



# Pegasus Prep

By Brian W. Everstine, Pentagon Editor

A KC-46 refuels an A-10 in July 2016 on the last flight test required for the tanker's Milestone C low-rate production go-ahead.

## The Air Force's KC-46 tanker program faces developmental and budgetary headwinds in the quest to bring aircraft into service.



**T**he Air Force/Boeing KC-46 tanker program is focused on a singular goal in 2017: getting iron on the ramp.

After a 2016 marked by technical setbacks—forcing a boom redesign—and an intense test and evaluation schedule, the program is aimed at putting the first Pegasus in operational service by the end of the year.

As a program in development, the KC-46 has “had a few hiccups along the way,” Brig. Gen. Duke Z. Richardson, the Air Force program executive officer for tankers, said in a recent interview with *Air Force Magazine*. Broadly, though, “I see a very successful program. If it didn’t have hiccups, I’d be shocked,” he said.

Cumulatively, these problems have pushed delivery of the first lot of 18 KC-46s back from summer 2017 to February 2018, Richardson said. And delays on the fixed-price program have cost Boeing nearly \$2 billion in overruns. Given the technical advances the

KC-46 will deliver, compared to the existing fleet of KC-135s and KC-10s, however, the “hiccups” will have been worth it, Richardson said.

The program hit its major 2016 turning point last summer, when Frank Kendall III, the Pentagon’s head of acquisition, technology, and logistics, approved Milestone C, allowing the Pegasus to start low-rate production. This was immediately followed by contracts for the first two production lots: \$2.8 billion covering seven and 12 aircraft, respectively. The next lot contract was due to be inked in January, Richardson said.

By mid-December, there were five KC-46s flying. Technically, Boeing still “owns” them, Richardson said, having not “DD-250’d” the aircraft—the process of completing checks to pass them to the Air Force. USAF and Boeing crews have been putting the jets through their paces both at Seattle—near where Boeing manufactures them—and at Edwards AFB,

Calif. Development has been “cranking along,” Richardson said, and by early December testers had completed just over half the evaluation program.

“It’s great to get past the 50 percent mark,” Richardson said.

To reach Kendall’s Milestone C decision, the KC-46 had to successfully pass fuel to five different receiver aircraft. Those basic flights were conducted in good conditions, but now the KC-46 is really being challenged.

Aircrews are flying refueling missions in all sorts of flight conditions, pushing to “expand the envelope” of KC-46 operations, Richardson explained. The tanker is being flown at high speed with fast-movers such as F-16s, at different altitudes, and at low speed with aircraft such as A-10s. Operational testers must certify the KC-46 with eight different tanker receivers.

Testing isn’t just about refueling. For example, the KC-46 has a new radar warning receiver suite that allows it

USAF photo by A1C Jake Carter



USAF photo by Christopher Okula



to pinpoint threats instead of simply telling the crew a threat is out there, somewhere. That testing is underway “pretty heavily,” Richardson said.

## FIXING THE BOOM

Before the aircraft could be cleared for production, a major issue had to be corrected with its new refueling boom, the flyable pipe that connects the KC-46 to receiver aircraft. The boom system on the KC-46 was adapted from the KC-10 Extender’s. It uses a fly-by-wire, telescoping boom with a hydraulic system to keep it steady during flight.

During a flight test with an F-16, the boom experienced “higher than expected axial loads,” the service said. The issue arose again during a test flight with a C-17. “The receiver aircraft was pushing on the boom” more than expected, Col. John Newberry, KC-46 system program manager, told *Air Force Magazine*.

The problem was worrisome enough that USAF delayed its Milestone C timeline and pressed for a fix.

Boeing engineers developed hydraulic relief valves for the boom. They were quickly fitted to a test aircraft. Initial flights in July 2016 showed that the fix worked, and the push for production approval was back on track.

Secretary of the Air Force Deborah Lee James commended the USAF/Boeing team for “diligently working through some difficult technical challenges,” after test flights with an F-16 and a C-17 proved the fix. “The KC-46 program has made significant strides in moving the Air Force toward the modernization needed in our strategic tanker fleet,” she said.

After the successful tests, Boeing “production-ized” the new design, Newberry said. Boeing is building the revised system into the rest of the test aircraft and those under production.

The developmental tweaks came at a cost, but not for the taxpayer. The contract is fixed price, with the Air

**Top left: TSgt. Chris Joyce works the boom on a KC-135 during a Red Flag training mission. He was selected to become a boom operator on the new Pegasus. Left: A KC-46 runs receiver compatibility tests with a C-17 during the late stages of the Milestone C testing.**

Force’s cost capped at \$4.9 billion. Any overruns must be borne by Boeing.

The overrun amount was about \$1.9 billion, the company said last July. This included some \$393 million for the boom fix.

In addition to getting the aircraft on the ramp, the Air Force is moving to get more airmen in Pegasus cockpits, maintenance hangars, and boom stations. As of December, the service had trained 29 pilots, 25 boom operators, and 13 maintainers for the KC-46, and that number “will ramp up” as the program moves forward and more aircraft are delivered, Newberry said.

Test flights out of Seattle are flown and supported by a mixed crew of Boeing employees and Air Force personnel.

## BACK END TO THE FRONT

The KC-46 boom operator station is a major departure from the way this function has been performed in the past. Instead of “flying” the boom by sitting or lying at the back of the jet and watching the action directly through windows, KC-46 boom operators sit at a workstation behind the cockpit, using a 3-D camera system to direct the refueling operation. There’s an instructor station right next to the operator station, providing for better training and redundancy. Boeing is still fine-tuning the camera system’s software.

Despite the radical departure from the traditional layout and operation of the tanker station, Newberry said he’s not aware of it causing any training issues. “They are taking to it,” he said of the boom operators.

To go with a modern system, there’s a modern training apparatus. The KC-46 program includes full-motion aircrew simulators, along with an integrated maintenance training system, purchased in the July contracts.

Infrastructure to support KC-46 basing is coming along. Support equipment deliveries are underway at Altus AFB, Okla., and McConnell AFB, Kan. Military construction is on track to the point where it is “basically ready for the first airplane,” Richardson said. McConnell, the first operating location for the aircraft, will eventually host 36 KC-46s.

Altus is home to the 56th Air Refueling Squadron and will be the schoolhouse for KC-46 aircrews. The service

unveiled the formal training center at the base during an event last August, and the first aircraft is expected to arrive early this year.

USAF is still evaluating other operating sites. Pease Intl. Tradeport ANG, N.H., will host the first Air National Guard unit and Seymour Johnson AFB, N.C., will host the first Reserve unit. The Air Force announced Dover AFB, Del.; Fairchild AFB, Wash.; Grand Forks AFB, N.D.; Travis AFB, Calif.; and JB McGuire-Dix-Lakehurst, N.J., as candidates for the second Active Duty wing to host the aircraft starting in 2020.

Air Mobility Command is planning to rotate the aircraft among the bases, to extend their service lives, AMC Commander Gen. Carlton D. Everhart II said. The KC-46 deployment will follow a model used with C-17s. They rotate through bases depending on their utilization rates and environmental conditions.

If aircraft are being underused, they’ll be sent to busier bases, and vice versa, so the fleet will age at a relatively even rate and avoid excessive strain on any group of airframes.

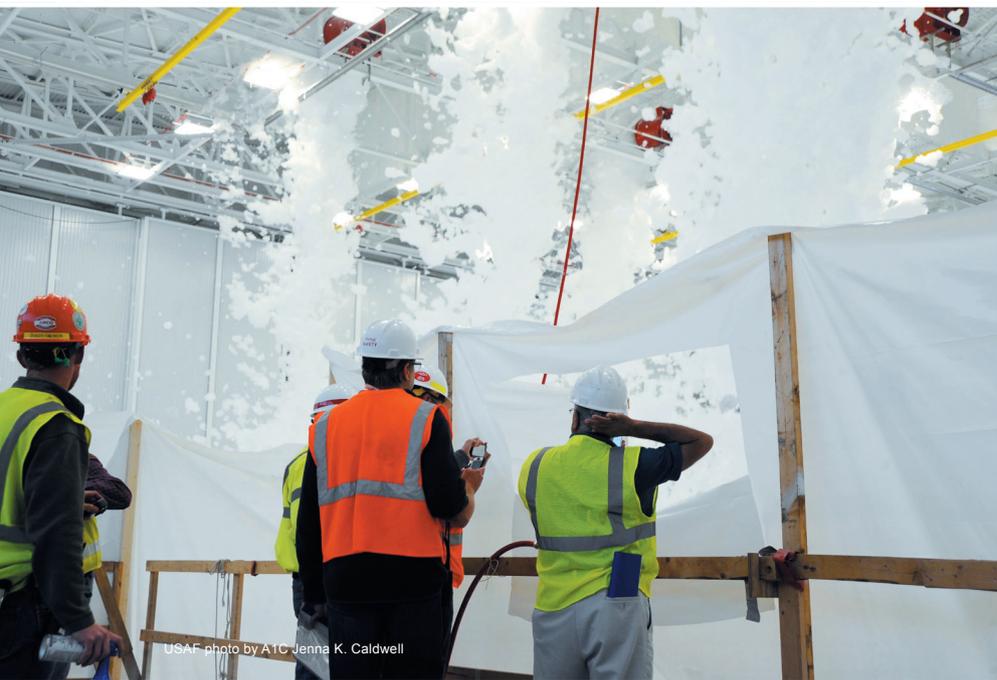
Aircraft based near humid, salty conditions will rotate to regions that are dry to even out the effect of environmental issues such as corrosion, Everhart said in September. This management technique could extend the lifespan of C-17s by 10 to 20 years, he said.

The budget uncertainty coming out of Washington, D.C., threatened the KC-46 program. Congress in December passed a long-term continuing resolution to fund the government, a move Air Force and Pentagon leadership had repeatedly asked lawmakers to avoid.

A continuing resolution, James had warned, would limit production to Fiscal 2016 levels of just 12 aircraft, a move that would have required renegotiating the contract with Boeing. The contract called for 15 aircraft in Fiscal 2017, and buying fewer tankers would have caused the Pentagon to pay a penalty to the contractor.

Defense Secretary Ashton B. Carter specifically asked lawmakers to avoid this penalty, and legislation authorizing the 15 aircraft made it into the final bill language.

Even at that rate, however, it will be a long road to deliver the 179 planned



USAF photo by A1C Jenna K. Caldwell

Above left: MSgt. Luis Rodriguez-Asad uses the KC-46 boom operator demonstrator at McConnell AFB, Kan., to get a taste of what refueling on the new tanker might be like. Above: The newly unveiled "Pegasus Country" emblem on display at Pease ANG, N.H. Left: Contractors perform a fire suppression foam test in a hangar at McConnell AFB, Kan. The new hangars will house the KC-46s, scheduled to arrive in early 2017.

aircraft. "It will take a good 30 years to replace the fleet at that rate," Richardson said.

The Air Force's tanker requirement is actually 479 aircraft. To keep the remaining KC-135s and KC-10s healthy, Richardson has a "robust integrity program" to monitor its legacy tankers and track their airworthiness, he said, because "we always fly safe aircraft."

Evidence of this is seen in how the Air Force sustains these tankers.

The KC-10 is going through a program to update its avionics equipment to meet Communication, Navigation, Surveillance/Air Traffic Management international mandates. The fleet was facing flight restrictions because of its outdated equipment, and the new

program ensures it will have complete, unrestricted access to worldwide airspace.

The KC-135, among the service's oldest at an average age of more than 55 years, is undergoing the Block 45 cockpit refresh. The program includes upgraded autopilot systems and digital screens that replace analog gauges. Air Force officials expect updates could help the Stratotankers fly until 2040, almost 85 years since the first KC-135A's inaugural flight.

### THE NEXT, NEXT GENERATION

The service's massive need for tankers in the future means the 179 KC-46s won't be enough. Air Mobility Command needs to prepare now for whatever comes next.

The command is making a "capabilities-based assessment" to identify what gaps are ahead and set a formal requirements document. Once those requirements are identified, that's when the acquisition community gets to work, Richardson said.

Everhart is on record saying he thinks the KC-46 is a good product and probably should be continued beyond the planned 179 aircraft. The long-standing tanker plan has been to modernize the tanker fleet in three tranches: KC-X (now called the KC-46A), the KC-Y, expected to finish replacing the KC-135 fleet, and the KC-Z, targeted at replacing the KC-10. But Everhart thinks it might be better to simply buy the KC-46 as the KC-Y iteration as well, and move on to a futuristic design for the KC-Z.

Speaking at a National Defense Transportation Association meeting in St. Louis in early November, Everhart avoided specifics for what this technology could be, saying only that he seeks a significant advancement.

"I want to be able to leap to technology 20 years down the road, and I actually want to go straight to the Z," Everhart said. "That's where I want to head as long as our budgets allow us to be able to do so." ✪