

Left: The Eagle Modernization team starts work on an F-15E radar in October 2016 at Seymour Johnson AFB, N.C.

Airmen of the 31st Aircraft Maintenance Squadron work on an F-16, while a pilot observes at Krzesiny AB, Poland, during BALTOPS, a multinational exercise.

# SLEP Through the Cracks

**The F-15 and F-16 need service life extension programs. What's needed, and how long should they keep flying?**

**By John A. Tirpak,** Editorial Director

After years of internal wrangling about whether to stretch the service lives of its old fourth generation fighters, the Air Force is moving forward with improvements to keep the F-15 Eagle and F-16 Fighting Falcon viable for at least another decade. Still to be decided, though, is just how much the Air Force will invest in capability upgrades for the jets—and just when the sun will set on the F-15 and F-16 in USAF service.

A number of fighters from both fleets are receiving new active electronically scanned array (AESA) radars and new computers. They will also need new or strengthened structural parts to replace elements suffering from fatigue stress. Fleetwide capability upgrades, however, depend on how fast the fifth generation F-35A is delivered and the results of studies in the works about options for a new air superiority airplane, the Penetrating Counter-Air platform.

USAF is committed to updating 300 F-16s with structural improvements and capability upgrades, but to what degree it will extend the 245-jet F-15C/D fleet remains uncertain. In March, Maj. Gen. Scott D. West, then director of operations in the Office of the Deputy Chief of Staff for Operations, told the House Armed Services Committee that the service is reviewing the idea of retiring the F-15C fleet and employing upgraded F-16s for the homeland defense mission. The F-15C's age and its cost per flying hour are working against it, he said.

"We do have capacity in the F-16C community to recapitalize it with an improved radar to serve the same [mission] as the F-15 has done," he said. Air National Guard Director Lt. Gen. L. Scott Rice, at the same hearing, said such a plan is one option among many, and that no choice has been made.

"There is a risk in changing any of our force structure decisions," Rice noted, but capabilities that can be added to the F-16 to enable it to do the mission with that aircraft. "Our readiness and then our protection of the US will change, but I think, overall, we will be OK," he said of the idea.

SSgt. Nathaniel Fisher, a crew chief, maintains an F-16 during Red Flag-Alaska 17-2 in June at Eielson AFB, Alaska.

## MOVING PARTS

In an April interview, Air Combat Command chief Gen. James M. "Mike" Holmes said there are many moving parts to the air superiority mission in the coming years: the F-35, F-22, PCA, F-15, and F-16. Most likely, not all of those platforms can be in the Air Force at the same time, he said.

"We have to figure out whether we can afford" new aircraft and SLEPs [service life extension programs] of the old ones, Holmes said. "I don't know what my budget will be at the end of the 2020s, but I can assume it won't be radically different from what it is now." Given limits on the size of the force and the budget, "I have choices that I have to make. Something has to go and it will come down to, how much does it cost to operate" each platform.

The F-15Cs, he said, have been "used really hard" and need structural reinforcement to keep flying safely beyond the next few years. "You risk them coming apart" if flown to their full design envelope, he said.

That risk came into sharp focus when, in 2007, an Air National Guard F-15C broke in half in a high-G turn during dogfight training. The culprit was found to be a failed longeron, a structural element connecting the front and rear of the airplane that bears much of the load in a hard turn. The crash resulted in a new inspection regime and flight limitations on some F-15s. New longerons—considered life-of-the-airplane parts when the F-15 was new—are being purchased and installed through 2023. The upgrade will allow the F-15 to continue serving into the late 2020s.

Holmes said if he has to make a choice, he favors upgrading F-16s rather than F-15s because F-16s are generally younger and more versatile—having a ground-attack capability—than the F-15Cs, used strictly for control of the air.

The Viper would be "the most cost-effective service life extension," he contended.

For homeland defense, either aircraft would require an AESA radar because of the increasing threat from cruise missiles—small, potentially stealthy, and able to fly at very low altitudes. The advanced radar is needed to see and track cruise missiles among the clutter of trees and hills.

Holmes said it would cost about $1 million per F-15C to buy the longeron and other modifications needed to keep the fleet safe to fly out into the late 2020s, and "I think that is probably a good deal," but a hefty upgrade permitting the type to serve into the 2040s and beyond "may not be."

Photos: A1C Shawna L. Keyes; SSgt. Jonathan Snyder; A1C Haley D. Phillips

In an interview with *Air Force Magazine,* Boeing F-15 Vice President Stephen Parker said an overall SLEP cost of $40 million per F-15C, quoted previously by Holmes and others, was a "worst-case" scenario representing the cost of taking the F-15 essentially to a zero-time aircraft. This restoration would practically rebuild the airframe from scratch, making it capable of serving to 2045. USAF requested the information and Boeing provided it, but such a proposal is not currently under consideration, Parker said.

## CAN THEY CARRY ON?

Before embarking on a SLEP, the Air Force needed to answer a basic question: Can the jets carry on? The F-15 and F-16 initially were warranted for service lives of 9,000 and 8,000 flying hours, respectively, and both fleets have aircraft technically past their original life expectancy. After nonstop combat deployments for the last 26 years, the jets are tired.

Lockheed Martin was tasked to put a representative F-16 Block 50 through a Full Scale Durability test to see how many more flight hours it could sustain and establish whether a SLEP would be cost-effective in terms of additional years of life. The jet was rigged with cables and bars that incessantly pushed, pulled, flexed, and bent it to simulate, on the ground, the forces it would endure through more years of heavy maneuvering. (See "New Life for Old Fighters," February 2011.) This torture test was finally called off after 27,713 simulated flight hours, showing that the F-16 could theoretically last beyond the 2030s.

The goal was to demonstrate that the F-16 could serve to 12,000 hours, and the result "gives us good confidence that we are likely even to be able to extend beyond 12,000 at some point," said Lockheed Martin's Susan Ouzts, vice president for the F-16 and F-2 fighter programs. The jet is similar enough to the Block 40 and 52 models that the test was considered valid for all. Fighters fly about 300 hours per year, so with the additional 4,000 hours, the F-16 fleet could safely fly a minimum of another 13 years or so—and probably much more. The test was completed near the end of 2015.


A depot field team member from Robins AFB, Ga., works with a maintainer to rewing an F-15C in Oregon.

Boeing is still conducting a durability test on the F-15. The fleet is at about the 10,000-hour mark, and the test is aimed at certifying it can reach 15,000 hours.

The Air Force has said repeatedly that the F-15 and F-16 cannot survive against modern air defenses in the mid- to late-2020s, and if they are retained, they would be relegated to battles where enemy air defenses are less advanced or have already been beaten down by the stealthier F-22 and F-35.

Lt. Gen. Arnold W. Bunch Jr., USAF's top uniformed weapons buyer, said in an interview with *Air Force Magazine,* "We … know that there are places in an [anti-access, area-denial] environment that a fourth gen fighter is just not going to be able to do the mission. So it is constantly a balancing act of: What can I do for readiness today, how fast can we procure [new jets and upgrades, and] what's the cost to procure them."

The Air Force is hedging its bets. There are a number of improvement programs for the F-15C in development.

> "IT WILL COME DOWN TO, HOW MUCH DOES IT COST TO OPERATE."
>
> —Gen. Mike Holmes
> Commander, Air Combat Command


SSgt. Jair Hausheer services an F-16 at Kunsan AB, South Korea, in April.

"We're doing the radars" for sure, Bunch said. On the F-15C, it's the AN/APG-63(V)3, and "those are going to continue right now," he said. To go with it is the new Advanced Display Core Processor, called the ADCP II, to dramatically boost computing power. Also in the pipeline is the Multifunctional Information Distribution System Joint Tactical Radio System (MIDS JTRS); a new FAA-required transponder; improvements to the Identification Friend or Foe system; "and then we're starting the EPAWSS, the Eagle Passive Active Warning Survivability System," Bunch said. EPAWSS is an electronic warfare system that replaces an obsolete radar warning and response suite.

Work is also underway to develop an infrared search and track (IRST) system on the F-15, to allow it to detect stealthy aircraft and cruise missiles by their heat signature.

"It's in the early stages," Bunch said of the IRST.

Image from a video produced by Boeing as part of the Air Force's accident investigation reconstructing the in-flight structural failure of an ANG F-15C in November 2007. The breakup was caused by fatigue cracking of a forward fuselage longeron; the pilot survived.

Most of these upgrades are going to be common with the F-15E Strike Eagle—exception for the radar, which will be the AN/APG-82(V)1—so even if they aren't widely disseminated in the air superiority C fleet, they can be applied to the younger Es, likely to serve into the late 2030s.

The Air National Guard also announced recently that it will evaluate buying conformal fuel tanks such as those used on the F-15E for use on the F-15C fleet. The CFTs would expand the F-15C's range or loiter time and would not take away any weapon stations.

## FOR THE VIPERS AND EAGLES

On the F-16, capability upgrades include the APG-83 AESA radar, MIDS JTRS as on the F-15, a new mission computer, FAA-required transponders, a programmable display generator, and Automatic Ground Collision Avoidance System, or Auto-GCAS. Among the F-16s already equipped with GCAS, four aircraft and their pilots have been saved by the system so far. (See "The Science of Avoidance," February 2016.)

The Air Force already has funding for 72 F-16s equipped with the APG-83 radar—it's a response to a Joint Urgent Operational Need, for the homeland defense mission—"and then we have options [for] more," Bunch said. Asked if all 300 F-16s scheduled to be updated will get the radar, Bunch said, "If we get the money, [they] will."

Bunch said the money's in the pipeline to start the F-16 SLEP. The Air Force has decided to make it a small-business set-aside contract for a company to buy the materials and build the SLEP kits for the Air Force. The F-16 depot at Ogden Air Logistics Complex at Hill AFB, Utah, will install the kits, comprising six different elements, Bunch said: canopy sill longerons, bulkheads, stringers, and skin for the upper and lower wings and upper fuselage. Lockheed Martin will provide tooling and technical support, as the original equipment manufacturer.

Of the capability improvements, broadly, "I think we're off and running for the Vipers and Eagles," Bunch said. "We've got to modernize these things and keep them relevant."

The F-15 and F-16 were frankly never intended to serve this long. The last F-15C/Ds—the air superiority version—were delivered in 1985. The F-22 Raptor was originally intended to start replacing it in the mid- to late-1990s, but didn't arrive until a decade later. The F-22 was terminated at half the planned production, so some F-15Cs were retained to supplement them. The F-16—operational since 1980—was planned for retirement starting in the mid-2000s, but delays with the F-35 added 15 years to that timetable.

The Air Force has long pushed for a faster buy rate on the F-35A, hoping to bring on enough of the jets quickly enough to make an F-16 SLEP unnecessary. Service leaders now say that an annual buy of about 46 F-35s—two squadrons' worth—are all the Air Force can afford in the coming years. USAF is faced with a mandate from the Trump Administration to increase readiness, add thousands of more people to the ranks, and preserve the rest of an oversubscribed modernization program.

Heather A. Wilson, the new Air Force Secretary, said in early June that she wants to buy F-35s "as quickly as possible," and noted that the 14 additional fighters called out in the service's Unfunded Priorities List for Congress would help USAF get to a goal of buying 60 a year. She wants a look at the conclusions of the new National Security Strategy before setting future ramp rates, she said.

The House Armed Services Committee not only approved the 14 additional F-35s in its markup of the 2018 defense bill, it added 10 more—making a total of 70—but the bill has a long way to go before becoming law.

It's not clear the Air Force could absorb that many aircraft, though, as it is struggling to fill fighter cockpits, and the F-35 training pipeline might not be able to supply enough new pilots to expand the fleet at such a rate. A buy rate of 60 F-35As per year is the official planning goal for the time being.

"Unless something gets added" to the Air Force's budget topline, "something's gotta come out," Bunch asserted.

Boeing, maker of the F-15C and E, believes the Air Force should not ignore the investments made in the aircraft so far. Parker said the Air Force has already spent "probably $4 billion" on the EPAWSS that will "allow the F-15C or E to get into the fight, working very closely with the F-22 … and F-35." The capabilities are classified, but "we are very, very bullish" on what the EPAWSS will bring, Parker said.

"It is going to be a game-changer for the F-15, getting into the contested environment—and also from a homeland defense perspective," he said. EPAWSS just passed critical design review, and flight testing will begin next year.

Equipped with the new radar, electronic warfare, conformal fuel tanks, and other upgrades, the F-15C would be a formidable homeland defense machine, Parker argued.

"Wouldn't you want the aircraft that's fastest, that can carry the most [weapons], longer?" he asked rhetorically.

Holmes said the F-15 "is a fantastic airplane, I flew 3,000 hours in it," it can carry "a big air-to-air payload," and it is "a good match for things we are asking it to do in homeland defense." However, he said, "if I'm going to make the decision to go forward with the Penetrating Counter-Air aircraft, then I have to prove to people that I can afford it."

The Air Force, for now, will keep sending the F-15s "through depot, like we have been doing," and fixing the jet up as Holmes and other leaders debate how much more to ask of the Eagle. ✪

Photos: SMSgt. Shelly Davison/ANG; Boeing Phantom Works/USAF; SSgt. Chelsea Sweatt