

FROM SEVE

The USAF's fighter force comprises a disparate mix of aircraft types – some of which are rather old – so there are urgent plans to recapitalize the fleet with a mix of new and upgraded types, as **Jon Lake** explains

The USAF is planning to rationalize its fighter fleet from seven aircraft types to just four and will jettison the A-10C and F-22A in the process. This plan forms part of a wider initiative that is aimed at rebalancing the USAF's frontline in order to keep pace and compete with China. Today's fighter fleet comprises the A-10C; F-15C/D; F-15E; F-16C/D; F-22A and the F-35A, but the air arm wants to transition to a frontline force that consists of F-15E/EXs; F-16s; F-35As and the new Next Generation Air Dominance (NGAD) fighter.

Last December, the US Government Accountability Office (GAO) published a report into Tactical Aircraft Investments, noting that: "Most of [the Department

of Defense's (DOD's)] existing aircraft first entered service in the 1970s and 1980s and have exceeded their original service lives. As DOD seeks to modernize its tactical aircraft fleet, it must balance sustaining older aircraft currently in operation with developing and procuring more advanced capabilities to support the future force."

The report acknowledged: "Recent studies conducted by the DOD's Joint Staff and the military services have found that DOD needs to modernize its tactical

aircraft fleet. Seven of eight studies found that existing aircraft did not have the capabilities needed to compete in future combat scenarios and some noted the need to invest in advanced technologies to address future needs."

However, the report also highlighted a lack of transparency in the USAF's plans, which, it averred, was likely to lead to poorly informed decision-making, with the potential for wasting money and duplicating efforts.

N TO FOUR



“The lack of an integrated acquisition portfolio review of tactical aircraft platforms leaves DOD and Congress with limited insight into interdependencies, risks and related trade-offs among some of DOD’s highest priority and most expensive investments.

“Without an analysis of the tactical aircraft platform portfolio and a requirement to report underlying information externally, DOD and Congress

will continue to have limited information when making major investment decisions,” the report stated.

Changing Environment

Gen Mark Kelly, commander of Air Combat Command, used his keynote address to the Air Force Association Air, Space and Cyber Conference on September 22, 2022, to acknowledge that today’s fighter force had been designed for a different peer adversary, and had been built for a different time. He acknowledged that they had been used in a different way than had originally been planned and said that the proposed changes were urgently required.

The seven-fleet fighter force was itself something of an accident of history. At the height of the Cold War, the USAF had planned for an ‘all-stealth’ force,

with a fighter fleet comprising F-22s and F-35s, along with an all B-2 bomber force. Budgetary constraints and a changing strategic environment saw this ambitious plan being abandoned, and the teen-series fighters and A-10 enjoyed longer careers than were once envisaged. These fighters proved themselves better suited to the asymmetric and counterinsurgency air campaigns that characterized the post-Cold War-era than the newer fifth-generation fighters, and their shortcomings were less apparent as the USAF shifted its focus away from major near-peer adversaries.

But in 2018, the DOD’s primary strategy document, the National Defense Strategy, signaled a shift away from a focus on counterinsurgency operations and combatting violent extremism. Instead, the DOD realigned its sights on the

challenges of peer-level warfare and on the growing threat posed

by major powers, recognizing the challenge to US prosperity and security from long-term, strategic competition with Putin’s Russia and Jinping’s China, who have actively sought to undermine US military advantages.

In an age of rapid technological change – accompanied by increasing uncertainty and complexity – the US military advantage is being eroded and the nation can no longer take for granted the unchallenged military dominance it has enjoyed for the last three decades.

Now that the USAF is facing the growing possibility of having to fight a peer-level opponent, the balance is shifting back in favor of the low-observable (LO) F-35, though there has been recognition that non-stealth platforms may still have a useful part to play. However, USAF Chief of Staff Gen Charles Q Brown Jr has said that the service must prioritize the cutting-edge capabilities that will be able to survive in contested airspace and that will keep the force ahead of the “pacing threat”, which is now seen as being China.

F-16C Fighting Falcons equipped with AIM-120 AMRAAMs, AGM-88 HARMs and a pair of drop tanks on the underwing hardpoints; they’re also fitted with an AN/ALQ-184 Electronic Attack Pod, Sniper XR targeting pod and AN/VASQ-213 HARM targeting system under the fuselage. All images Jim ‘Hazy’ Haseltine, unless otherwise stated



"We have to focus our fighter force to face the realities of a new threat environment," Kelly noted. "Our fighter force was designed for a Soviet force. We are behind and our current incremental rate of change is insufficient. Fighter Roadmap is a change in investment priorities required for a peer fight. The fighter force will again need to flex from its original design to defeat a peer threat. We need to face the realities of a new threat environment and that requires the fighter force to change.

"We have to be able to compete and fight well beyond the permissive counterinsurgency environments we've operated in for the last 20 years. If you're going to be an Air Force that flies, fights, and wins anytime, anywhere; the anywhere includes the highly contested sovereigns," Kelly continued, noting that: "It is significantly harder to compete against a nation in their own sovereign space." To beat a near-peer adversary like China or Russia, Kelly says that the US needs "high capability, high capacity and affordability," which "takes a range of capabilities".

Beating China and Russia will require US

forces to strike diverse targets (including mobile targets) in highly contested environments, protected by the enemy's integrated air defense networks. This will require urgent change at a significant scale and the 2018 National Defense Strategy warned that failure to achieve this would rapidly result in a force that would be irrelevant to the threat.

Gen Brown's strategy document, titled *Accelerate Change or Lose*, noted that "good enough today will fail tomorrow." Kelly also said: "When it comes to modern combat, if you don't like change, you're going to really dislike irrelevance, and you're going to outright hate a kinetic defeat."

To avoid this, the USAF will need tactical aircraft with more advanced capabilities, as well as improved air-to-air refueling capabilities, enhanced connectivity, and battlespace awareness, but mass is also vitally important.

"The Fighter Roadmap is part of the change you must make or lose. We must have the right-sized fleet to keep viable," Kelly said. The USAF operated a fleet of approximately 4,000 tactical fast jets across 134 fighter squadrons when



Above: The F-35A will form the backbone of the USAF's future fighter fleet, with a program of record calling for 1,760 examples of the fifth-generation multi-role stealth fighter to be acquired

it conducted Operation Desert Storm in 1991, but 30 years on, that inventory has shrunk to around 2,000 aircraft across 48 fighter units (and nine attack squadrons).

The USAF is statutorily required to maintain a minimum of 1,145 fighters in its primary mission aircraft inventory and officials have said that a minimum of 2,100 tactical jets would be sufficient to meet future needs, though there is an acknowledgement that the USAF found that fifth- and sixth-generation aircraft should allow the service to meet its mission with fewer aircraft than are in the current inventory. The US Navy and USMC want another 1,200 fighters. Some believe that the US fighter fleet is already too small and, though the USAF's own study of its tactical air requirements is classified, Kelly has endorsed the conclusions of the 2018 Air Force We Need study, which called for a 62-squadron fighter force.

Above left: The F-35A is likely to replace both the A-10C and F-15C/D Eagle fleets, along with a number of F-15E Strike Eagles toward the end of this decade

A compelling argument

Overall figures aside, there is a compelling case for reducing the number of aircraft types in service, to lower support and sustainment costs, while

Legacy F-15C Eagles assigned to the 131st FS 'Death Vipers' pop flares before breaking formation during a local sortie from Barnes ANGB, Massachusetts, on February 11, 2020





An F-22A Raptor shows off its internally stored air-to-air missiles, comprising six AIM-120C/D AMRAAMs in the internal fuselage weapons bay and one short-range AIM-9 Sidewinder missile in each of the aircraft's sideward-facing weapons bays



The USAF's first F-15EX Eagle II was delivered to the 96th Test Wing at Eglin AFB, Florida, on March 11, 2021 USAF/ Samuel King Jr

withdrawing the oldest airframes in order to reduce the average age of the fleet. Many of the USAF's fighter aircraft are becoming increasingly more expensive and difficult to maintain as they face issues with diminishing manufacturing sources and systems/parts obsolescence. Mission-capable rates have proved disappointing – especially for the F-35, which forms the cornerstone of the USAF's tactical aircraft fleet, but also for the service's older fighter types.

To address future capability gaps while maintaining acquisition and sustainment affordability, the USAF aims to axe some fourth-generation tactical aircraft – specifically the A-10C and F-15C/D – and redirect funding for these types to fund development of the NGAD system of systems.

To recapitalize the fighter force while reducing the number of types in service

without further eroding overall numbers is a tough challenge, and one that will require heavy investment and a steady flow of new aircraft. The USAF calculated that it would need to buy at least 72 new fighters each year if it is to reach the force levels required, with the right capabilities.

For years, Congress has approved fighter procurements that are lower than the USAF's requested totals and has also stood in the way of divestment plans – especially in the case of the A-10. There are some signs that this may be changing. The USAF's FY23 budget request initially asked for 57 new fighters – comprising 33 F-35As and 24 F-15EXs, with seven additional F-35As in an unfunded priorities list. Congress eventually approved the procurement of 43 F-35As (three more than requested), along with 24 F-15EXs, giving a total of 67 new fighters.

The USAF's FY24 budget request (released in March) asked for 72 new fighters (48 F-35As and 24 F-15EXs). The USAF's Deputy Chief of Staff for Plans and Programs, Lt Gen Richard Moore, commented that this level of request is not a "one-time thing."

While this level of procurement is sustainable as the US has what Moore called "two hot fighter production lines," once F-15EX procurement is complete

(and under current plans the final 24 will be requested in FY25), it will rely on Lockheed Martin's ability to build 72 F-35As for the USAF each year, in addition to aircraft for a growing list of export customers, unless NGAD production is beginning by then, which seems unlikely.

Moore said that the US defense-industrial base has limitations, and that the COVID-19 pandemic caused lingering supply chain and workforce issues that could make it difficult to deliver more than 72 fighters per year.

In its recent report, the GAO said: "Tactical air forces are critical to achieving and maintaining air dominance during combat operations," noting that "these aircraft often operate during the first days of a conflict to penetrate enemy airspace, defeat air defenses and achieve air dominance."

Only when control of the air has been gained do follow-on ground, air and naval forces have the necessary freedom to operate within the battlespace. Once air dominance is established, tactical aircraft will of course continue to strike ground targets for the remainder of the conflict.

Therefore, the overall joint force needs the USAF to win the air superiority fight, but the highly contested environment presents a range of challenges for the service, putting this at risk. The



Air National Guard's (ANG's) fighter pilots a little better at 7.3 hours. This may, or may not, be enough to maintain competence, but it probably isn't enough to guarantee war-winning, dominance-achieving excellence.

As a side note, this author remembers how we all hooted with derisive laughter when we heard that Warsaw Pact pilots were only getting 12 hours per month at the height of the Cold War. There may be no immediate cause for concern, but nor is there room for complacency.

Left: Legacy F-15C Eagles from the 123rd FS 'Redhawks' – a component of the Oregon ANG's 142nd FW – pop flares as they go vertical during a sortie on July 31, 2014. They are armed with AIM-120 AMRAAMs and AIM-9 Sidewinder missiles

THE AIRCRAFT A-10C Thunderbolt II

For years, Congress blocked USAF efforts to retire the A-10 and, as a result, the future fighter roadmap involved '4+1' aircraft types, with the A-10 being the '+1'. But all that seems to be changing, and in March 2023, Gen Brown noted that the '4+1' fighter plan was "probably just '4' now." He told the annual McAleese Defense Forum in Washington DC that: "We're retiring A-10s faster than we originally thought, and I think that's probably the right answer."

Below: F-16C Fighting Falcon (serial 89-2109) from the 112th FS 'Stingers' drops inert GBU-24 Paveway III training bombs during a training mission on July 10, 2018. Have Glass V gray camouflage makes it less observable to enemy radar systems



threat is evolving rapidly, and many scenarios impose difficult payload/range requirements, as well as capability and capacity issues. The USAF will need to make concerted efforts if it is to remain the world leader in air superiority capability, using F-35 and NGAD to try to ensure a qualitative edge, and its remaining fourth-generation aircraft to solve the capacity/affordability dilemma.

Buried within the facts and figures of the USAF's own *Air and Space Force Magazine 2022 Almanac* is another cause for concern when it comes to the service's effectiveness against a peer threat. The Almanac reveals that in 2021, active-duty USAF fighter pilots averaged only 6.8 flying training hours per month, while their Air Force Reserve Command (AFRC) colleagues managed just 6.7, and the



As part of the USAF's FY23 budget request, 21 A-10Cs operated by the 122nd FW's 163rd FS 'Blacksnakes' at Fort Wayne ANGB are to be withdrawn from use and replaced by F-16C/Ds

He said that the A-10's close air support (CAS) mission could be carried out by a variety of other platforms, albeit not in quite the same way. Significantly, Brown noted that combatant commanders had not been asking for A-10s, because it is a "single-mission airplane," while it was also felt that the low-and-slow-flying Warthog (A-10) would not be able to survive in a fight against a peer nation threat with modern air defenses.

"The A-10 is a great airplane... in an uncontested environment. The challenge is that we're going to be in more contested environments in the future," Brown explained.

There are 281 A-10Cs in the inventory – 141 active-duty, 85 ANG and 55 AFRC aircraft – with an average age of 40.3 years. These serve in the interdiction, combat search-and-rescue; Forward Air Controller-Airborne (FAC-A); and strike control and reconnaissance roles.

The current fleet operates the A-10C variant – modernized under the Precision Engagement Program and first flew from Eglin AFB, Florida, in 2005. The A-10C has color multifunction displays (MFDs) in

the cockpit, hands-on-throttle-and-stick (HOTAS) controls; a Helmet Mounted Cueing System (HMCS); advanced datalinks; GPS-guided weapons; Litening/Sniper advanced targeting pods (ATPs); a digital stores management system and new integrated sensors. Led by Boeing, a Wing Replacement Program is underway to enable 218 A-10Cs to remain operational until approximately 2030. Meanwhile, the 21 A-10Cs of the 122nd Fighter Wing (FW) 'Blacksnakes' at Fort Wayne ANGB, Indiana, will be replaced by F-16s in 2023, and 42 more Warthogs are due to follow these into retirement in 2024.

F-15C/D Eagle

The F-15 has been one of the most successful USAF fighters in history, accounting for 34 air-to-air kills during its combat debut in Operations Desert Storm and Provide Comfort, and four more during Operation Allied Force in 1999. The type retains competitive performance and powerful combat capabilities; the latter part due to a Multistage Improvement Program, which saw the integration of a number of upgrades.

The final 43 production aircraft received the F-15E's APG-70 radar, others had their radars upgraded to a similar standard as the APG-63(V)1, 18 examples received the AN/APG-63(V)2 active electronically scanned array (AESA) system, while 179 more received the AN/APG-63(V)3 AESA radar. The latter formed part of a 'Golden Eagle' upgrade with Link-16 datalink connectivity, a Sniper ATP (Passive Attack Sighting System) and Passive Attack Display, an Advanced Display Core

Processor (ADCP) II, and later, the Legion Infrared Search-and-Track (IRST) or Talon HATE pods to provide air-to-air detection, tracking and ranging capabilities for F-15C/Ds in a radar-contested environment.

A more comprehensive modernization, including a new Eagle Passive/Active Warning Survivability System (EPAWSS) and structural upgrades, was cut short when the decision was taken to replace the type with a mix of F-15EXs and additional F-35As. Some 63 aircraft received the structural service-life extension program (SLEP) of the 128 originally scheduled for modification.

But the USAF's F-15C/D fleet is now almost 40 years old (on average) and have 8,400 flying hours 'on the clock', and despite structural modifications, the type now has performance-limiting structural issues and is being rapidly withdrawn from service. In July 2022, the active-duty force had 87 F-15Cs and nine F-15Ds, with 122 F-15Cs and 14 F-15Ds with ANG units.

Since then, the type has been withdrawn from the 48th FW at RAF Lakenheath, UK, and is being retired from the last active-duty squadrons under the 18th Wing at Kadena AB, Japan. The Florida ANG's 159th Fighter Squadron (FS) 'Boxin' Gators' – part of the 125th FW at Jacksonville ANGB – is transitioning from the Eagle to the F-35A.

F-15E Strike Eagle

Despite being probably the most 'in demand' tactical aircraft type, the F-15E Strike Eagle fleet is facing a significant reduction in size by the end of the decade. The USAF plans to cut 119 of its

Below: This F-35A (serial 17-5265) of the 134th FS 'Yellow Scorpions' – part of the Vermont ANG's 158th FW – pops flares during a sortie on April 2, 2021



An F-15E Strike Eagle (serial 91-0311) is joined by three other F-15Es of the 48th FW's 492nd FS 'Bolars' and 494th FS 'Panthers' for a local flight over the UK. A legacy F-15C from the 493rd FS 'Grim Reapers' can also be seen in the formation





218 F-15Es by FY28, phasing out those powered by Pratt & Whitney's 23,770lb F100-PW-220E afterburning turbofan, while retaining the examples powered by the 29,160lb F100-PW-229. The multi-role F-15E is equipped with an AN/APG-82(V)1 AESA radar and the USAF is adding the EPAWSS system, which will bring defensive, situational awareness, and electronic attack improvements.

The Strike Eagle made its combat debut during Operation Desert Storm and has since seen action in Afghanistan, Iraq, Syria and Libya. The aircraft undertakes deep interdiction/attack; tactical nuclear delivery; and air-to-air combat missions. It can carry most air-launched precision-guided and stand-off munitions in the USAF's current inventory.

The F-15E is the tactical platform of choice for outsized stand-off strike weapons, as well as the new B61-12 nuclear gravity bomb, and the type has conducted demonstration flights carrying five AGM-158 JASSM missiles or ferrying up to 15 JDAMs to forward airfields. An F-15E also conducted the first test-drop of the 5,000lb GBU-72 Advanced 5K Penetrator bomb on October 7, 2021.

With the withdrawal of the F-15C/D from USAFE, the F-15Es of the 48th FW's 492nd FS 'Bolars' at RAF Lakenheath began conducting deterrence operations at Łask AB, Poland, on November 29, 2022, in support of the US forward fighter presence along NATO's eastern flank, flying in a new configuration, stripped of their conformal fuel tanks (CFTs). This was intended to increase the Strike Eagle's air dominance capabilities, enabling a supercruise ability and enhancing beyond-visual-range air combat capabilities.

F-15EX Eagle II

The F-15EX is planned to complement the fifth-generation F-22s and F-35s, as well



as the future NGAD system of systems and will initially replace the F-15C/D in the homeland air defense role. The aircraft might later be used to support more advanced fighters operating in highly contested environments, perhaps bringing large numbers of air-to-air weapons to the fight, or perhaps carrying weapons too large to be carried internally by its stealthy counterparts.

The type is a development of the 'Advanced Eagles' built for Saudi Arabia (F-15SA) and Qatar (F-15QA), with an increased payload capacity; two additional outboard underwing weapons stations; fly-by-wire controls; a digital cockpit with large area displays and a touchscreen interface; enhanced electronic warfare capabilities and modernized sensors, including an AN/APG-82 AESA radar and passiveIRST targeting for highly contested engagements.

While the export 'Advanced Eagles' are very much multi-role aircraft, flown as two-seaters, the USAF F-15EX is likely to be flown as a single-seater air defense aircraft, with the second seat enabling future mission expansion. As such, these will not be delivered with CFTs as standard, and the configuration for the first operational

Above: The USAF is once again proposing the retirement of 32 F-22A Block 20s in its FY24 request, despite Congress blocking its move to cut these aircraft from operational service in its FY23 budget proposal

Top: Maj Benjamin 'Torch' Naumann and Maj Mark 'Smack' Smith from the USAF's 40th FLTS prepare to fire an AIM-120D AMRAAM from F-15EX Eagle II (serial 20-0001) during a test mission near Eglin AFB on January 25, 2022. **USAF/Tech Sgt John Raven**

F-15EX units will not include CFTs, though the first two aircraft have carried CFTs during initial Phase 1 testing. There are plans to procure a limited number of CFT sets for the F-15EX fleet.

The USAF originally sought to acquire 144 F-15EXs, but the FY23 budget request accelerated procurement of the type, while also including a proposal to decrease the total planned procurement total to 80 aircraft. The USAF's proposed budget for FY24 included a request for 24 more Eagle IIs, taking the total planned fleet size up to 104 aircraft. The latest budget documents now indicate that the service plans to ask for funds to acquire another 24 F-15EXs in FY25, bringing the total to 128, and providing for at least one additional Eagle II squadron.

This should be enough to re-equip all four current F-15C/D squadrons and the FTU. It is hoped that the F-15EX's similar infrastructure, support and training requirements will permit existing F-15 units to transition to the new type quicker. The first unit to receive the Eagle II was set to be the FTU at Kingsley Field ANGB – but this is now being reconsidered – and the second is expected to be operated by the 123rd FS at Portland ANGB.

The F-15EX airframe is designed to have a life of 20,000 flying hours and the aircraft has Open Mission System (OMS) software to enable and facilitate rapid upgrades and capability enhancements.

F-16C/D Fighting Falcon

Also known as the 'Viper', the F-16 Fighting Falcon is a lightweight, multi-role fighter that fulfills air-to-air; CAS; suppression of enemy air defenses (SEAD); interdiction; all-weather strike; FAC-A; and tactical nuclear delivery operations. It forms about half of the USAF's fighter inventory, with 441 F-16Cs and 108 F-16Ds in the active-duty force; 287 F-16Cs and 45 F-16Ds in the ANG; and 52 F-16Cs and a pair of F-16Ds in AFRC. These have an average age of 31 years. There are also 66 QF-16As operated as unmanned target drones.

The prototype YF-16 first flew on February 2, 1974, and was the winner of the USAF's Lightweight Fighter competition. Deliveries of production F-16As began in August 1978, and the type achieved Initial Operational Capability (IOC) in October 1980, before the first F-16C/D Block 25s were handed over in 1984. It made its combat debut during Desert Storm in 1991 and scored its sole USAF air-to-air kill during Operation Southern Watch on December 27, 1992.

The F-16 is still one of the most maneuverable fighters in service, and ongoing upgrades promise to keep the aircraft viable well into the future. The fleet is divided between Pre-Block (Blocks 25-32) and Post-Block (Blocks 40-52) aircraft, and the USAF is currently retiring its Pre-Block aircraft, while extending and modernizing the Post-Block fleet.

The fleet now has a standardized cockpit with a color MFD; modular mission computer; Helmet Mounted Integrated Targeting (HMIT) and Link-16 datalink. The Operational Flight Program (OFP) continuously updates the F-16's software and has added AGM-158 JASSM-ER and enhanced AIM-120 AMRAAMs to the aircraft's arsenal, which includes the majority of precision-guided munitions in USAF service.

Some 450 Post-Block airframes are undergoing a SLEP that will extend their airframe lives beyond 8,000 flying hours, and these aircraft are also receiving a comprehensive modernization with a new Northrop Grumman AN/APG-83 SABR AESA radar, mission computer, digital radar warning receiver (RWR) and cockpit display upgrades, among

other improvements, including software upgrades to allow the integration of new precision weapons and enhanced avionics. The AESA radar will provide greater capability to detect, track and identify low-observable, low-flying and slow-flying targets, as well as giving datalink and electronic attack capabilities.

In its FY23 budget request, the USAF proposed transitioning away from its oldest F-16 aircraft, and 47 Pre-Block 'Vipers' were retired in FY22. Additional divestment details were deemed sensitive and were omitted from the GAO's report on tactical aircraft.

F-22A Raptor

Perhaps the most surprising 'casualty' of the USAF's planned reduction to four fighter fleets is the F-22A Raptor. Surprising because the F-22 is still the most capable fighter in the world, with a devastating combination of agility, supercruise performance and low observability. Its powerful sensor package (including the class-leading AN/APG-77

AESA radar), integrated avionics and datalinks permits simultaneous multi-target engagements.

But the USAF sees no place for the relatively tiny fleet of F-22s once the NGAD is in operational service, and the aircraft is undoubtedly costly and increasingly difficult to support, with a host of issues regarding obsolescence and diminishing manufacturing sources, and some unique maintenance challenges.

In its FY23 budget request, the Air Force proposed the withdrawal of 33 of its 35 F-22A Block 20s. These are used for training and are not configured as frontline combat aircraft. The USAF says that it would be cost prohibitive to upgrade the Block 20 aircraft, and that retiring them would save approximately \$2.5bn over five years – money that will instead be used for NGAD development. It has been estimated that upgrading the Block 20 aircraft with modern communications systems, electronic warfare capabilities and weapons would take more than a decade to get started,

F-15E Strike Eagles assigned to the 366th FW's 389th FS 'Thunderbolts' and 391st FS 'Bold Tigers' during a training sortie on May 18, 2016. Each is equipped with AIM-120 AMRAAM missiles along with Sniper XR and AN/AAQ-28(V) Litening targeting pods under the fuselage



Four F-16Cs from the 31st FW at Aviano AB, Italy, conduct a four-ship formation flight over Venice on May 15, 2014

► USAF FIGHTER RECAPITALIZATION ROADMAP

and would cost approximately \$3.5bn, while also representing an unwelcome diversion and distraction from Lockheed Martin's F-35 Block 4 upgrade.

Lt Gen Richard Moore told the House Armed Services Committee's Tactical Air and Land Forces panel on March 29 that the Block 20 aircraft are "not competitive" with China's latest Chengdu J-20 stealth fighters. He implied that the Block 20s are not much use for training either, with so little commonality with the later Block 35 that pilots have to "unlearn" procedures used flying the Block 20 before they can become fully proficient on the Block 35.

The F-22 program has pursued an "agile" modernization strategy to rapidly and continuously develop, test and field incremental improvements to the aircraft. The fleet recently received Increment 3.2B software, which added high-resolution synthetic aperture radar (SAR) ground mapping, threat geolocation and electronic attack capabilities, along with the integration of the Small Diameter Bomb I; AIM-120D AMRAAM and AIM-9X Sidewinder.

Significant ongoing efforts include the Reliability, Availability and Maintainability Program (RAMP). This project will improve electrical power generation, replace fiber-optic avionics cables, and add more durable low-observable coatings, as well as embodying structural and wiring fixes. Link-16 datalinks will enable two-way networking with legacy aircraft



using the Multifunctional Information Distribution System/Joint Tactical Radio System (MIDS/JTRS). Initial installations began in FY22, and the fleet-wide upgrade is now planned for FY25. A next-generation air-to-air targeting sensor for the F-22 is planned for imminent flight demonstration and the development of a next-generation targeting sensor may include the provision of new sensors in underwing pods.

USAF budget documents indicate that the service plans to spend more than

\$9bn upgrading its remaining F-22s through 2030, and upgrade priorities include improving tactical information transmission, combat identification, stealthy external fuel tanks, and electronic protection, but especially improvements to the sensor systems that will maintain air dominance and preserve the Raptor's first look, first shot, and first kill capability against peer threats. Navigation system upgrades aim to ensure the F-22's ability to maintain its precision attack, navigation, and timing capabilities in GPS-degraded environments.

Two F-16Cs of the 175th FS 'Lobos' – a component of the South Dakota ANG's 114th FW at Joe Foss Field ANGS – shadow a third 'Viper' as it approaches the refueling boom of a KC-135R Stratotanker during a mission on November 9, 2016

USAF TACTICAL AIRCRAFT INVENTORIES

Current Aircraft

Type	Total in Service*	Mission Capable Rates	Average Age (Years)
A-10C Thunderbolt II	281** (to be replaced by F-35A)	72.54%	40.3
F-15C/D Eagle	232*** (209 F-15Cs, 23 F-15Ds to be replaced by F-15EX/NGAD)	69.48%	37
F-15E Strike Eagle	218 (to be replaced by F-15EX)	66.24%	29.5
F-16C/D Fighting Falcon	935**** (780 F-16Cs, 155 F-16Ds to be partially replaced by F-35A)	71.53%	31
F-22A Raptor	185***** (to be replaced by NGAD)	50.81%	15

Replacement Aircraft

F-35A Lightning II	302 (program of record calls for 1,760 F-35As to be procured in total)	68.8%*****	4.34
F-15EX Eagle II	2 (104 or 128 examples will be procured in total, down from original call for 144 F-15EXs)	N/A	0.5
NGAD	N/A (requirement calls for approximately 200 aircraft)	N/A	N/A
Collaborative Combat Aircraft (CCA)	N/A (requirement calls for approximately 1,000 CCA platforms)	N/A	N/A

Notes

* Numbers as given in the USAF *Air and Space Force Magazine* 2022 Almanac (published July 2022)

** 21 to be scrapped under the FY23 proposed budget, possibly followed by a further 42 in FY24

*** 67 F-15C/Ds to be divested under the proposed FY23 budget, and possibly 57 more in FY24

**** Additional 66 QF-16As used as unmanned target drones

***** USAF aiming to divest its fleet of F-22A Block 20 aircraft in the FY23/FY24 budget requests

***** In February 2023, Lt Gen Mike Schmidt – the new F-35 Program Executive Officer – said that only 53% of the US F-35 fleet was mission-capable, a figure that he described as unacceptable

F-35A Lightning II

The F-35 forms the cornerstone of the USAF's future fighter plans, with a 'program of record' for 1,760 aircraft, of which approximately 302 have been handed over. The type was originally intended to replace the A-10 and F-16; its low-observable characteristics, advanced systems and unparalleled connectivity making it better able to penetrate advanced anti-access/area denial (A2/AD) defenses and then to strike heavily defended targets. Today, it seems that some F-16s will likely remain in service, while some F-15C/Ds and F-15Es now seem more likely to be replaced by F-35As.

The build-up of the force has been slow, thanks in part to continuing program delays caused by significant challenges in testing, production, performance, and sustainment. The completion of initial operational testing has been delayed several times (not least by problems with the Joint Simulation Environment),

Right: The legacy F-15C/D Eagle, likely to leave USAF service before the end of the decade, has been one of the most successful fighters in the air arm's history, responsible for 38 air-to-air kills, most of which were scored during Operation Desert Storm

preventing a full-rate production decision and not allowing multi-year block buys that could save costs.

The Lightning II continues to suffer from a number of deficiencies affecting safety, operational suitability (and effectiveness), as well as reliability, availability, and maintainability. These issues continue to directly impact USAF modernization plans and to delay the retirement schedule for some older tactical aircraft. At current delivery rates, it will take 30 years to deliver the remaining F-35As – leading many to suspect that the eventual number may be lower than was once planned.

The current fleet-standard Block 3F software gives the F-35A full combat capability with a variety of precision-guided weapons allowing the aircraft to perform interdiction, basic CAS and limited SEAD missions. The new Block 4 modernization will add new hardware and software, bringing all F-35s to a common fleet configuration, adding 88 new capabilities, correcting deficiencies found in concurrent development/testing and allowing the integration of new weapons,

A pair of F-35As assigned to the Vermont ANG's 134th FS 'Yellow Scorpions' break formation during a sortie on April 2, 2021



While the future of the F-16C/D in USAF service appears to be secure in the medium-term, the air arm will need to figure out how it will replace its venerable 'Viper' fleet in the long-term



such as the Advanced Anti-Radiation Guided Missile-Extended Range (AARGM-ER), the GBU-53/B StormBreaker (formerly known as the Small Diameter Bomb II), the Stand-in Attack Weapon (SiAW) and the new B61-12 nuclear gravity bomb.

The so-called Technology Refresh 3 (TR-3) package provides updated displays, memory, core processing and computer power to the F-35 and will facilitate the full Block 4 upgrade. Plans for a new-generation adaptive engine have now been abandoned, however.

The 302 F-35As now in the USAF's inventory include 282 with active-duty units and 20 with the ANG. The next active-duty base to receive the F-35A will be Tyndall AFB, Florida, while the ANG

Lightning II operations will stand up at Montgomery ANGB, Alabama, and Truax Field ANGB, Wisconsin. Meanwhile, one AFRC location – Naval Air Station Joint Reserve Base Fort Worth, Texas – will also receive F-35As.

NGAD

The NGAD program is intended to produce an advanced air dominance fighter that will replace the F-22 Raptor in operational USAF service. As far as is known, no final design (nor contractor) has been downselected. The NGAD story will be explained more in the next issue of *Combat Aircraft Journal*, which will also feature a database of all of the USAF's current fighter squadrons and bases. **CAJ**

