

= General Dynamics F @-@ 16 Fighting Falcon =

The General Dynamics F @-@ 16 Fighting Falcon is a single @-@ engine multirole fighter aircraft originally developed by General Dynamics (now Lockheed Martin) for the United States Air Force (USAF) . Designed as an air superiority day fighter , it evolved into a successful all @-@ weather multirole aircraft . Over 4 @,@ 500 aircraft have been built since production was approved in 1976 . Although no longer being purchased by the U.S. Air Force , improved versions are still being built for export customers . In 1993 , General Dynamics sold its aircraft manufacturing business to the Lockheed Corporation , which in turn became part of Lockheed Martin after a 1995 merger with Martin Marietta .

The Fighting Falcon has key features including a frameless bubble canopy for better visibility , side @-@ mounted control stick to ease control while maneuvering , a seat reclined 30 degrees to reduce the effect of g @-@ forces on the pilot , and the first use of a relaxed static stability / fly @-@ by @-@ wire flight control system which helps to make it a nimble aircraft . The F @-@ 16 has an internal M61 Vulcan cannon and 11 locations for mounting weapons and other mission equipment . The F @-@ 16 's official name is " Fighting Falcon " , but " Viper " is commonly used by its pilots and crews , due to a perceived resemblance to a viper snake as well as the Battlestar Galactica Colonial Viper starfighter .

In addition to active duty for U.S. Air Force , Air Force Reserve Command , and Air National Guard units , the aircraft is also used by the USAF aerial demonstration team , the U.S. Air Force Thunderbirds , and as an adversary / aggressor aircraft by the United States Navy . The F @-@ 16 has also been procured to serve in the air forces of 25 other nations . As of 2015 , it is the second most common currently operational military aircraft in the world .

= = Development = =

= = = Lightweight Fighter program = = =

Experiences in the Vietnam War revealed the need for air superiority fighters and better air @-@ to @-@ air training for fighter pilots . Based on his experiences in the Korean War and as a fighter tactics instructor in the early 1960s Colonel John Boyd with mathematician Thomas Christie developed the Energy ? maneuverability theory to model a fighter aircraft 's performance in combat . Boyd 's work called for a small , lightweight aircraft that could maneuver with the minimum possible energy loss , and which also incorporated an increased thrust @-@ to @-@ weight ratio . In the late 1960s , Boyd gathered a group of like @-@ minded innovators that became known as the Fighter Mafia and in 1969 they secured Department of Defense funding for General Dynamics and Northrop to study design concepts based on the theory .

Air Force F @-@ X proponents remained hostile to the concept because they perceived it as a threat to the F @-@ 15 program . However , the Air Force 's leadership understood that its budget would not allow it to purchase enough F @-@ 15 aircraft to satisfy all of its missions . The Advanced Day Fighter concept , renamed F @-@ XX , gained civilian political support under the reform @-@ minded Deputy Secretary of Defense David Packard , who favored the idea of competitive prototyping . As a result , in May 1971 , the Air Force Prototype Study Group was established , with Boyd a key member , and two of its six proposals would be funded , one being the Lightweight Fighter (LWF) . The Request for Proposals issued on 6 January 1972 called for a 20 @,@ 000 @-@ pound (9 @,@ 100 kg) class air @-@ to @-@ air day fighter with a good turn rate , acceleration and range , and optimized for combat at speeds of Mach 0 @.@ 6 ? 1 @.@ 6 and altitudes of 30 @,@ 000 ? 40 @,@ 000 feet (9 @,@ 100 ? 12 @,@ 000 m) . This was the region where USAF studies predicted most future air combat would occur . The anticipated average flyaway cost of a production version was \$ 3 million . This production plan , though , was only notional as the USAF had no firm plans to procure the winner .

== == Finalists selected and flyoff == ==

Five companies responded and in 1972 , the Air Staff selected General Dynamics ' Model 401 and Northrop 's P @-@ 600 for the follow @-@ on prototype development and testing phase . GD and Northrop were awarded contracts worth \$ 37 @. @ 9 million and \$ 39 @. @ 8 million to produce the YF @-@ 16 and YF @-@ 17 , respectively , with first flights of both prototypes planned for early 1974 . To overcome resistance in the Air Force hierarchy , the Fighter Mafia and other LWF proponents successfully advocated the idea of complementary fighters in a high @-@ cost / low @-@ cost force mix . The " high / low mix " would allow the USAF to be able to afford sufficient fighters for its overall fighter force structure requirements . The mix gained broad acceptance by the time of the prototypes ' flyoff , defining the relationship of the LWF and the F @-@ 15 .

The YF @-@ 16 was developed by a team of General Dynamics engineers led by Robert H. Widmer . The first YF @-@ 16 was rolled out on 13 December 1973 , and its 90 @-@ minute maiden flight was made at the Air Force Flight Test Center (AFFTC) at Edwards AFB , California , on 2 February 1974 . Its actual first flight occurred accidentally during a high @-@ speed taxi test on 20 January 1974 . While gathering speed , a roll @-@ control oscillation caused a fin of the port @-@ side wingtip @-@ mounted missile and then the starboard stabilator to scrape the ground , and the aircraft then began to veer off the runway . The test pilot , Phil Oestricher , decided to lift off to avoid a potential crash , safely landing six minutes later . The slight damage was quickly repaired and the official first flight occurred on time . The YF @-@ 16 's first supersonic flight was accomplished on 5 February 1974 , and the second YF @-@ 16 prototype first flew on 9 May 1974 . This was followed by the first flights of Northrop 's YF @-@ 17 prototypes on 9 June and 21 August 1974 , respectively . During the flyoff , the YF @-@ 16s completed 330 sorties for a total of 417 flight hours ; the YF @-@ 17s flew 288 sorties , covering 345 hours .

== == Air Combat Fighter competition == ==

Increased interest would turn the LWF into a serious acquisition program . North Atlantic Treaty Organization (NATO) allies Belgium , Denmark , the Netherlands , and Norway were seeking to replace their F @-@ 104G Starfighter fighter @-@ bombers . In early 1974 , they reached an agreement with the U.S. that if the USAF ordered the LWF winner , they would consider ordering it as well . The USAF also needed to replace its F @-@ 105 Thunderchief and F @-@ 4 Phantom II fighter @-@ bombers . The U.S. Congress sought greater commonality in fighter procurements by the Air Force and Navy , and in August 1974 redirected Navy funds to a new Navy Air Combat Fighter (NACF) program that would be a navalized fighter @-@ bomber variant of the LWF . The four NATO allies had formed the " Multinational Fighter Program Group " (MFPG) and pressed for a U.S. decision by December 1974 ; thus the USAF accelerated testing .

To reflect this serious intent to procure a new fighter @-@ bomber , the LWF program was rolled into a new Air Combat Fighter (ACF) competition in an announcement by U.S. Secretary of Defense James R. Schlesinger in April 1974 . Schlesinger also made it clear that any ACF order would be in addition to the F @-@ 15 , which extinguished opposition to the LWF . ACF also raised the stakes for GD and Northrop because it brought in competitors intent on securing what was touted at the time as " the arms deal of the century " . These were Dassault @-@ Breguet 's proposed Mirage F1M @-@ 53 , the Anglo @-@ French SEPECAT Jaguar , and the proposed Saab 37E " Eurofighter " . Northrop offered the P @-@ 530 Cobra , which was similar to the YF @-@ 17 . The Jaguar and Cobra were dropped by the MFPG early on , leaving two European and the two U.S. candidates . On 11 September 1974 , the U.S. Air Force confirmed plans to order the winning ACF design to equip five tactical fighter wings . Though computer modeling predicted a close contest , the YF @-@ 16 proved significantly quicker going from one maneuver to the next , and was the unanimous choice of those pilots that flew both aircraft .

On 13 January 1975 , Secretary of the Air Force John L. McLucas announced the YF @-@ 16 as the winner of the ACF competition . The chief reasons given by the Secretary were the YF @-@ 16 's lower operating costs , greater range , and maneuver performance that was " significantly better "

than that of the YF @-@ 17 , especially at supersonic speeds . Another advantage of the YF @-@ 16 ? unlike the YF @-@ 17 ? was its use of the Pratt & Whitney F100 turbofan engine , the same powerplant used by the F @-@ 15 ; such commonality would lower the cost of engines for both programs . Secretary McLucas announced that the USAF planned to order at least 650 , possibly up to 1 @, @ 400 production F @-@ 16s . In the Navy Air Combat Fighter (NACF) competition , on 2 May 1975 the Navy selected the YF @-@ 17 as the basis for what would become the McDonnell Douglas F / A @-@ 18 Hornet .

= = = Into production = = =

The U.S. Air Force initially ordered 15 " Full @-@ Scale Development " (FSD) aircraft (11 single @-@ seat and four two @-@ seat models) for its flight test program , but was reduced to eight (six F @-@ 16A single @-@ seaters and two F @-@ 16B two @-@ seaters) . The YF @-@ 16 design was altered for the production F @-@ 16 . The fuselage was lengthened by 10 @. @ 6 in (0 @. @ 269 m) , a larger nose radome was fitted for the AN / APG @-@ 66 radar , wing area was increased from 280 sq ft (26 m²) to 300 sq ft (28 m²) , the tailfin height was decreased , the ventral fins were enlarged , two more stores stations were added , and a single door replaced the original nosewheel double doors . The F @-@ 16 's weight was increased by 25 % over the YF @-@ 16 by these modifications .

The FSD F @-@ 16s were manufactured by General Dynamics in Texas at United States Air Force Plant 4 in late 1975 ; the first F @-@ 16A rolled out on 20 October 1976 and first flew on 8 December . The initial two @-@ seat model achieved its first flight on 8 August 1977 . The initial production @-@ standard F @-@ 16A flew for the first time on 7 August 1978 and its delivery was accepted by the USAF on 6 January 1979 . The F @-@ 16 was given its formal nickname of " Fighting Falcon " on 21 July 1980 , entering USAF operational service with the 34th Tactical Fighter Squadron , 388th Tactical Fighter Wing at Hill AFB in Utah on 1 October 1980 .

On 7 June 1975 , the four European partners , now known as the European Participation Group , signed up for 348 aircraft at the Paris Air Show . This was split among the European Participation Air Forces (EPAF) as 116 for Belgium , 58 for Denmark , 102 for the Netherlands , and 72 for Norway . Two European production lines , one in the Netherlands at Fokker 's Schiphol @-@ Oost facility and the other at SABCA 's Gosselies plant in Belgium , would produce 184 and 164 units respectively . Norway 's Kongsberg Vaapenfabrikk and Denmark 's Terma A / S also manufactured parts and subassemblies for EPAF aircraft . European co @-@ production was officially launched on 1 July 1977 at the Fokker factory . Beginning in November 1977 , Fokker @-@ produced components were sent to Fort Worth for fuselage assembly , then shipped back to Europe for final assembly of EPAF aircraft at the Belgian plant on 15 February 1978 ; deliveries to the Belgian Air Force began in January 1979 . The first Royal Netherlands Air Force aircraft was delivered in June 1979 . In 1980 , the first aircraft were delivered to the Royal Norwegian Air Force by SABCA and to the Royal Danish Air Force by Fokker .

During the late 1980s and 1990s , Turkish Aerospace Industries (TAI) produced 232 Block 30 / 40 / 50 F @-@ 16s on a production line in Ankara under license for the Turkish Air Force . TAI also produced 46 Block 40s for Egypt in the mid @-@ 1990s and 30 Block 50 from 2010 . Korean Aerospace Industries opened a production line for the KF @-@ 16 program , producing 140 Block 52s from the mid @-@ 1990s to mid @-@ 2000s (decade) . If India had selected the F @-@ 16IN for its Medium Multi @-@ Role Combat Aircraft procurement , a sixth F @-@ 16 production line would be built in India . In May 2013 , Lockheed Martin stated there were currently enough orders to keep producing the F @-@ 16 until 2017 .

= = = Improvements and upgrades = = =

One change made during production was augmented pitch control to avoid deep stall conditions at high angles of attack . The stall issue had been raised during development , but had originally been discounted . Model tests of the YF @-@ 16 conducted by the Langley Research Center revealed a

potential problem , but no other laboratory was able to duplicate it . YF @-@ 16 flight tests were not sufficient to expose the issue ; later flight testing on the FSD aircraft demonstrated there was a real concern . In response , the areas of the horizontal stabilizer were increased 25 % on the Block 15 aircraft in 1981 and later retrofitted to earlier aircraft . In addition , a manual override switch to disable the horizontal stabilizer flight limiter was prominently placed on the control console , allowing the pilot to regain control of the horizontal stabilizers (which the flight limiters otherwise lock in place) and recover . Besides reducing the risk of deep stalls , the larger horizontal tail also improved stability and permitted faster takeoff rotation .

In the 1980s , the Multinational Staged Improvement Program (MSIP) was conducted to evolve the F @-@ 16 's capabilities , mitigate risks during technology development , and ensure the aircraft 's worth . The program upgraded the F @-@ 16 in three stages . The MSIP process permitted the quick introduction of new capabilities , at lower costs and with reduced risks compared to traditional independent upgrade programs . In 2012 , the USAF had allocated \$ 2 @. @ 8 billion to upgrade 350 F @-@ 16s while waiting for the F @-@ 35 to enter service . One key upgrade has been an auto @-@ GCAS (Ground collision avoidance system) to reduce instances of controlled flight into terrain . Onboard power and cooling capacities limits the scope of upgrades , which often involves the addition of more power @-@ hungry avionics .

Lockheed won many contracts to upgrade foreign operator 's F @-@ 16s . BAE Systems also offers various F @-@ 16 upgrades , receiving orders from South Korea , Oman , Turkey , and the US Air National Guard ; BAE lost the South Korean contract due to a price breach in November 2014 . In 2012 , the USAF assigned the total upgrade contract to Lockheed Martin . Upgrades include Raytheon ' s Center Display Unit , which replaces several analog flight instruments with a single digital display .

In 2013 , sequestration budget cuts cast doubt on the USAF 's ability to complete the Combat Avionics Programmed Extension Suite (CAPES) , a part of secondary programs such as Taiwan 's F @-@ 16 upgrade . ACC 's General Mike Hostage stated that if he only had money for SLEP (service life extension program) or CAPES , he would fund SLEP to keep the aircraft flying . Lockheed Martin responded to talk of CAPES cancellation with a fixed @-@ price upgrade package for foreign users . CAPES was not included in the Pentagon 's 2015 budget request . The USAF said that the upgrade package will still be offered to Taiwan , and Lockheed said that some common elements with the F @-@ 35 will keep the radar 's unit costs down . In 2014 the USAF issued a RFI to SLEP 300 F @-@ 16 C / Ds .

= = Design = =

= = = Overview = = =

The F @-@ 16 is a single @-@ engine , highly maneuverable , supersonic , multi @-@ role tactical fighter aircraft ; it was designed to be a cost @-@ effective combat " workhorse " that can perform various missions and maintain around @-@ the @-@ clock readiness . It is much smaller and lighter than predecessors , but uses advanced aerodynamics and avionics , including the first use of a relaxed static stability / fly @-@ by @-@ wire (RSS / FBW) flight control system , to achieve enhanced maneuver performance . Highly nimble , the F @-@ 16 was the first fighter aircraft purpose @-@ built to pull 9 @-@ g maneuvers and can reach a maximum speed of over Mach 2 . Innovations include a frameless bubble canopy for better visibility , side @-@ mounted control stick , and reclined seat to reduce g @-@ force effects on the pilot . It is armed with an internal M61 Vulcan cannon in the left wing root and has multiple locations for mounting various missiles , bombs and pods . It has a thrust @-@ to @-@ weight ratio greater than one , providing power to climb and accelerate vertically .

The F @-@ 16 was designed to be relatively inexpensive to build and simpler to maintain than earlier @-@ generation fighters . The airframe is built with about 80 % aviation @-@ grade aluminum alloys , 8 % steel , 3 % composites , and 1 @. @ 5 % titanium . The leading @-@ edge

flaps , stabilators , and ventral fins make use of bonded aluminum honeycomb structures and graphite epoxy lamination coatings . The number of lubrication points , fuel line connections , and replaceable modules is significantly lower than predecessors ; 80 % of access panels can be accessed without stands . The air intake was placed so it was rearward of the nose but forward enough to minimize air flow losses and reduce aerodynamic drag .

Although the LWF program called for a structural life of 4 @, @ 000 flight hours , capable of achieving 7 @. @ 33 g with 80 % internal fuel ; GD 's engineers decided to design the F @- @ 16 's airframe life for 8 @, @ 000 hours and for 9 @- @ g maneuvers on full internal fuel . This proved advantageous when the aircraft 's mission changed from solely air @- @ to @- @ air combat to multi @- @ role operations . Changes in operational use and additional systems have increased weight , necessitating multiple structural strengthening programs .

= = = General configuration = = =

The F @- @ 16 has a cropped @- @ delta wing incorporating wing @- @ fuselage blending and forebody vortex @- @ control strakes ; a fixed @- @ geometry , underslung air intake (with splitter plate) to the single turbofan jet engine ; a conventional tri @- @ plane empennage arrangement with all @- @ moving horizontal " stabilator " tailplanes ; a pair of ventral fins beneath the fuselage aft of the wing 's trailing edge ; and a tricycle landing gear configuration with the aft @- @ retracting , steerable nose gear deploying a short distance behind the inlet lip . There is a boom @- @ style aerial refueling receptacle located behind the single @- @ piece " bubble " canopy of the cockpit . Split @- @ flap speedbrakes are located at the aft end of the wing @- @ body fairing , and a tailhook is mounted underneath the fuselage . A fairing beneath the rudder often houses ECM equipment or a drag chute . Later F @- @ 16 models feature a long dorsal fairing along the fuselage 's " spine " , housing additional equipment or fuel .

Aerodynamic studies in the 1960s demonstrated that the " vortex lift " phenomenon could be harnessed by highly swept wing configurations to reach higher angles of attack , using leading edge vortex flow off a slender lifting surface . As the F @- @ 16 was being optimized for high combat agility , GD 's designers chose a slender cropped @- @ delta wing with a leading edge sweep of 40 ° and a straight trailing edge . To improve maneuverability , a variable @- @ camber wing with a NACA 64A @- @ 204 airfoil was selected ; the camber is adjusted by leading @- @ edge and trailing edge flaperons linked to a digital flight control system (FCS) regulating the flight envelope . The F @- @ 16 has a moderate wing loading , reduced by fuselage lift . The vortex lift effect is increased by leading edge extensions , known as strakes . Strakes act as additional short @- @ span , triangular wings running from the wing root (the juncture with the fuselage) to a point further forward on the fuselage . Blended into the fuselage and along the wing root , the strake generates a high @- @ speed vortex that remains attached to the top of the wing as the angle of attack increases , generating additional lift and allowing greater angles of attack without stalling . Strakes allow a smaller , lower @- @ aspect @- @ ratio wing , which increases roll rates and directional stability while decreasing weight . Deeper wingroots also increase structural strength and internal fuel volume .

= = = Armament = = =

Early F @- @ 16s could be armed with up to six AIM @- @ 9 Sidewinder heat @- @ seeking short @- @ range air @- @ to @- @ air missiles (AAM) by employing rail launchers on each wingtip , as well as radar guided AIM @- @ 7 Sparrow medium @- @ range AAMs in a weapons mix . More recent versions support the AIM @- @ 120 AMRAAM . The aircraft can carry various other AAMs , a wide variety of air @- @ to @- @ ground missiles , rockets or bombs ; electronic countermeasures (ECM) , navigation , targeting or weapons pods ; and fuel tanks on 9 hardpoints ? six under the wings , two on wingtips , and one under the fuselage . Two other locations under the fuselage are available for sensor or radar pods . The F @- @ 16 carries a 20 mm (0 @. @ 787 in) M61A1 Vulcan cannon for close range aerial combat and strafing .

== Negative stability and fly @-@ by @-@ wire ==

The F @-@ 16 was the first production fighter aircraft intentionally designed to be slightly aerodynamically unstable , also known as " relaxed static stability " (RSS) , to improve maneuverability . Most aircraft are designed with positive static stability , which induces aircraft to return to straight and level flight attitude if the pilot releases the controls ; this reduces maneuverability as the inherent stability has to be overcome . Aircraft with negative stability are designed to deviate from controlled flight and thus be more maneuverable . At supersonic speeds the F @-@ 16 gains stability (eventually positive) due to aerodynamic changes .

To counter the tendency to depart from controlled flight ? and avoid the need for constant trim inputs by the pilot , the F @-@ 16 has a quadruplex (four @-@ channel) fly @-@ by @-@ wire (FBW) flight control system (FLCS) . The flight control computer (FLCC) accepts pilot input from the stick and rudder controls , and manipulates the control surfaces in such a way as to produce the desired result without inducing control loss . The FLCC conducts thousands of measurements per second on the aircraft 's flight attitude to automatically counter deviations from the pilot @-@ set flight path ; leading to a common aphorism among pilots : " You don 't fly an F @-@ 16 ; it flies you . "

The FLCC further incorporates limiters governing movement in the three main axes based on attitude , airspeed and angle of attack (AOA) ; these prevent control surfaces from inducing instability such as slips or skids , or a high AOA inducing a stall . The limiters also prevent maneuvers that would exert more than a 9 g load . Flight testing has revealed that " assaulting " multiple limiters at high AOA and low speed can result in an AOA far exceeding the 25 ° limit , colloquially referred to as " departing " ; this causes a deep stall ; a near @-@ freefall at 50 ° to 60 ° AOA , either upright or inverted . While at a very high AOA , the aircraft 's attitude is stable but control surfaces are ineffective ; the pitch limiter locks the stabilators at an extreme pitch @-@ up or pitch @-@ down attempting to recover , this can be overridden so the pilot can " rock " the nose via pitch control to recover .

Unlike the YF @-@ 17 , which had hydromechanical controls serving as a backup to the FBW , General Dynamics took the innovative step of eliminating mechanical linkages between the control stick and rudder pedals , and the flight control surfaces . The F @-@ 16 is entirely reliant on its electrical systems to relay flight commands , instead of traditional mechanically @-@ linked controls , leading to the early moniker of " the electric jet " . The quadruplex design permits " graceful degradation " in flight control response in that the loss of one channel renders the FLCS a " triplex " system . The FLCC began as an analog system on the A / B variants , but has been supplanted by a digital computer system beginning with the F @-@ 16C / D Block 40 . The F @-@ 16 's controls suffered from a sensitivity to static electricity or electrostatic discharge (ESD) . Up to 70 ? 80 % of the C / D models ' electronics were vulnerable to ESD .

== Cockpit and ergonomics ==

A key feature of the F @-@ 16 's cockpit is the exceptional field of view . The single @-@ piece , bird @-@ proof polycarbonate bubble canopy provides 360 ° all @-@ round visibility , with a 40 ° look @-@ down angle over the side of the aircraft , and 15 ° down over the nose (compared to the common 12 ? 13 ° of preceding aircraft) ; the pilot 's seat is elevated for this purpose . Furthermore , the F @-@ 16 's canopy lacks the forward bow frame found on many fighters , which is an obstruction to a pilot 's forward vision . The F @-@ 16 's ACES II zero / zero ejection seat is reclined at an unusual tilt @-@ back angle of 30 ° ; most fighters have a tilted seat at 13 ? 15 ° . The tilted seat can accommodate taller pilots and increases G @-@ force tolerance ; however it has been associated with reports of neck ache , possibly caused by incorrect head @-@ rest usage . Subsequent U.S. fighters have adopted more modest tilt @-@ back angles of 20 ° . Due to the seat angle and the canopy 's thickness , the ejection seat lacks canopy @-@ breakers for emergency egress ; instead the entire canopy is jettisoned prior to the seat 's rocket firing .

The pilot flies primarily by means of an armrest @-@ mounted side @-@ stick controller (instead of a traditional center @-@ mounted stick) and an engine throttle ; conventional rudder pedals are also employed . To enhance the pilot 's degree of control of the aircraft during high @-@ g combat maneuvers , various switches and function controls were moved to centralised " hands on throttle @-@ and @-@ stick (HOTAS) " controls upon both the controllers and the throttle . Hand pressure on the side @-@ stick controller is transmitted by electrical signals via the FBW system to adjust various flight control surfaces to maneuver the F @-@ 16 . Originally the side @-@ stick controller was non @-@ moving , but this proved uncomfortable and difficult for pilots to adjust to , sometimes resulting in a tendency to " over @-@ rotate " during takeoffs , so the control stick was given a small amount of " play " . Since introduction on the F @-@ 16 , HOTAS controls have become a standard feature on modern fighters .

The F @-@ 16 has a head @-@ up display (HUD) , which projects visual flight and combat information in front of the pilot without obstructing the view ; being able to keep his head " out of the cockpit " improves a pilot 's situation awareness . Further flight and systems information are displayed on multi @-@ function displays (MFD) . The left @-@ hand MFD is the primary flight display (PFD) , typically showing radar and moving @-@ maps ; the right @-@ hand MFD is the system display (SD) , presenting information about the engine , landing gear , slat and flap settings , and fuel and weapons status . Initially , the F @-@ 16A / B had monochrome cathode ray tube (CRT) displays ; replaced by color liquid @-@ crystal displays on the Block 50 / 52 . The MLU introduced compatibility with night @-@ vision goggles (NVG) . The Boeing Joint Helmet Mounted Cueing System (JHMCS) is available from Block 40 onwards , for targeting based on where the pilot 's head faces , unrestricted by the HUD , using high @-@ off @-@ boresight missiles like the AIM @-@ 9X .

= = = Fire @-@ control radar = = =

The F @-@ 16A / B was originally equipped with the Westinghouse AN / APG @-@ 66 fire @-@ control radar . Its slotted planar array antenna was designed to be compact to fit into the F @-@ 16 's relatively small nose . In uplook mode , the APG @-@ 66 uses a low pulse @-@ repetition frequency (PRF) for medium- and high @-@ altitude target detection in a low @-@ clutter environment , and in look @-@ down / shoot @-@ down employs a medium PRF for heavy clutter environments . It has four operating frequencies within the X band , and provides four air @-@ to @-@ air and seven air @-@ to @-@ ground operating modes for combat , even at night or in bad weather . The Block 15 's APG @-@ 66 (V) 2 model added a more powerful signal processing , higher output power , improved reliability and increased range in cluttered or jamming environments . The Mid @-@ Life Update (MLU) program introduced a new model , APG @-@ 66 (V) 2A , which features higher speed and more memory .

The AN / APG @-@ 68 , an evolution of the APG @-@ 66 , was introduced with the F @-@ 16C / D Block 25 . The APG @-@ 68 has greater range and resolution , as well as 25 operating modes , including ground @-@ mapping , Doppler beam @-@ sharpening , ground moving target indication , sea target , and track while scan (TWS) for up to 10 targets . The Block 40 / 42 's APG @-@ 68 (V) 1 model added full compatibility with Lockheed Martin Low @-@ Altitude Navigation and Targeting Infra @-@ Red for Night (LANTIRN) pods , and a high @-@ PRF pulse @-@ Doppler track mode to provide continuous @-@ wave radar (CW) target illumination for semi @-@ active radar @-@ homing (SARH) missiles like the AIM @-@ 7 Sparrow . Block 50 / 52 F @-@ 16s initially used the more reliable APG @-@ 68 (V) 5 which has a programmable signal processor employing Very @-@ High @-@ Speed Integrated Circuit (VHSIC) technology . The Advanced Block 50 / 52 (or 50 + / 52 +) are equipped with the APG @-@ 68 (V) 9 radar , with a 30 % greater air @-@ to @-@ air detection range and a synthetic aperture radar (SAR) mode for high @-@ resolution mapping and target detection @-@ recognition . In August 2004 , Northrop Grumman were contracted to upgrade the APG @-@ 68 radars of Block 40 / 42 / 50 / 52 aircraft to the (V) 10 standard , providing all @-@ weather autonomous detection and targeting for Global Positioning System (GPS) -aided precision weapons , SAR mapping and terrain @-@ following

radar (TF) modes , as well as interleaving of all modes .

The F @-@ 16E / F is outfitted with Northrop Grumman 's AN / APG @-@ 80 active electronically scanned array (AESA) radar . Northrop Grumman developed the latest AESA radar upgrade for the F @-@ 16 (selected for USAF and Taiwan Air Force F @-@ 16 upgrades) , named the Scalable Agile Beam Radar (SABR) . In July 2007 , Raytheon announced that it was developing a Next Generation Radar (RANGR) based on its earlier AN / APG @-@ 79 AESA radar as a competitor to Northrop Grumman 's AN / APG @-@ 68 and AN / APG @-@ 80 for the F @-@ 16 .

= = = Propulsion = = =

The initial powerplant selected for the single @-@ engined F @-@ 16 was the Pratt & Whitney F100 @-@ PW @-@ 200 afterburning turbofan , a modified version of the F @-@ 15 's F100 @-@ PW @-@ 100 , rated at 23 @, @ 830 lbf (106 @. @ 0 kN) thrust . During testing , the engine was found to be prone to compressor stalls and " rollbacks " , wherein the engine 's thrust would spontaneously reduce to idle . Until resolved , the Air Force ordered F @-@ 16s to be operated within " dead @-@ stick landing " distance of its bases . It was the standard F @-@ 16 engine through the Block 25 , except for new @-@ build Block 15s with the Operational Capability Upgrade (OCU) . The OCU introduced the 23 @, @ 770 lbf (105 @. @ 7 kN) F100 @-@ PW @-@ 220 , later installed on Block 32 and 42 aircraft : the main advance being a Digital Electronic Engine Control (DEEC) unit , which improved reliability and reduced stall occurrence . Beginning production in 1988 , the " -220 " also supplanted the F @-@ 15 's " -100 " , for commonality . Many of the " -220 " engines on Block 25 and later aircraft were upgraded from 1997 onwards to the " -220E " standard , which enhanced reliability and maintainability ; unscheduled engine removals were reduced by 35 % .

The F100 @-@ PW @-@ 220 / 220E was the result of the USAF 's Alternate Fighter Engine (AFE) program (colloquially known as " the Great Engine War ") , which also saw the entry of General Electric as an F @-@ 16 engine provider . Its F110 @-@ GE @-@ 100 turbofan was limited by the original inlet to thrust of 25 @, @ 735 lbf (114 @. @ 5 kN) , the Modular Common Inlet Duct allowed the F110 to achieve its maximum thrust of 28 @, @ 984 lbf (128 @. @ 9 kN) . (To distinguish between aircraft equipped with these two engines and inlets , from the Block 30 series on , blocks ending in " 0 " (e.g. , Block 30) are powered by GE , and blocks ending in " 2 " (e.g. , Block 32) are fitted with Pratt & Whitney engines .)

The Increased Performance Engine (IPE) program led to the 29 @, @ 588 lbf (131 @. @ 6 kN) F110 @-@ GE @-@ 129 on the Block 50 and 29 @, @ 160 lbf (129 @. @ 4 kN) F100 @-@ PW @-@ 229 on the Block 52 . F @-@ 16s began flying with these IPE engines in the early 1990s . Altogether , of the 1 @, @ 446 F @-@ 16C / Ds ordered by the USAF , 556 were fitted with F100 @-@ series engines and 890 with F110s . The United Arab Emirates ? Block 60 is powered by the General Electric F110 @-@ GE @-@ 132 turbofan with a maximum thrust of 32 @, @ 500 lbf (144 @. @ 6 kN) , the highest thrust engine developed for the F @-@ 16 .

= = Operational history = =

Due to their ubiquity , F @-@ 16s have participated in numerous conflicts , most of them in the Middle East .

= = = United States = = =

The F @-@ 16 is being used by the active duty USAF , Air Force Reserve , and Air National Guard units , the USAF aerial demonstration team , the U.S. Air Force Thunderbirds , and as an adversary @-@ aggressor aircraft by the United States Navy at the Naval Strike and Air Warfare Center .

The U.S. Air Force , including the Air Force Reserve and the Air National Guard , flew the F @-@ 16 in combat during Operation Desert Storm in 1991 and in the Balkans later in the 1990s . F @-@ 16s also patrolled the no @-@ fly zones in Iraq during Operations Northern Watch and Southern

Watch and served during the wars in Afghanistan (Operation Enduring Freedom) and Iraq (Operation Iraqi Freedom) from 2001 and 2003 respectively . In 2011 , Air Force F @-@ 16s took part in the intervention in Libya .

The F @-@ 16 had been scheduled to remain in service with the U.S. Air Force until 2025 . Its replacement was planned to be the F @-@ 35A variant of the Lockheed Martin F @-@ 35 Lightning II , which is expected gradually begin replacing several multi @-@ role aircraft among the program 's member nations . However , due to delays in the F @-@ 35 program , all USAF F @-@ 16s will receive service life extension upgrades .

= = = Israel = = =

The F @-@ 16 's first air @-@ to @-@ air combat success was achieved by the Israeli Air Force (IAF) over the Bekaa Valley on 28 April 1981 , against a Syrian Mi @-@ 8 helicopter , which was downed with cannon fire . On 7 June 1981 , eight Israeli F @-@ 16s , escorted by F @-@ 15s , executed Operation Opera , their first employment in a significant air @-@ to @-@ ground operation . This raid severely damaged Osirak , an Iraqi nuclear reactor under construction near Baghdad , to prevent the regime of Saddam Hussein from using the reactor for the creation of nuclear weapons .

The following year , during the 1982 Lebanon War Israeli F @-@ 16s engaged Syrian aircraft in one of the largest air battles involving jet aircraft , which began on 9 June and continued for two more days . Israeli Air Force F @-@ 16s were credited with 44 air @-@ to @-@ air kills during the conflict .

In January 2000 , Israel completed a purchase of 102 new " F @-@ 16I " planes in a deal totaling \$ 4 @. @ 5 billion . F @-@ 16s were also used in their ground @-@ attack role for strikes against targets in Lebanon . IAF F @-@ 16s participated in the 2006 Lebanon War and during the attacks in the Gaza strip in December 2008 . During and after 2006 Lebanon war , IAF F @-@ 16s shot down Iranian @-@ made UAV drones launched by Hezbollah , using Rafael Python 5 air @-@ to @-@ air missile .

= = = Pakistan = = =

During the Soviet @-@ Afghan war , between May 1986 and January 1989 , Pakistan Air Force F @-@ 16s shot down at least eight intruders from Afghanistan . The first three of these (one Su @-@ 22 , one probable Su @-@ 22 , and one An @-@ 26) were shot down by two pilots from No. 9 Squadron . No. 14 Squadron pilots destroyed the other five intruders (two Su @-@ 22s , two MiG @-@ 23s , and one Su @-@ 25) . Most of these kills were by AIM @-@ 9 Sidewinders , but at least one (a Su @-@ 22) was destroyed by cannon fire . Flight Lieutenant Khalid Mahmoud is credited with three of these kills . One F @-@ 16 was lost in these battles during an encounter between two F @-@ 16s and four Soviet Air Force MiG @-@ 23s on 29 April 1987 ; the pilot ejected safely .

The Pakistan Air Force has used its F @-@ 16s in various foreign and internal military exercises , such as the " Indus Vipers " exercise in 2008 conducted jointly with Turkey . Since May 2009 , the PAF has also been using their F @-@ 16 fleet to attack militant positions and support the Pakistan Army 's operations in North @-@ West Pakistan against the Taliban insurgency . As of November 2011 , PAF F @-@ 16 have launched 5 @, @ 500 sorties in operations . More than 80 % of the dropped munitions were laser @-@ guided bombs .

PAF F @-@ 16s patrolled the Indian border during the Kargil Conflict and during the 2008 tension with India .

= = = Turkey = = =

The Turkish Air Force acquired its first F @-@ 16s in 1987 . Turkish F @-@ 16s participated in the Bosnia Herzegovina and Kosovo since 1993 in support of United Nations resolutions .

On 18 June 1992 , a Greek Mirage F @-@ 1 crashed during dogfight with a Turkish F @-@ 16 . On

8 February 1995 , a Turkish F @-@ 16 crashed into the Aegean after being intercepted by Greek Mirage F1 fighters .

On 8 October 1996 , 7 months after the escalation over Imia a Greek Mirage 2000 reportedly fired an R.550 Magic II missile and shot down a Turkish F @-@ 16D over the Aegean Sea . The Turkish pilot died , while the co @-@ pilot ejected and was rescued by Greek forces . In August 2012 , after the downing of a RF @-@ 4E on the Syrian Coast , Turkish Defence Minister ?smet Y?lmaz confirmed that the Turkish F @-@ 16D was shot down by a Greek Mirage 2000 with an R.550 Magic II in 1996 after violating Greek airspace near Chios island .

On 23 May 2006 , two Greek F @-@ 16s intercepted a Turkish RF @-@ 4 reconnaissance aircraft and two F @-@ 16 escorts off the coast of the Greek island of Karpathos , within the Athens FIR . A mock dogfight ensued between the two sides , resulting in a midair collision between a Turkish F @-@ 16 and a Greek F @-@ 16 . The Turkish pilot ejected safely , but the Greek pilot died due to damage caused by the collision .

Turkey used its F @-@ 16s extensively in its conflict with separatist Kurds in Kurdish parts of Turkey and Iraq . Turkey launched its first cross @-@ border raid on 16 December 2007 , a prelude to the 2008 Turkish incursion into northern Iraq , involving 50 fighters before Operation Sun . This was the first time Turkey had mounted a night @-@ bombing operation on a massive scale , and also the largest operation conducted by Turkish Air Force .

During the Syrian Civil War , Turkish F @-@ 16s were tasked with airspace protection on the Syrian border . After the RF @-@ 4 downing in June 2012 Turkey changed its rules of engagements against Syrian aircraft , resulting in scrambles and downings of Syrian combat aircraft . A Turkish Air Force F @-@ 16 shot down a Russian Air Force Sukhoi Su @-@ 24 on the Turkey @-@ Syria border on 24 November 2015 .

= = = Egypt = = =

On 16 February 2015 , Egyptian F @-@ 16s performed air strikes on jihadi weapons caches and training camps in Libya in revenge of the murder of 21 workers by masked militants affiliated with the Islamic State (ISIS) . The air strikes killed 64 ISIS fighters , including three leaders in Derna and Sirte on the coast .

= = = Others = = =

The Royal Netherlands Air Force , Belgian Air Force , Royal Danish Air Force , Royal Norwegian Air Force , Pakistan Air Force , and Venezuela Air Force have flown the F @-@ 16 on combat missions . A Serbian MiG @-@ 29 was shot down by a Dutch F @-@ 16AM during the Kosovo War in 1999 . Belgian and Danish F @-@ 16s also participated in joint operations over Kosovo during the war . Dutch , Belgian , Danish , and Norwegian F @-@ 16s were deployed during the 2011 intervention in Libya and in Afghanistan . In Libya , Norwegian F @-@ 16s dropped almost 550 bombs and flew 596 missions , some 17 % of the total strike missions including the bombing of Muammar Gaddafi 's headquarters .

= = Variants = =

F @-@ 16 models are denoted by increasing block numbers to denote upgrades . The blocks cover both single- and two @-@ seat versions . A variety of software , hardware , systems , weapons compatibility , and structural enhancements have been instituted over the years to gradually upgrade production models and retrofit delivered aircraft .

While many F @-@ 16s were produced according to these block designs , there have been many other variants with significant changes , usually due to modification programs . Other changes have resulted in role @-@ specialization , such as the close air support and reconnaissance variants . Several models were also developed to test new technology . The F @-@ 16 design also inspired the design of other aircraft , which are considered derivatives . Older F @-@ 16s are being

converted into QF @-@ 16 drone targets .

F @-@ 16A / B

The F @-@ 16A (single seat) and F @-@ 16B (two seat) were initial production variants . These variants include the Block 1 , 5 , 10 and 20 versions . Block 15 was the first major change to the F @-@ 16 with larger horizontal stabilizers . It is the most numerous F @-@ 16 variant with 475 produced .

F @-@ 16C / D

The F @-@ 16C (single seat) and F @-@ 16D (two seat) variants entered production in 1984 . The first C / D version was the Block 25 with improved cockpit avionics and radar which added all @-@ weather capability with beyond @-@ visual @-@ range (BVR) AIM @-@ 7 and AIM @-@ 120 air @-@ air missiles . Block 30 / 32 , 40 / 42 , and 50 / 52 were later C / D versions . The F @-@ 16C / D had a unit cost of US \$ 18 @. @ 8 million (1998) . Operational cost per flight hour has been estimated at \$ 7 @, @ 000 to \$ 22 @, @ 470 or \$ 24 @, @ 000 , depending on calculation method .

F @-@ 16E / F

The F @-@ 16E (single seat) and F @-@ 16F (two seat) are newer F @-@ 16 variants . The Block 60 version is based on the F @-@ 16C / D Block 50 / 52 and has been developed especially for the United Arab Emirates (UAE) . It features improved AN / APG @-@ 80 active electronically scanned array (AESA) radar , avionics , conformal fuel tanks (CFTs) , and the more powerful General Electric F110 @-@ GE @-@ 132 engine .

F @-@ 16IN

For the Indian MRCA competition for the Indian Air Force , Lockheed Martin offered the F @-@ 16IN Super Viper . The F @-@ 16IN is based on the F @-@ 16E / F Block 60 and features conformal fuel tanks ; AN / APG @-@ 80 AESA radar , GE F110 @-@ GE @-@ 132A engine with FADEC controls ; electronic warfare suite and infra @-@ red searching (IRST) ; updated glass cockpit ; and a helmet @-@ mounted cueing system . As of 2011 , the F @-@ 16IN is no longer in the competition .

F @-@ 16IQ

In September 2010 , the Defense Security Cooperation Agency informed the United States Congress of a possible Foreign Military Sale of 18 F @-@ 16IQ aircraft along with the associated equipment and services to the newly reformed Iraqi Air Force . Total value of sale is estimated at US \$ 4 @. @ 2 billion .

F @-@ 16N

The F @-@ 16N is an adversary aircraft operated by the U.S. Navy . It is based on the standard F @-@ 16C / D Block 30 and is powered by the General Electric F110 @-@ GE @-@ 100 engine . However , the F @-@ 16N has a strengthened wing and is capable of carrying an Air Combat Maneuvering Instrumentation (ACMI) pod on the starboard wingtip . Although the single @-@ seat F @-@ 16Ns and twin @-@ seat (T) F @-@ 16Ns are based on the early @-@ production small @-@ inlet Block 30 F @-@ 16C / D airframe , they retain the APG @-@ 66 radar of the F @-@ 16A / B. In addition , the aircraft 's 20 mm cannon has been removed , as has the ASPJ , and they carry no missiles . Their EW fit consists of an ALR @-@ 69 radar warning receiver (RWR) and an ALE @-@ 40 chaff / flare dispenser . The F @-@ 16Ns and (T) F @-@ 16Ns have the standard Air Force tailhook and undercarriage and are not aircraft carrier capable . Production totaled 26 airframes , of which 22 are single @-@ seat F @-@ 16Ns and 4 are twin @-@ seat TF @-@ 16Ns . The initial batch of aircraft were in service between 1988 and 1998 . At that time , hairline cracks were discovered in several bulkheads and the Navy did not have the resources to replace them , so the aircraft were eventually retired , with one aircraft sent to the collection of the National Naval Aviation Museum at NAS Pensacola , Florida , and the remainder placed in storage at Davis @-@ Monthan AFB . These aircraft were later replaced by embargoed ex @-@ Pakistani F @-@ 16C / Ds in 2003 . The original inventory of F @-@ 16Ns were previously operated by adversary squadrons at NAS Oceana , Virginia ; NAS Key West , Florida and the former NAS Miramar , California . The current aircraft are operated by the Naval Strike and Air Warfare Center at NAS Fallon , Nevada .

F @-@ 16V

At the 2012 Singapore Air Show Lockheed Martin unveiled plans for the new F @-@ 16V variant with the V suffix for its Viper nickname . It is to feature an active electronically scanned array (AESA) radar , a new mission computer and electronic warfare suite , and various cockpit improvements ; this package is an option on current production F @-@ 16s and can be retrofitted to most in service F @-@ 16s .

QF @-@ 16

In September 2013 , an unmanned F @-@ 16 was tested by Boeing and US Air Force , with two US Air Force pilots controlling the airplane from the ground as it flew from Tyndall AFB over the Gulf of Mexico .

= = Operators = =

4 @,@ 500 F @-@ 16s had been delivered by July 2010 .

= = = Former operators = = =

Italy ? Italian Air Force leased up to 30 F @-@ 16As and 4 F @-@ 16Bs from the USAF from 2001 until 2012 .

= = Notable accidents and incidents = =

The F @-@ 16 has been involved in over 650 hull @-@ loss accidents as of June 2016 .

On 8 May 1975 , while practicing a 9 @-@ g aerial display maneuver with the second YF @-@ 16 (tail number 72 @-@ 1568) at Fort Worth , Texas , prior to being sent to the Paris Air Show , one of the main landing gear jammed . The test pilot , Neil Anderson , had to perform an emergency gear @-@ up landing and chose to do so in the grass , hoping to minimize damage and to avoid injuring any observers . The aircraft was only slightly damaged , but due to the mishap the first prototype was sent to the Paris Air Show in its place .

On 15 November 1982 , while on a training flight outside Kunsan Air Base in South Korea , USAF Captain Ted Harduvel died when he crashed inverted into a mountain ridge . In 1985 , Harduvel 's widow filed a lawsuit against General Dynamics claiming an electrical malfunction , not pilot error , as the cause ; a jury awarded the plaintiff \$ 3 @. @ 4 million in damages . However , in 1989 , the U.S. Court of Appeals ruled the contractor had immunity to lawsuits , overturning the previous judgment . The court did remand the plaintiff 's claim of electrical malfunction as the cause , noting that General Dynamics and the USAF knew about chafing of instrumentation wiring , which they had not initially disclosed . The accident and subsequent trial was the subject of the 1992 film Afterburn .

On 23 March 1994 , during a joint Army @-@ Air Force exercise at Pope AFB , North Carolina , F @-@ 16D (AF Serial No. 88 @-@ 0171) of the 23d Fighter Wing / 74th Fighter Squadron was simulating an engine @-@ out approach when it collided with a USAF C @-@ 130E . Both F @-@ 16 crew members ejected , but their aircraft , on full afterburner , continued on an arc towards Green Ramp and struck a USAF C @-@ 141 that was being boarded by US Army paratroopers . This accident resulted in 24 fatalities and at least 80 others injured . It has since been known as the " Green Ramp disaster " .

On 15 September 2003 , a USAF Thunderbird F @-@ 16C crashed during an air show at Mountain Home AFB , Idaho . Captain Christopher Stricklin attempted a " Split S " maneuver based on an incorrect mean @-@ sea @-@ level altitude of the airfield . Climbing to only 1 @,@ 670 ft (510 m) above ground level instead of 2 @,@ 500 ft (760 m) , Stricklin had insufficient altitude to complete the maneuver , but was able to guide the aircraft away from spectators and ejected less than one second before impact . Stricklin survived with only minor injuries ; the aircraft was destroyed . USAF procedure for demonstration " Split @-@ S " maneuvers was changed , requiring both pilots and controllers to use above @-@ ground @-@ level (AGL) altitudes .

On 30 November 2014 , a US air force F @-@ 16 crashed in Jordan due to a technical problem ; the pilot died .

On 26 January 2015 , a Greek F @-@ 16D crashed while performing a NATO training exercise in Albacete , Spain . Both crew members and nine French soldiers on the ground died when it crashed in the flight @-@ line , destroying or damaging two Italian AMXs , two French Alpha jets , and one French Mirage 2000s .

On 11 May 2015 , a Moroccan F @-@ 16 crashed in Yemen while on a mission against Houthis , killing the pilot .

On 7 July 2015 , an F @-@ 16CJ collided with a Cessna 150M over Moncks Corner , South Carolina , U.S. The pilot of the F @-@ 16 ejected safely , but both people in the Cessna were killed .

On 27 October 2015 , a Royal Danish Air Force pilot had to eject after his F @-@ 16 's landing gear was damaged during takeoff . The aircraft crashed into the North Sea near Rømø , and the pilot was quickly extracted from the water with minor injuries .

On 21 January 2016 , a USAF F @-@ 16 of the 56th Fighter Wing crashed in Arizona killing the Taiwanese pilot training in the US .

= = Aircraft on display = =

= = = Belgium = = =

F @-@ 16A

FA @-@ 01 ? On display at the Royal Museum of the Armed Forces and Military History in Brussels , Belgium

FA @-@ 55 ? On display at the Chateau de Savigny les Beaune in Beaune , France . A former Belgian Air Force example .

= = = Germany = = =

F @-@ 16A

78 @-@ 0057 ? Pylon display at Spangdahlem AB , Germany

= = = Japan = = =

F @-@ 16A

78 @-@ 0053 ? Pylon display at Misawa AB , Japan

= = = The Netherlands = = =

F @-@ 16A

78 @-@ 0215 ? RNLAf designation j @-@ 215 . Former RNLAf f @-@ 16A on display at the National Military museum at former airbase Soesterberg in the Netherlands .

= = = Turkey = = =

F @-@ 16C

89 @-@ 0032 - F @-@ 16C Block 40A at Istanbul Aviation Museum .

= = = United States = = =

YF @-@ 16

72 @-@ 1567 ? Virginia Air and Space Center , Hampton , Virginia

YF @-@ 16B

75 @-@ 0752 ? Frontiers of Flight Museum , Dallas , Texas

F @-@ 16A

75 @-@ 0746 ? Pylon @-@ mounted gate guard , McEntire Air National Guard Base , South Carolina

75 @-@ 0748 ? Cadet Area Quadrangle , U.S. Air Force Academy , Colorado

75 @-@ 0750 ? On display at the Experimental Aircraft Display Hangar , National Museum of the United States Air Force , Wright @-@ Patterson AFB , Ohio

78 @-@ 0001 ? Langley AFB Memorial Park , Langley AFB , Virginia . First production model F @-@ 16A delivered to USAF .

78 @-@ 0005 ? 162d Fighter Wing Park , Tucson Air National Guard Base , Arizona

78 @-@ 0025 ? Gate guard , Burlington Air National Guard Base , Vermont

78 @-@ 0042 ? Gate guard , Montgomery Air National Guard Base / Dannelly Field , Alabama

78 @-@ 0052 ? Eielson AFB Heritage Park , Eielson AFB , Alaska

78 @-@ 0059 ? Selfridge Military Air Museum and Air Park , Selfridge ANGB , Michigan

78 @-@ 0065 ? 388th Fighter Wing and 419th Fighter Wing combined Headquarters , Hill AFB , Utah

78 @-@ 0066 ? On display in Kansas Air National Guard Memorial Park area , McConnell AFB , Kansas

79 @-@ 0290 ? On display at Great Falls Air National Guard Base , Montana .

79 @-@ 0296 ? Gate guard , Jacksonville Air National Guard Base , Florida

79 @-@ 0307 ? On display at Cannon AFB Air Park , Cannon AFB , New Mexico

79 @-@ 0309 ? Base park area adjacent to USAFCENT Headquarters , Shaw AFB , South Carolina . Painted as 20th Fighter Wing F @-@ 16C 93 @-@ 0534 . Memorial to Maj Brinson Phillips , 20 FW , killed 19 Mar 2000 while flying F @-@ 16C 93 @-@ 0534

79 @-@ 0312 ? On pylon display , 8th Street Park , Douglas , Arizona

79 @-@ 0326 ? Gate guard , Homestead Air Reserve Base , Florida

79 @-@ 0327 ? Pedestal mounted memorial , Luke AFB , Arizona . Painted in 302d Fighter Squadron markings , to include World War II Tuskegee Airmen " Red Tails " empennage

79 @-@ 0334 ? USS Alabama Battleship Memorial Park , Mobile , Alabama

79 @-@ 0337 ? Ground @-@ mobile static display aircraft , normally located at Hancock Field Air National Guard Base , New York . Utilized by New York Air National Guard 's 174th Attack Wing (former 174th Fighter Wing) at fairs and expositions for Air National Guard recruiting .

79 @-@ 0352 ? On static display with 23d Wing at Moody AFB , Georgia

79 @-@ 0366 ? Memorial park static display , Mountain Home AFB , Idaho

79 @-@ 0373 ? On display at Buckley AFB , Colorado . Aircraft painted in markings of Colorado Air National Guard 's 140th Fighter Wing based at Buckley AFB .

79 @-@ 0388 ? Hill Aerospace Museum , Hill AFB , Utah

79 @-@ 0402 ? Hill Aerospace Museum , Hill AFB , Utah

79 @-@ 0403 ? Intrepid Sea , Air & Space Museum , New York City , New York

80 @-@ 0481 ? Display on Parade Ground , Sheppard AFB , Texas .

80 @-@ 0527 ? Former Arizona Air National Guard 162d Fighter Wing aircraft destined for transfer to / display at the Pima Air and Space Museum , Tucson , Arizona .

80 @-@ 0528 ? City park in Pinellas Park , Florida . Painted in markings of 56th Tactical Training Wing @-@ cum @-@ 56th Fighter Wing , previously assigned to nearby MacDill AFB in the 1980s and early 1990s .

80 @-@ 0573 ? Air Force Armament Museum , Eglin AFB , Florida .

80 @-@ 0612 ? Memorial park static display at Puerto Rico National Guard 's Camp Santiago , Salinas , Puerto Rico . Former Puerto Rico Air National Guard F @-@ 16ADF , painted in markings of PRANG 's former 198th Fighter Squadron , but marked as 81612 .

81 @-@ 0663 ? On display in United States Air Force Thunderbirds markings at the National Museum of the United States Air Force , Wright @-@ Patterson AFB , Dayton , Ohio .

81 @-@ 0676 ? Museum of Aviation , Robins AFB , Warner Robins , Georgia

81 @-@ 0721 ? MacDill AFB Memorial Park , MacDill AFB , Florida . Former Florida Air National Guard 125th Fighter Wing F @-@ 16ADF repainted in markings of a 56th Fighter Wing F @-@ 16A previously assigned to MacDill in the 1980s .

82 @-@ 0930 ? On display at Ellington Field Joint Reserve Base , Houston , Texas
F @-@ 16B

78 @-@ 0088 ? On display at the Naval Air Station Wildwood Aviation Museum , Cape May County Airport , New Jersey

78 @-@ 0101 ? On display at United States Space Camp / Aviation Challenge , Huntsville , Alabama

78 @-@ 0107 ? On display adjacent to Parade Ground , Lackland AFB , Texas

79 @-@ 0430 ? Stafford Air & Space Museum , Weatherford , Oklahoma

81 @-@ 0816 ? Pylon display gate guard , Atlantic City Air National Guard Base , New Jersey

81 @-@ 0817 ? Russell Military Museum , Russell , Illinois .

F @-@ 16C

83 @-@ 1126 ? Pylon display at Hill Memorial Park , Hill AFB , Utah

84 @-@ 1264 ? Air park display , Fort Wayne Air National Guard Station , Indiana . Aircraft retains Air Force Heritage paint scheme honoring 358th Fighter Group during World War II .

84 @-@ 1393 ? Pylon display at Texas National Guard 's Camp Mabry , Austin , Texas . Former Texas Air National Guard 147th Fighter Wing / 111th Fighter Squadron aircraft .

85 @-@ 1469 ? Static display at Joe Foss Field Air National Guard Station , South Dakota

87 @-@ 0323 ? Preserved as Thunderbird 1 in front of the USAF Air Demonstration Squadron / United States Air Force Thunderbirds hangar , Nellis AFB , Nevada . Assigned to Thunderbirds in the 1992 ? 2008 timeframe . Had number 1 attached on 11 Jun 1999 ; number 2 in the 2004 season ; number 3 on 3 Mar 2003 and number 4 on 1 Apr 2005 .

F @-@ 16N

163269 ? San Diego Aerospace Museum , San Diego , California

163271 ? Pacific Coast Air Museum , Santa Rosa , California

163277 ? Palm Springs Air Museum , Palm Springs , California

163569 ? NAS Fort Worth JRB , Fort Worth , Texas . It is painted in USAFR colors of the 457th FS , 301st FW .

163572 ? National Naval Aviation Museum , Naval Air Station Pensacola , Pensacola , Florida

163576 ? Air Power Park , Naval Air Station Fallon , Nevada

= = Specifications (F @-@ 16C Block 50) = =

Data from USAF sheet , International Directory of Military Aircraft

General characteristics

Crew : 1

Length : 49 ft 5 in (15 @.@ 06 m)

Wingspan : 32 ft 8 in (9 @.@ 96 m)

Height : 16 ft (4 @.@ 88 m)

Wing area : 300 ft ² (27 @.@ 87 m ²)

Airfoil : NACA 64A204 root and tip

Empty weight : 18 @,@ 900 lb (8 @,@ 570 kg)

Loaded weight : 26 @,@ 500 lb (12 @,@ 000 kg)

Max. takeoff weight : 42 @,@ 300 lb (19 @,@ 200 kg)

Powerplant : 1 x General Electric F110 @-@ GE @-@ 129 (for F @-@ 16C / D Block 30 @-@ 40 @-@ 50) afterburning turbofan

Dry thrust : 17 @,@ 155 lbf (76 @.@ 3 kN)

Thrust with afterburner : 28 @,@ 600 lbf (127 kN)

Internal fuel : 7 @,@ 000 pounds (3 @,@ 200 kg)

Performance

Maximum speed : At sea level : Mach 1 @.@ 2 (915 mph , 1 @,@ 470 km / h)

At altitude : Mach 2 (1 @, @ 320 mph , 2 @, @ 120 km / h) clean configuration
 Combat radius : 340 mi (295 nmi , 550 km) on a hi @-@ lo @-@ hi mission with four 1 @, @ 000 lb (450 kg) bombs
 Ferry range : 2 @, @ 280 nmi (2 @, @ 620 mi , 4 @, @ 220 km) with drop tanks
 Service ceiling : 50 @, @ 000 + ft (15 @, @ 240 + m)
 Rate of climb : 50 @, @ 000 ft / min (254 m / s)
 Wing loading : 88 @. @ 3 lb / ft ² (431 kg / m ²)
 Thrust / weight : 1 @. @ 095 (1 @. @ 24 with loaded weight & 50 % internal fuel)
 Maximum g @-@ load : + 9 @. @ 0 g
 Armament
 Guns : 1 × 20 mm (0 @. @ 787 in) M61A1 Vulcan 6 @-@ barrel Gatling cannon , 511 rounds
 Hardpoints : 2 × wing @-@ tip Air @-@ to @-@ air missile launch rails , 6 × under @-@ wing , and 3 × under @-@ fuselage pylon (2 of 3 for sensors) stations with a capacity of Up to 17 @, @ 000 lb (7 @, @ 700 kg) of stores
 Rockets : 4 × LAU @-@ 61 / LAU @-@ 68 rocket pods (each with 19 / 7 × Hydra 70 mm / APKWS rockets , respectively)
 4 × LAU @-@ 5003 rocket pods (each with 19 × CRV7 70 mm rockets)
 4 × LAU @-@ 10 rocket pods (each with 4 × Zuni 127 mm rockets)
 Missiles : Air @-@ to @-@ air missiles :
 2 × AIM @-@ 7 Sparrow
 6 × AIM @-@ 9 Sidewinder
 6 × AIM @-@ 120 AMRAAM
 6 × IRIS @-@ T
 6 × Python @-@ 4
 Air @-@ to @-@ ground missiles :
 6 × AGM @-@ 65 Maverick
 4 × AGM @-@ 88 HARM
 AGM @-@ 158 Joint Air @-@ to @-@ Surface Standoff Missile (JASSM)
 Anti @-@ ship missiles :
 2 × AGM @-@ 84 Harpoon
 4 × AGM @-@ 119 Penguin
 Bombs : 8 × CBU @-@ 87 Combined Effects Munition
 8 × CBU @-@ 89 Gator mine
 8 × CBU @-@ 97 Sensor Fuzed Weapon
 4 × Mark 84 general @-@ purpose bombs
 8 × Mark 83 GP bombs
 12 × Mark 82 GP bombs
 8 × GBU @-@ 39 Small Diameter Bomb (SDB)
 4 × GBU @-@ 10 Paveway II
 6 × GBU @-@ 12 Paveway II
 4 × GBU @-@ 24 Paveway III
 4 × GBU @-@ 27 Paveway III
 4 × Joint Direct Attack Munition (JDAM) series
 4 × AGM @-@ 154 Joint Standoff Weapon (JSOW)
 Wind Corrected Munitions Dispenser (WCMD)
 B61 nuclear bomb
 B83 nuclear bomb
 Others :
 SUU @-@ 42A / A Flares / Infrared decoys dispenser pod and chaff pod or
 AN / ALQ @-@ 131 & AN / ALQ @-@ 184 ECM pods or
 LANTIRN , Lockheed Martin Sniper XR & LITENING targeting pods or
 Up to 3 × 300 / 330 / 370 / 600 US gallon Sargent Fletcher drop tanks for ferry flight / extended range / loitering time or

UTC Aerospace DB @-@ 110 long range EO / IR sensor pod on centerline
Avionics
AN / APG @-@ 68 radar
MIL @-@ STD @-@ 1553 bus

= = Notable appearances in media = =