

GENERATION



For the U.S. and countries that buy its warplanes, the upgrade to fifth-generation fighters won't be like flipping a switch. In fact, Boeing and Lockheed Martin each have proposals to soup up the designs of their decades-old fourth-generation fighters, the F-15 and F-16. **Jan Tegler** looks at the arguments for and against the F-15EX and F-21.

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AL CONFLICT



Air power strategists in the Pentagon and Air Force have long billed today's F-22 and F-35 variants as the aircraft that will keep the U.S. ahead of adversaries through at least 2060. These fifth-generation fighters are stealthy and loaded with sensors that create a complete picture of the airspace that can be shared with other aircraft, ground vehicles, ships and command centers. They are the Swiss Army knives of fighters and are far more lethal than the fourth-generation F-15s and F-16s flown by the U.S. Air Force.

Over the past year, however, manufacturers have proposed two fighter concepts that challenge the notion that the U.S. Air Force and equivalent services abroad should jump straight from today's fourth-generation jets to the fifth generation.

One proposal, revealed by Boeing in July 2018, calls for updating the F-15 design that Boeing inherited with its purchase of McDonnell Douglas in 1997. The new version would be called the F-15X and would come in a two-seat F-15EX version and maybe someday also a single-seat CX model. Pitched as a cost-effective, low-risk replacement for today's F-15C, the F-15EX would combine the F-15's proven airframe with a selection of sensors, avionics, self-protection systems (electronic jamming) and offensive weapons similar to those on fifth-generation fighters.

The way budget deliberations are unfolding in the U.S., it looks like Congress could come close to meeting the Air Force's request for \$1.1 billion in fiscal 2020 to buy the first eight of 80 F-15EXs to be purchased over the next five years for \$7.8 billion. The House Appropriations Committee would provide

▲ **A U.S. Air Force F-35A** Lightning II, above, and an illustration of a Boeing F-15EX, left.

U.S. Air Force and Boeing

\$986 million for eight F-15EX planes to replace the F-15C and its F-15D trainer models, according to the bill the committee passed in June. The authorization bills in the House and Senate also call for eight aircraft but would trim the cost a bit to \$941 million in the House version and \$948 million in the Senate. Boeing also offered the Air Force the single-seat version, but the service has not announced plans to buy this.

Meanwhile, at a February trade show in India, Lockheed Martin showed off a small-scale model of a derivative of the F-16 to be called the F-21. Unlike the F-15EX, the F-21 would not be intended for the U.S. Air Force. Lockheed Martin hopes to sell the F-21s to the Indian Air Force through the U.S. foreign military sales process. The F-21 would follow a similar formula of doing as much as possible with a nonstealthy airframe. The planes would be enhanced versions of the Block-70 F-16s that Lockheed Martin produces in Greenville, South Carolina, for export. Like the F-15EX, the F-21 would incorporate fifth-generation technology, including an active electronically scanned radar and what Lockheed Martin calls an “India-unique” electronic warfare suite for self-protection along with improved avionics, data links and the ability to fire a range of air-to-air and air-to-ground weapons.

I spoke to analysts, defense officials and corporate executives, some of whom would not be named so they could speak freely about the merits of the F-15EX and F-21 proposals.

Selling the F-15EX

The Air Force wants to wrap the F-35A into the force to achieve a 50-50 ratio of fourth-generation fighters to fifth-generation F-22s and F-35As. Planners face a conundrum, though, with the F-15Cs designed exclusively to shoot down other aircraft. Their internal longerons are showing signs of fatigue, and the Air Force calculates that if nothing is done the planes will need to be retired between 2023 and 2028. The F-15EXs could replace them.

Air Force leaders initially opposed buying any additional fourth-generation fighters, including the F-15EX, viewing it as distraction from procuring F-35As. Here’s then-Air Force Secretary Heather Wilson speaking to Defense News last September: “... getting to 50-50 means not buying new fourth-gen aircraft, it means continuing to increase the fifth generation.”

Wilson’s view did not prevail in the 2020 budget request; after leaving the Air Force in May, she became president of the University of Texas at El Paso.

Retired Air Force Lt. Gen. David Deptula reported in Forbes in March that the Office of the Secretary of Defense “drove” a decision to include F-15EXs in the request released that month.

The Air Force’s hesitancy to embrace the F-15EX proposal might be understandable. The service

selected McDonnell Douglas’ design for the F-15 in 1967. Even with some fifth-generation technology, these planes will never be as capable as the 1980s-designed F-22 or 1990s-designed F-35A, some defense analysts and U.S. senators argue. A combination of stealth and sensor fusion enables the F-22s and F-35As to simultaneously perform multiple missions amid defenses that would rapidly destroy or cripple the F-15EX.

Also in this view, employing a mixed force of F-35As, F-22s and F-15EXs would require greater numbers of expensive support aircraft to ensure that fourth-generation fighters could survive and be effective against sophisticated adversaries. That support would include electronic warfare aircraft and airplanes capable of suppressing surface-to-air missile systems.

F-35A backers also worry that the U.S. may have passed the apogee of the Trump increase in defense spending and that even a small buy of F-15EXs would mean fewer F-35As. That outcome would dent the capability of an already fighter- and pilot-poor Air Force, even with the F-35A’s development woes and delays.

So far, the fear has not born out that F-15EXs might be procured instead of some F-35As. The 2020 budget request calls for a buy of 48 F-35As per year, the same rate requested in the 2019 defense budget. This comports with Lockheed Martin CEO Marilyn Hewson’s prediction from January that if Boeing-built F-15EXs are purchased, it “won’t be at the expense of F-35 quantities,” adding that she was “hearing that directly from leadership in the Pentagon.”

Rather than taking funds from the F-35A, the F-15EX acquisition funds would be drawn from money that would have been used to keep the F-15C flying. F-15EX supporters note that keeping Boeing’s F-15 line up and running also would preserve diversity in American fighter manufacturing.

Perhaps, in talking up the F-15EX, these supporters are pushing back against those who don’t like the plane’s lack of stealth. They cite a list of pluses about the F-15EX, even if they don’t necessarily mean that the Air Force should buy them instead of F-35As. When it comes to dollars, they predict that the F-15EX will retain an edge in unit cost over the F-35A. This will be true, they say, despite an agreement announced in June between the F-35 Joint Program Office and Lockheed Martin that would seek to bring the unit cost of the F-35A in the next lots to under \$80 million. That’s about the predicted unit cost of an F-15EX, but the F-15EX supporters do not believe this will be achieved.

That still leaves the question of cost per flight hour. F-15EX advocates say the hourly cost will be almost half that of the F-35A. Pentagon officials seem to agree. In early May, Vice Adm. Matt Winter,

director of the F-35 Joint Program Office, told a House subcommittee that the current flight-hour cost for the plane is \$44,000. During the same hearing, Robert Daigle, director of the Pentagon's Cost Assessment and Program Evaluation Office, said his office projects a cost of \$29,000 per flight hour for the F-15EX.

Another plus would be that the Air Force would at least temporarily avoid any interruptions in readiness because integrating F-15EXs into the force would be relatively straightforward. In mid-March, Maj. Gen. David Krumm, Air Force director of strategic plans, told Air Force Magazine that there is "80 to 90 percent commonality between the F-15C and the F-15EX" adding that the service expected it could transition units from F-15C to F-15EX in "less than six months." Krumm said transitioning to an all-new airplane could take between 18 months and three years for active-duty or Air National Guard units. "If you average that out, Active and Guard, each time we do that we save about two years of readiness," he said. F-15EX backers add that Air Force bases will not bear the expense of F-35A-specific construction of hangars and support equipment and that the cost of retraining pilots to fly the F-15EX will be negligible. The F-15EX can be plugged directly into existing F-15C squadrons.

The F-15EX would carry a larger payload of air-to-air missiles than the F-15C as well as smart bombs and missiles that can strike enemy air defense systems. It could also be flown on homeland defense missions with the capability to carry future air-launched hypersonic missiles to defend against Chinese or Russian hypersonic cruise missiles. The F-35A will likely be flown for this purpose as well but will have to carry the large weapons externally, negating its stealth.

The case for the F-21

Lockheed Martin's immediate goal with the F-21 is to position itself for an international fighter competition that India plans to start shortly. At stake would be the right to supply 114 fighters to India at a reported cost of \$15 billion to \$20 billion. India's Ministry of Defense specifies that roughly 97 of the 114 jets would be manufactured in India.

Opportunities to win Indian fighter business do not come often. The last foreign-made fighter to join the Indian Air Force is the Sukhoi Su-30, which India began flying in 1997. A formal request for proposals for the new acquisition reportedly could be issued this year or in 2020, with deliveries starting in the mid-2020s.

In the U.S., Lockheed Martin's statements about the program have provided tantalizing

Fighting for Pentagon's favor

A look at the mix of fighter jets that figure into the U.S. government's planning for the Defense Department budget.

4TH GENERATION



F-15C

Manufacturer: Boeing
Maximum speed: Mach 2.5
Range: 1,200 nm
Engines: Two P&W F100 or two GE F110 turbofan engines



F-15EX

Manufacturer: Boeing
Maximum speed: Mach 2.5
Range:
Engines: Two P&W F-100-PW-229 or GE F110-GE-129 — decision to come from U.S. Air Force



F-16

Manufacturer: Lockheed Martin
Maximum speed: Mach 2 at altitude
Range: 2,002 miles ferry range (1,740 nm)
Engines: General Electric F110-GE-129 or Pratt and Whitney F100-PW-229

5TH GENERATION



F-21

Manufacturer: Lockheed Martin
Maximum speed: 2,120 kph
Range: 4,220 kilometers
Engine: One General Electric F-110-GE-129 afterburning turbofan



F-22

Manufacturer: Lockheed Martin
Maximum speed: Mach 2 with supercruise capability
Range: 1,600 nm
Engines: Two P&W F119-PW-100 turbofan engines with afterburners and two-dimensional thrust vectoring nozzles



F-35A

Manufacturer: Lockheed Martin
Maximum speed: Mach 1.6
Range: 2,200 kilometers
Engine: P&W F135



fodder for speculation about the company's long-term plans. On its website, the company says that it will partner with New Delhi-based Tata Advanced Systems to accelerate "India-U.S. cooperation on advanced technologies." The reference to "advanced technologies" led to speculation that Lockheed Martin might view collaboration on the F-21s as a precursor to someday exporting F-35As to India. What does Lockheed Martin say about this theory? Any future sales of F-35As would be "a government-to-government issue," says Vivek Lall, the company's vice president for strategy and business development. If India does decide to pursue a fifth-generation fighter, the F-35A might be the only option. In 2007, India agreed to participate in the development of Russia's fifth-generation Sukhoi Su-57 fighter but pulled out of the program last year.

Lockheed Martin likes to emphasize that someone who buys an F-21 will get some technology similar to what's on the F-22 and F-35A. For example, the F-21's APG-83 radar "will have 85 percent hardware and software commonality" with the F-35A and F-22 radars, says Lall, and the planes "will share a common supply chain on a variety of components." Further sweetening its bid, Lockheed Martin announced an agreement with Tata last year to produce F-16 wings in India, adding that it expects to export F-16 wings from India for all future F-16 customers. Lall says Tata and Lockheed Martin are working on the first prototype F-16 wing now and expect to finish by next year. Tata could potentially produce "other supply-chain-side components" for the F-16, Lall notes. "That would all be part of that ecosystem that is part of our offer to India."

Such a move would be a boon to Indian Prime Minister Narendra Modi's "Make in India" initiative to improve the nation's military industrial base and create jobs. Defense analysts tell me the F-21 stands a good chance of winning the Indian order, with odds perhaps as high as 60 percent in its favor. They

▲ **An F-15C Eagle gets** ready to refuel with a KC-135 Stratotanker during a training exercise out of Kadena Air Base, Japan.
U.S. Air Force

see Lockheed Martin's decision to partner with Tata as positive, noting that the two companies already partner in production of Lockheed's C-130J cargo airplane and that since 2009, Tata has been a reliable partner with Sikorsky, manufacturing cabins for its S-92 helicopter. Lall says Lockheed Martin's "decade-old deep partnership" with Tata has "built a lot of trust" and that with the outreach the company is doing with small and medium-size suppliers and startups in the Indian aerospace sector, "we think we can execute flawlessly in a timely manner should we be chosen for this contract."

In terms of capability, Lockheed Martin is keen to stress that the F-21 is a new offering rather than a rebranding of the Block-70 F-16s that it bid in India's earlier attempt at the procurement. "The F-21 is a unique configuration exclusively for the government of India with aspects that are unique to Indian requirements," Lall says. He adds that F-21s will first be built in the U.S. "with a phased transition to production in India."

Some analysts have contended that the company put a new name on the F-16 aircraft that it had previously proposed. The F-21 designation also could be an effort to distance the airplane from the memory of an earlier attempt to procure Western fighters that was started in 2007. This resulted in the selection of Dassault's Rafale in 2012. Seven years after this Medium Multi-Role Combat Aircraft selection, no Rafales have been delivered to the Indian Air Force as contract negotiations stalled over cost, technology transfer and allegations of corruption by the Modi government. Indian media reports indicate that four of the 36 Rafales on order may arrive next April or May.

The F-21 designation might also be meant to avoid conjuring thoughts of the F-16s that archrival Pakistan flies. That last concern was apparently born out in February after a suicide bomber attacked a bus carrying Indian paramilitary troopers, killing at least 40, according to press reports. India responded with an airstrike against what it described as a terrorist training camp inside Pakistan. In the ensuing skirmish, Pakistan shot down at least one Indian MiG-21 and captured a pilot who was released in March. India claimed to have shot down a Pakistani F-16, although Pakistan denied this.

The F-21 will be in competition with six other fighters: the Boeing F/A-18 Super Hornet, Dassault Rafale, Eurofighter Typhoon, Saab Gripen, Sukhoi Su-35 and MiG-35. All are fourth-generation jets that have been enhanced with varying levels of fifth-generation technology. Lockheed Martin could have an edge in that the F-21 is the only entrant with a connection to the F-35A.

Staff reporter Cat Hofacker contributed to this report.