air Refueling Operator's Station, enabled by an exterior RVS, additional fuel tanks in the body, a boom refueling receiver receptacle, a 787 digital cockpit update, Large Aircraft Infrared Countermeasures, a modified ALR-69A radar warning receiver (RWR), and Tactical Situational Awareness System (TSAS). The KC-46A cargo bay is designed to accommodate palletized cargo, aeromedical evacuation equipment, and roll-on command, control, and communications gateway payloads.

MISSION

Commanders will use units equipped with the KC-46A to:

- Perform AR in support of six primary missions of nuclear operations support, global strike support, air bridge support, aircraft deployment support, theater support, and special operations support.
- Accomplish the secondary missions of airlift, aeromedical evacuation, emergency AR, air sampling, and support of combat search and rescue.

PROGRAM

The KC-46A Pegasus is an Acquisition Category IC program intended to be the first increment of 179 replacement tankers for the fleet of more than 400 KC-135 and KC-10 tankers. DOT&E approved the Milestone C Test and Evaluation Master Plan update in 2016 and the IOT&E test plan in April 2019. In a May 2020 memorandum, DOT&E communicated to the Assistant Secretary of the Air Force for Acquisition, Technology, and Logistics that DOT&E will not submit an IOT&E report on KC-46A until operational testing of a production-representative RVS is complete. The Air Force expects a corrected RVS version 2.0 to be ready for operational testing in mid-FY24. Air Mobility Command has issued seven interim capability releases for KC-46A to support 97 percent of joint force operational refueling taskings.

» MAJOR CONTRACTOR

- The Boeing Company, Commercial Aircraft, in conjunction with Defense, Space & Security – Seattle, Washington

TEST ADEQUACY

KC-46A IOT&E has been ongoing since May 2019. AFOTEC has continued to collect data, in accordance with the DOT&E-approved test plan, to support assessments for sortie generation, AR, airlift, aeromedical evacuation,

survivability through threat-avoidance, and sustained operations under adversarial cybersecurity conditions. DOT&E has been periodically observing and continually monitoring all IOT&E testing. In FY22, AFOTEC data collection included WARP loading demonstrations and certification flight testing, RWR and TSAS update integrated testing, participation in the COPE NORTH and VALIANT SHIELD exercises, special fueling operations, and desert operations in Africa.

AFOTEC has executed over 160 IOT&E AR test events for B-1B, B-2, B-52H, C-5M, C-17A, CV-22, E-3G, F-15C/E, F-16C, F/A-18C/D, F/A-18E/F, F-22A, F-35A, F-35B, H/MC-130J, KC-10, and KC-46A receivers. During IOT&E, probe/drogue receivers such as the CV-22, F/A-18C/D, and F-35B have been refueling from the Centerline Drogue System (CDS). The Air Force completed F-15EX AR certification testing in September 2022. The WARP, used to refuel probe/drogue receivers, is under developmental and receiver certification testing. Once complete, it will begin AR operations as part of IOT&E (anticipated beginning 1QFY23).

The Air Force collected and adjudicated suitability data exceeding the minimum planned 1,250 flight hours for IOT&E while accumulating over 10 times the required flight hours for an adequate suitability assessment. The Program Office periodically reviews the entire KC-46A fleet's maintenance data, which currently exceeds 30 times the IOT&E flight-

hour requirement, to help guide future decisions on the program.

So far, during IOT&E, AFOTEC collected data from over 60 cargo and 18 passenger test events while executing airlift missions throughout the United States and locations in Australia, France, Germany, Guam, Japan, Korea, Morocco, and the United Kingdom.

Boeing and the Program Office completed a Critical Design Review for the RVS 2.0 in June 2022 and are continuing hardware and software laboratory testing for the boom actuator redesign to rectify the stiff boom deficiency. Flight testing of the new boom actuator is anticipated to begin 4QFY23.

AFOTEC is planning a second phase of cooperative and adversarial cybersecurity testing in FY23-24. Future KC-46A operational assessments will be focused on solutions to fleet-wide maintenance and supply issues, as well as already planned changes to the existing baseline (e.g., boom and RVS upgrades).

PERFORMANCE

» EFFECTIVENESS

Deficiencies with the fielded RVS in low sun angles and dynamic lighting conditions continue to degrade boom AR effectiveness. However, the test team recorded zero undetected contacts outside the receptacle during IOT&E AR events throughout FY22. This suggests the restrictions the Air Force put on the system using the RVS have been adequate to

avoid additional occurrences of undetected contacts outside the receptacle. These restrictions come at a cost of interrupting boom AR operations if lighting conditions invoke the restrictions.

AFOTEC assessed that a combination of individual cargo-related deficiencies merited generation of a Category I emergency deficiency report against overall KC-46A cargo operations capability. Any of the following individual contributing deficiencies could result in an unsafe cargo configuration problem:

- Complex, unorganized cargo loading guidance.
- Non-standard cargo limitations, causing aircrew confusion and requirement of onboard cargo inspections.
- Restrictions regarding the cargo barrier net can prohibit loading sufficient, or any, cargo if the forward-most cargo does not meet requirements.
- Problems with the Automated Performance Tool software used to calculate aircraft weight and balance can increase loadmaster workload and require complex manual calculations, introducing potential human error.
- Aerial port operational restrictions caused by inadequate technical guidance increase workload for loading personnel and loading times, driving KC-46A incompatibilities within the Defense Transportation System.

AFOTEC attempted to evaluate performance of the Roll-On Beyond-line-of-sight Enhancement palletized data communications system during VALIANT SHIELD. However, problems with network and cryptographic setup, exacerbated by inadequate technical data, prohibited its successful demonstration.

» SUITABILITY

Operational availability (≥ 80 percent threshold) and mission capable rate (≥ 90 percent threshold) are currently well below their threshold requirements, as are several secondary suitability measures. The latest factors affecting these measures include scheduled inspections and reliability problems with two fuel system components. In particular, fuel manifold leaks have degraded receiver capability and caused mission delays or cancellations since FY20. The Program Office is aggressively attempting to address suitability problems and, based on the program's reliability growth plan, the program may still meet their suitability requirements by 50,000 fleet flight hours.

» SURVIVABILITY

The program continues work on software updates to the TSAS and RWR systems and mission data files in order to improve survivability, including integrated open-air range testing of recent updates in June 2022. Analysis of the data is ongoing to determine whether further improvements are necessary to ensure threat identification and avoidance

capabilities are adequate before the closure of IOT&E on these systems.

Active and passive system electromagnetic pulse testing in FY21 indicated that the KC-46A has basic survivability in a nuclear environment. The program will conduct electromagnetic pulse direct electric current testing in

early FY23 to determine the extent of that survivability.

RECOMMENDATIONS

The Air Force should:

1. Continue to redesign the RVS and refueling boom to facilitate their readiness for operational testing, scheduled in FY24.
2. Address the collection of cargo-related deficiencies to improve cargo-carrying operations.
3. Continue to improve systems that support threat identification and avoidance to improve aircraft and aircrew survivability.