Why the F-15EX Is Such a Badass Plane

The Eagle II boasts capabilities that even fifth-generation fighters don't have—all in a fourth-gen disguise.

BY ERIC TEGLER PUBLISHED: NOV 30, 2023

Boeing's vastly experienced F-15 chief pilot says he never went faster than Mach 2 while flying the F-22 Raptor in the Air Force. But when he took the Boeing F-15EX Eagle II on its maiden flight in 2021, he sure did.

"It was a clean airplane right off the production line in green primer [paint]," Matthew "Phat" Giese tells *Popular Mechanics*. "I did a maximum-afterburner takeoff, pointing the jet straight up, and wound up at 40,000 feet going Mach 2.5 [1,650 miles per hour]. That's a hell of a first flight."

Giese's experience illustrates what any pilot who has flown Eagles from the 1970s up through today will tell you: no other Western fighter has the high-altitude smash of an F-15 Eagle. It's a performance benchmark that the new twin-engine, two-place F-15EX enhances with thrust plus electrical and computing power to best its predecessor.

"The things that the F-15 has always done well—go high, go fast, stay airborne for a really long time with a huge payload [30,000 pounds of ordnance], and see further than any other fighter—are there today in the EX," Giese says.

The F-15EX, the Air Force's newest fighter aircraft, arrives to Eglin Air Force Base, Florida, March 11, 2021.

(U.S. Air Force photo/1st Lt. Karissa Rodriguez)

These attributes, including payload, are not hallmarks of America's fifth-generation fighters. The F-35, for example, can only carry 5,700 pounds of air-to-air and air-to-ground weapons at shorter range and slower speeds than the F-15EX.

"Frankly, [F-15EX] can almost fill in where you might not have as many bombers as you'd like to have. … This thing can carry so much ordnance … much like you would with a bomber. So that's going to be quite effective," Gen. Kenneth Wilsbach, head of U.S. Pacific Air Forces, said during the Air Force's annual convention in fall 2023.

The Air Force is beginning to recognize how valuable the Eagle II could be. However, it only currently plans to buy 104 F-15EXs in total, down from an originally planned minimum fleet size of at least 144. And yet, the state of global affairs today is arguably as grave as when the F-15 first flew in 1972.

Then, as now, the U.S. needed Eagles.

Built Right the First Time

Former Eagle driver and current Boeing F-15 business development director, Robert "Blend'r" Novotny says he's heard the F-15EX casually characterized as a 50-year old airframe. "I agree," he tells *Popular Mechanics*. "Sometimes you get lucky and you build an exceptional airplane right the first time."

The F-15 was conceived for the Air Force's F-X fighter requirement in 1968. Informed by America's Vietnam experience and the revelation of the USSR's

Mach 2.8-capable MiG-25 Foxbat interceptor the year before, designers from McDonnell-Douglas penned a twin-tailed, twin-engine Mach 2.5-capable air superiority fighter intended to out-rival anything in the air, including the Foxbat.

Selected in late 1969, the first Eagle delivered to the service was a two-seat F-15B trainer, handed over in November 1974. It's an interesting historical footnote given that the F-15EX is a two-seat airplane. Getting two-seaters in 1974 allowed pilots transitioning from the F-4 Phantom and other fighters/trainers to go aloft for the first time with an instructor. As the Eagle evolved, the back seat became the focus of added capability.

The first single-seat F-15A destined for a combat squadron was delivered in January 1976. Longer-ranged F-15C and D models (with greater internal fuel capacity) came along in 1979. The Eagle spent the next three decades as the U.S. Air Force's primary air superiority fighter, officially amassing a combat record of 104 kills and zero losses. (However, the Iraqi Air Force MiG-25s claimed to have shot one down in 1991.)

An Air Refueling Squadron from Travis Air Force Base use a KC-10 Extender to refuel U.S. Air Force F-15 Eagles above Joint Base Elmendorf-Richardson, Alaska, during Exercise Northern Edge 19, May 14, 2019. (Footage by U.S. Department of Defense/Milmotion via Getty Images)

So sturdy was its design, so powerful its engines (two Pratt & Whitney F100-PW-220s with a maximum 23,450 pounds-thrust each), so long-ranged its endurance (1,061 nautical miles), that in 1979, McDonnell-Douglas and radar manufacturer Hughes privately teamed up to develop a two-seat fighter-bomber version of the airplane that became the F-15E Strike Eagle.

Put simply: a line from the F-15A through E can be drawn to the F-15EX, but it's not a straight line.

21st-Century Guts

An F-15EX from the 53d Wing takes off from Joint Base Elmendorf-Richardson in support of Northern Edge 2021. NE21 is one in a series of U.S. Indo-Pacific Command exercises designed to sharpen the joint forces' skills; to practice tactics, techniques, and procedures; to improve command, control and communication relationships; and to develop cooperative plans and programs.

(U.S. Air Force photo by 1st Lt Savanah Bray)

Boeing's Novotny says it's difficult to "strip away whether the F-15EX is a pivot off the A, C, or E models. The reality is they share so much original DNA." The EX also evolved from other, newer F-15s like the F-15QA developed for the Qatar Emiri Air Force and the F-15SA built for Saudi Arabia.

The mix of ingredients that make up the F-15EX really goes back to 2013 when Boeing "completely gutted the airplane from the inside out," Giese explains. Minor structural changes were made to accommodate more powerful General Electric F110-GE-129 engines with a maximum 29,500 pounds of thrust. A Full-Size Determinant Assembly production technique (which reduces build time by moving drilling to the component fabrication process) is used for the wings and the nose barrel.

A new digital backbone was designed for the F-15EX, including a fly-by-wire flight control system (FCS), a far more powerful Advanced Display Core Processor II mission computer, and more powerful electrical system. Nearly all of the F-15C/Ds avionics were updated in a fully digital all-glass cockpit, which includes a 10 x 19-inch large-area touch display (LAD) that's fitted in both cockpits.

The large-area touch display can be custom configured by either the pilot or weapons officer to present an array of information, including inputs from the F-15EX's AN/APG-82 active electronically-scanned array (AESA) radar and its Eagle Passive/Active Warning Survivability System (EPAWSS) electronic warfare suite.

The former allows the F-15EX to "see further than any other fighter," Giese says, while the latter can do "unique digital things that are creative, and produce effects the likes of which we've never seen before."

While Boeing is tight-lipped about EPAWSS' specific capabilities, it has been described as enabling "cognitive electronic warfare," a kind of real-time identification of adversary waveforms, adapting and modifying them to use against the enemy. The Air Force's Angry Kitten pod pioneered such capability. With EPAWSS, the F-15EX turns the fifth-gen fighter low observability equation on its head, Giese explains.

"Instead of being stealthy and managing a certain profile into a target area, we use badass power with the APG-82 and EPAWSS. In my opinion, that produces a battlespace effect that is greater for the rest of the airplanes [in a strike package] than one [stealth] asset," he says.

Boeing's Novotny agrees. "The EX has a fourth-generation outer mold line, but fifth- and sixth-generation sensors."

Badass Power

Power pervades every aspect of the Eagle II—sensor power, ordnance power, and the power of range. You just can't overlook its engines, however. We asked Giese, Boeing's chief F-15 pilot, how flying the F-15EX compared with flying the Raptors, F-16s, and other Eagles he's flown, plus how it flies in formation with other fighters it has seen during evaluation at Eglin Air Force Base in Florida.

The jet flies much like a legacy F-15 but better, he says. Its digital flight control system was designed to make transitioning from an F-15C or Strike Eagle easy.

"Where the EX differentiates itself is the acceleration and power of the GE-129s. An informal drag race of an EX vs an E model at Eglin resulted in an easy win for the EX. When it comes to climb/turn performance, the powerful GE-129s again out-perform legacy engines. Also, addition of the g limiter and roll limiter make the jet extremely predictable, and protects the pilot and airframe."

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(U.S. Air Force photo/Samuel King Jr.)

Single-engine fighters like the F-16 and F-35 can't match the F-15EX's power, Giese says. "I have flown countless formation flights with F-16 chase aircraft during development and other mission system flight tests. My chase F-16 ended up in a 20NM trail when I flew a high-speed Mach-2.3 flutter test point. We started out in close visual formation. I would expect similar results with an F-35."

With a reported combat radius of 1,100 miles (the maximum distance a combat-loaded fighter can fly to and from a target without refueling), the F-15EX can go further than any other U.S. fighter—including the F-35 (670 miles). That's a *huge* advantage in the Pacific, where the Air Force could face off against China over vast distances with limited aerial refueling availability.

Novotny recalls his longest mission in a legacy Eagle was a 13-hour dusk-to-lunchtime combat sortie on night one of Operation Iraqi Freedom. The F-15EX will surely be called upon similarly.

When that happens, it can carry virtually any aerial weapon in the U.S. arsenal on its nine wing pylons, from up to 14 AIM-120 AMRAAM and AIM-9X Sidewinder air-to-air missiles to a mix of small-diameter bombs, GBU-54 smart bombs, AGM-158 standoff cruise missiles, and Harpoon anti-ship missiles.

Pacific Air Forces commander, Gen. Wilsbach, told the media: "Some of the weapons that you can't carry internally [on] a fifth-generation aircraft, you can put on the F-15EX." Among those would be hypersonic missiles now in development, which the Eagle II can carry on its centerline pylon.

The two-seat EX logically lends itself well to Air Force “Battle Captain” concepts, wherein the crew works with the Collaborative Combat Aircraft (CCAs, loyal wingman drones) the service is eager to develop.

Maj. Kevin Hand, F-15EX operational and experimental test pilot with the Air National Guard-Air Force Reserve Test Center, prepares to taxi out for a mission from Nellis Air Force Base, Nevada, October 20, 2021.

(U.S. Air Force photo by William R. Lewis)

An Eagle II with a pilot flying into advanced tactical scenarios and a backseater who can operate offboard drones or weapons could make early semi-autonomous CCAs practical, while still holding a digital leash to such unmanned teaming systems.

So versatile is the F-15EX that buying it in small numbers and largely confining it to a homeland defense mission (as the Air Force says it intends) makes no sense. It’s a natural deterrent against China, a new badass to compliment current fifth- and forthcoming sixth-generation fighters—all while upholding the Eagle tradition.

“The Eagle has remained that dominant over half a century,” Giese says. “Can you imagine a professional sports team with a record of 104 wins, zero losses?”

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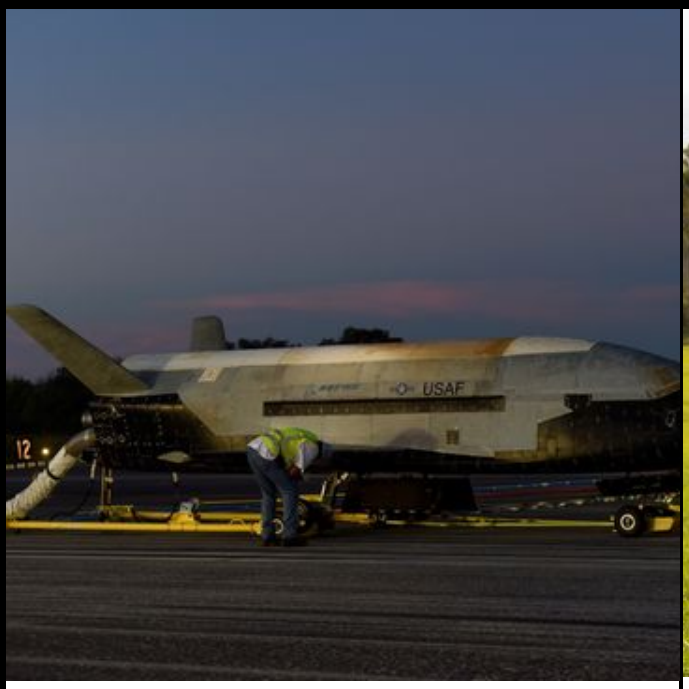

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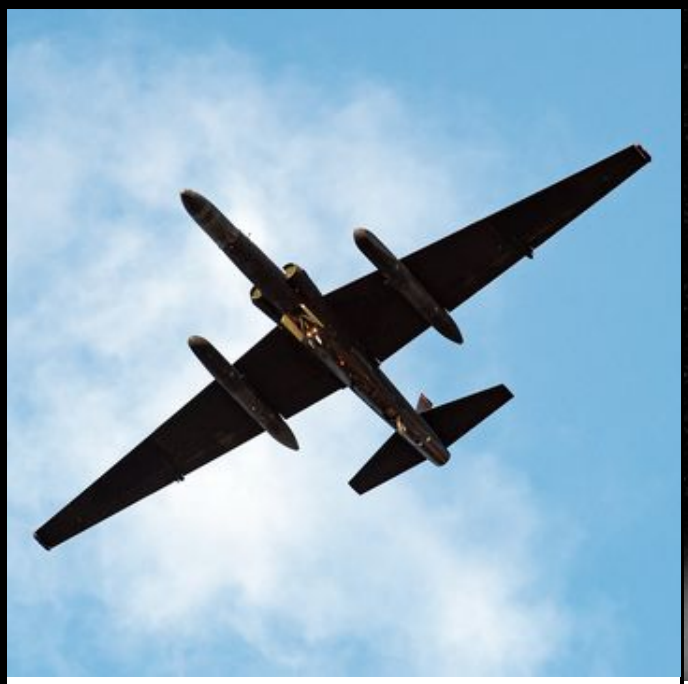

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