= Northrop F @-@ 20 Tigershark =

The Northrop F @-@ 20 Tigershark ( initially F @-@ 5G ) was a privately financed light fighter , designed and built by Northrop . Its development began in 1975 as a further evolution of Northrop 's F @-@ 5E Tiger II , featuring a new engine that greatly improved overall performance , and a modern avionics suite including a powerful and flexible radar . Compared with the F @-@ 5E , the F @-@ 20 was much faster , gained beyond @-@ visual @-@ range air @-@ to @-@ air capability , and had a full suite of air @-@ to @-@ ground modes capable of firing most U.S. weapons . With these improved capabilities , the F @-@ 20 became competitive with contemporary fighter designs such as the General Dynamics F @-@ 16 Fighting Falcon , but was much less expensive to purchase and operate .

Much of the F @-@ 20 's development was carried out under a US Department of Defense ( DoD ) project called " FX " . FX sought to develop fighters that would be capable in combat with the latest Soviet aircraft , but excluding sensitive front @-@ line technologies used by the United States Air Force 's own aircraft . FX was a product of the Carter administration 's military export policies , which aimed to provide foreign nations with high quality equipment without the risk of US front @-@ line technology falling into Soviet hands . Northrop had high hopes for the F @-@ 20 in the international market , but policy changes following Ronald Reagan 's election meant the F @-@ 20 had to compete for sales against aircraft like the F @-@ 16 , the USAF 's latest fighter design . The development program was abandoned in 1986 after three prototypes had been built and a fourth partially completed .

= = Development = =

= = = F @-@ 5E = = =

When the Kennedy administration entered office in 1961 , the U.S. Department of Defense was instructed to find an inexpensive fighter aircraft that the United States could offer to its allies through the Mutual Defense Assistance Act . A number of designs were studied , including stripped @-@ down versions of the Lockheed F @-@ 104 Starfighter and Vought F @-@ 8 Crusader , and the newly designed Northrop N @-@ 156F . On 23 April 1962 , the United States Air Force ( USAF ) informed the United States Secretary of Defense that the N @-@ 156F had been selected , under the designation F @-@ 5 and given the name " Freedom Fighter . " 847 F @-@ 5 's of various early marks would be produced .

As the Mikoyan @-@ Gurevich MiG @-@ 21 became more common , the U.S. Air Force initiated the International Fighter Aircraft ( IFA ) program to provide an equivalent to allies . The USAF desired a light weight fighter with competitive performance to the MiG , inexpensive when purchased in large numbers , and with reasonable operating costs for prospective customer nations . Although numerous companies entered designs , Northrop 's existing F @-@ 5 put them in a leading position . They submitted an upgrade , the F @-@ 5E Tiger II , with the AN / APQ @-@ 153 radar and other changes to allow the AIM @-@ 9 Sidewinder missile to be fired from wing @-@ tip rails . On 20 November 1970 , Northrop 's entry was announced as the IFA winner . Northrop produced a total of 1 @,@ 399 F @-@ 5E / F Tiger IIs by the time manufacturing ended in 1986 .

= = = F @-@ 5G and export limitations = = =

In the late 1970s , the Republic of China ( Taiwan ) Air Force started looking for a fighter aircraft to match improvements made in mainland People 's Republic of China ( PRC ) ' s air force . In particular , they wanted a platform capable of firing the AIM @-@ 7 Sparrow long @-@ range missile . At the time , the US was in the process of opening up ties with the People 's Republic of China after President Nixon 's famous visit in 1972 . China considered US support of Taiwan against their interests , and the US State Department wanted to tread carefully . They blocked export of all

of the AIM @-@ 7 capable aircraft , even otherwise outdated early models of the McDonnell Douglas F @-@ 4 Phantom II . The State Department suggested the Israeli IAI Kfir instead ; however , it was rejected . Taiwan was already producing the F @-@ 5E under license , so the Department of Defense asked Northrop to study adding an AIM @-@ 7 capable radar to the Tiger II as an alternative . This effort became the first of several F @-@ 5G studies .

In the spring of 1977 , Jimmy Carter 's administration had announced a new military export policy that limited sales of front line designs to countries within NATO , along with Australia and Japan . Carter stated at the time that the U.S. could not be " both the world 's champion of peace and the world 's leading supplier of the weapons of war . " Previously , there was no coherent export policy , fueling concerns that the US 's latest technologies might quickly end up in Soviet hands .

Numerous exceptions were made ; Israel and Egypt could buy advanced designs under the Camp David Agreements , Israel was even allowed to buy McDonnell Douglas F @-@ 15 Eagles , a key component in U.S. air @-@ defense technology . Iran was already receiving the Grumman F @-@ 14 Tomcat , and this demonstrated the problem with advanced exports in February 1979 when reports emerged that Iran had sold an AIM @-@ 54 Phoenix missile to the Soviets . South Korea 's F @-@ 16 order was initially blocked under this policy , but later allowed in the context of strengthening relations . Despite exceptions , the export policy was implemented , covering many potential and current customers . As the F @-@ 5G was a relatively modest upgrade to the F @-@ 5E , the F @-@ 5G appeared to be in a strong position for sales given the limitations placed on rival designs , however Carter personally blocked the sales of the F @-@ 5G to Taiwan .

= = = FX = = =

In 1979 , problems with the export policy were becoming apparent . The Soviets continued to sell newer aircraft designs to their clients , placing allies of the U.S. at a disadvantage . Denied by the U.S. , countries were turning to other vendors for modern fighters , notably France 's Dassault Mirage 2000 . Barry N. Blechman , Assistant Director of the Arms Control and Disarmament Agency , testified that the US reductions in foreign arms transfers had actually encouraged other nations and increased worldwide arms sales . At the same time , there was considerable pressure to provide a suitable aircraft for Taiwan .

The State Department argued that the U.S. needed a modern counterpart for the role the F @-@ 5E had occupied in the 1960s and 1970s . In light of Carter 's concerns , they suggested that a new aircraft be designed for the role , based on technology that would not pose a threat to the U.S. After a lengthy study , in January 1980 , President Carter allowed the development of a new export fighter : " FX . " The FX would have to outperform the F @-@ 5E ; however , it could not use any advanced avionics systems that were also used in US aircraft . Unlike the Mutual Defense Assistance Act programs that led to the F @-@ 5E , FX would be entirely privately financed . Moreover , the companies could not market the aircraft directly ; all sales would be handled by the Secretary of Defense .

Both Northrop and General Dynamics ( GD ) responded to the FX requirement . GD 's F @-@ 16 / 79 was a variant of the F @-@ 16A , replacing the Pratt & Whitney F100 engine with the J79 and equipping it with downgraded avionics ; Northrop responded with the F @-@ 5G .

= = = FX stumbles and F @-@ 20 emerges = = =

When Ronald Reagan 's administration took power in 1981 , the export restrictions put in place by the Carter administration were slowly relaxed . At first , the FX program continued as normal , but a number of events eroded the value of the program and limit the F @-@ 5G 's potential sales . The signing of the 1982 US @-@ PRC Joint Communiqué was a major agreement on arms sales , which continued blocking sales of the F @-@ 5G to Taiwan . By this point the Taiwanese had started their own light @-@ fighter project , the AIDC F @-@ CK @-@ 1 Ching @-@ kuo . In signing the Communiqué , the U.S. was signaling that Taiwan would not receive modern aircraft , therefore the Ching @-@ kuo became Taiwan 's primary focus . As a result , the F @-@ 5G 's sales potential

remained unestablished .

In the summer of 1982 , Deputy Secretary of Defense Frank Carlucci sent a memorandum to the Air Force and Navy , encouraging them to seek out potential foreign customers to procure FX aircraft . However , four months later Carlucci sent a classified memo to the same services to abandon the FX , and green @-@ lighting the exporting of front @-@ line fighters overseas . In December , after prompting from the White House , Carlucci reversed his position again , and directed the Air Force to fund a small number of F @-@ 20s in the fiscal year 1984 budget .

The future of the FX program seemed doubtful . Following an agreement to sell F @-@ 16s to Pakistan , Northrop felt that the F @-@ 5G needed to match the performance of F @-@ 16 . This would require not only better performance from the engine , but a new and comparable avionics suite as well . Northrop saw that the F @-@ 5G was still being viewed as the " FX fighter " , a low @-@ cost option for second @-@ tier air forces . To combat this perception , Northrop requested the designation " F @-@ 20 " ; the USAF approved in late 1982 , and of the name Tigershark in March 1983 .

= = Design = =

The primary design change between the earlier F @-@ 5E and the F @-@ 5G was the use of a single General Electric F404 engine that was originally designed for the F / A @-@ 18 Hornet . The new engine provided 60 % more thrust compared to the combined output of the F @-@ 5E 's paired General Electric J85s . This improved the aircraft 's thrust @-@ to @-@ weight ratio to 1 @.@ 13 from 1 @.@ 0 . The new engine gave speed of over Mach 2 @.@ 0 , a ceiling over 55 @,@ 000 ft ( 16 @,@ 800 m ) , an initial climb rate of 52 @,@ 800 ft per minute ( 16,100m / min ) .

The wing profile remained the same as the F @-@ 5E , but had modified leading edge extensions ( LEX ) , which improved the maximum lift coefficient of the wing by about 12 % with an increase in wing area of only 1 @.@ 6 % . The original aircraft was fairly sluggish in pitch , so the horizontal stabilizer was increased in size by 30 % and a new dual @-@ channel fly @-@ by @-@ wire control system was added . Destabilizing the aircraft in pitch and modifying the LEX improved the instantaneous turn rate by 7 % to 20 ° / sec . Sustained turn rate at Mach 0 @.@ 8 and 15 @,@ 000 ft ( 4 @,@ 572 m ) rose to 11 @.@ 5 ° / sec , which compared well with the F @-@ 16 's 12 @.@ 8 ° / sec . Supersonic turn rates were 47 % higher than those of the F @-@ 5E .

The F @-@ 20 would also make greater usage of composite materials in its construction . During its development , several areas using metal were re @-@ designed to use fiberglass , and there were numerous upgrades to various mechanical parts .

The F @-@ 20 's avionics suite was all @-@ new and greatly improved over the earlier designs . The General Electric AN / APG @-@ 67 multi @-@ mode radar was the heart of the sensor suite , offering a wide range of air @-@ to @-@ air and air @-@ to @-@ ground modes . The F @-@ 5 's electro @-@ mechanical navigation system was replaced with an all @-@ electronic version based on a ring laser gyroscope . Time from power @-@ on to being able to launch was greatly reduced as a result , to about 22 seconds , and Northrop boasted the aircraft had the shortest scramble time of any contemporary aircraft . The cockpit of the F @-@ 5 was completely re @-@ worked with a large heads @-@ up display ( HUD ) and two monochrome multi @-@ function displays set high on the control panel , and the addition of a complete hands @-@ on @-@ throttle @-@ and @-@ stick ( HOTAS ) control system . Many of the avionics promised to have reliability beyond that of any competing aircraft then in service .

The F @-@ 20 would have been able to utilize most of the common weapons in U.S. ' s inventory , including the entire range of Mark 80 series bombs , the AGM @-@ 65 Maverick air @-@ to @-@ ground missile , and the AIM @-@ 9 Sidewinder and AIM @-@ 7 Sparrow air @-@ to @-@ air missiles . Like the earlier F @-@ 5s , the test F @-@ 20s were equipped with two M39 cannon mounted in the nose . Production F @-@ 20s may have substituted two Ford Aerospace Tigerclaw cannons instead of the M39s ; while the Tigerclaw was based on the M39 , it was lighter and had a higher rate of fire than the M39A2 .

The F @-@ 20 did , however , have several problems inherent to its small size . The low @-@

mounted wing meant that there was limited ground clearance , and the position of the landing gear meant loads had to be positioned towards the outer ends of the wings . This limited hard point weights to 1 @,@ 000 lb ( 454 kg ) . A single hard point under the fuselage could carry more , a single Mk 84 2 @,@ 000 lbs bomb or up to five Mk 82 500 lbs bombs . Additionally , although the wing profiling improved lift at higher angles of attack ( AoA ) while maneuvering , it did not improve cruise lift performance at normal AoA . This did not present a problem in the fighter role , but did severely reduce its payload / range figures compared to similar aircraft like the F @-@ 16 .

Offered as a low @-@ cost option , the F @-@ 20 was significantly more expensive than the F @-@ 5E , but much less expensive than other designs like the $ 30 million F @-@ 15 Eagle , or $ 15 million F @-@ 16 Fighting Falcon . The F @-@ 20 was projected to consume 53 % less fuel , require 52 % less maintenance manpower , had 63 % lower operating and maintenance costs and had four times the reliability of average front @-@ line designs of the era . The F @-@ 20 also offer the ability to fire the beyond @-@ visual @-@ range AIM @-@ 7 Sparrow missile , a capability that the F @-@ 16 lacked at that time , and did not gain until the Block 15 ADF version in February 1989 .

= = Operational history = =

= = = Testing = = =

On 30 August 1982 , the original engine @-@ change @-@ only F @-@ 5G ( serial 82 @-@ 0062 , c / n GG1001 , registered N4416T ) made its maiden flight piloted by Russ Scott . During the 40 @-@ minute flight , the prototype climbed to 40 @,@ 000 ft ( 12 @,@ 000 m ) and reached Mach 1 @.@ 04 . GG1001 demonstrated outstanding reliability ; by the end of April 1983 240 flights had been accumulated , including evaluation flights with 10 potential customer nations . The second prototype ( serial number 82 @-@ 0063 , registered N3986B , c / n GI1001 ) , featuring the complete avionics suite , made its first flight on 26 August 1983 . The F @-@ 20 would fly a total of 1 @,@ 500 flights prior to its termination ; although these were exclusively flown in ideal conditions . Note : " ... Northrup did not take a prototype approach with the F @-@ 20 ... The First F @-@ 20 was intended to be a production quality aircraft ... " page 5 Rand Corporation report A Case Study of the F @-@ 20 Tigershark June 1987 .

During the test program , the F @-@ 20 fired the AIM @-@ 9 Sidewinder and , in February 1985 the AIM @-@ 7 Sparrow . In air @-@ to @-@ ground testing , it fired the AGM @-@ 65 Maverick , 2 @.@ 75 in ( 70 mm ) folding fin aerial rockets , dropped Mk . 82 bombs , and fired rounds from a 30 mm ( 1 @.@ 18 in ) gun pod ( GPU @-@ 5 / A , four @-@ barrel GAU @-@ 13 / A ) in addition to the two internal 20 mm ( .79 in ) M39 cannon . One of the F @-@ 20 's flight characteristics was the ability to fly at only 124 km / h ( 77 mph ) at 35 ° AoA ( angle of attack ) , while the F @-@ 16 was limited to 30 ° ; acceleration from Mach 0 @.@ 9 to 1 @.@ 2 in 29 seconds ( at 9 @,@ 150 m ) ; climb to 12 @,@ 200 m ( or 40 @,@ 000 ft ) in 2 @.@ 3 minutes ( including 55 sec for the start and 22 for the INS set @-@ up ) .

Northrop signed a Memorandum of Agreement with the Air Force in May 1983 that made the Air Force responsible for certifying the F @-@ 20 's performance , air worthiness and fixed @-@ price program . Aerospace legend Chuck Yeager , employed as a spokesperson for Northrop , touted the aircraft as " magnificent " and was featured in advertising .

In November 1982 , Bahrain became the first customer . South Korea also explored local production of the F @-@ 20 , and in support improvements were implemented . These included avionics upgrades , an expanded fuel tank , and the use of fibreglass composites . The changes were so extensive that a fourth prototype was built to test them . By 1983 , Northrop was involved in a number of simultaneous negotiations for the F @-@ 20 , and its prospects appeared positive .

On 10 October 1984 , GG1001 crashed in South Korea on a demonstration flight , killing Northrop pilot Darrell Cornell . An investigation cleared the F @-@ 20 of mechanical or design faults ; it concluded Cornell had blacked out due to excessive g @-@ forces . GI1001 crashed in May 1985 at

Goose Bay , Labrador , killing Northrop pilot Dave Barnes . Again the crash was blamed on G @-@ LOC ; Barnes had been practicing his aerobatic routine for the Paris Air Show .

= = = Battle for sales = = =

In December 1981 , President Reagan , reacting to the Soviet invasion of Afghanistan , signed a major economic and military aid package for Pakistan that included 40 F @-@ 16As . The offer was in keeping with U.S. policy towards the Soviet Union , and the idea of " containment " within a ring of U.S.-friendly countries . The Soviet invasion of Afghanistan was initially viewed as an attempt to break out of the arranged containment system , thus the U.S. placed a priority on quickly building up a new layer of defense . However , other U.S. allies saw this as a potential break in the FX policy , and began requesting only " the very best . "

Such approval was increasingly granted starting in 1982 . In May , Venezuela , who had long examined the FX project , agreed to buy 18 F @-@ 16As and six F @-@ 16Bs , replacing a fleet of Mirage III interceptors and Mirage 5 ground @-@ attack aircraft . Sweden decided to develop their own design , the JAS 39 Gripen . In September 1983 , Turkey announced plans to buy 132 F @-@ 16Cs and 28 F @-@ 16Ds to replace their Lockheed F @-@ 104G / S Starfighter and Northrop F @-@ 5A / B. Greece , stung by its long @-@ time rival receiving the F @-@ 16 , purchased 34 F @-@ 16C and six F @-@ 16Ds in November 1984 , giving a firm pledge of secrecy .

Then , late in 1983 , the U.S. government made a financial commitment to help Israel develop its own new fighter , the IAI Lavi . Northrop objected to this , as the Lavi would be a potential competitor to the F @-@ 20 in the export market ; while Northrop had to privately fund the F @-@ 5G , the government was directly subsidizing a foreign competitor . Congressional support for Israel overruled Northrop 's complaints along with complaints from other branches of the government .

While other companies marketed directly to foreign air forces , as part of the FX program , the F @-@ 5G could only be marketed by the State Department . Under this policy umbrella , Northrop had to submit every piece of marketing material to government review , which could take months . The State Department had no interest in selling the FX , from their perspective it was one aircraft among many , leading to a lackadaisical approach , and led to complaints from Northrop that the government was not promoting the F @-@ 20 enough .

= = = Congressional investigation and Air Force collusion = = =

Starting in March 1984 , Congress chaired a series of hearings into FX . William Schneider , Jr . , the Under Secretary of State for Security Assistance , Science and Technology , testified that FX policy might not result in any sales , in spite of any government support . He stated that the sales of arms such as FX was primarily a matter of foreign policy , secondarily a commercial venture . Thomas V. Jones , Northrop 's CEO , argued that there was little point independently developing aircraft if companies were reliant on the government to sell them . He suggested the FX concept be dropped , and F @-@ 20 allowed to be sold by the vendor . Additionally , Brigadier General Thomas Baker , USAF Director of International Programs , testified that the Air Force was not actively marketing FX . He observed that over four years the US had sold 100 fighters to 29 countries , none were FX . He also compared France 's aircraft exports , showing a market for a low @-@ cost fighter existed . In the Committee 's concluding remarks , the State Department and DOD were accused of rhetoric , and lacking support , on FX .

In April 1984 , after the Congressional hearings , the USAF was directed to promote FX actively . Several potential customers were briefed during May and June 1984 on the performance and cost of both the F @-@ 20 and F @-@ 16 / 79 . The Air Force published an internal report on FX in late June 1984 . The F @-@ 20 was characterized as having outstanding performance against viable threats ; and seen as a candidate for the Air Force 's aggressor requirement . The report additionally stated that the F @-@ 20 had been contractor @-@ funded , totaling over $ 750 million , compared to $ 60 million on the F @-@ 16 / 79 . However , the report concluded that it had little or no market to sell to . The USAF had a vested interest to encourage F @-@ 16 sales ; larger production

numbers would drive down the cost per unit . Gregg Easterbrook noted that F @-@ 20 may have cast the Air Force in a bad light , as an aircraft developed independent of their input , authors such as Donald Pattillo shared this conclusion . In contrast , the F @-@ 16 was heavily involved in the USAF hierarchy , originating from a group of officers known as the " fighter mafia " . By March 1985 , the Joint Chiefs of Staff and the Secretary of State were reconsidering the policy . Despite some calls to support Northrop , FX was abandoned .

= = = Aggressor and ANG roles = = =

A possibility for a U.S. purchase opened in 1984 , for a small number of " aggressor aircraft " for dissimilar air combat training . This style of training had been introduced by the United States Navy at their TOPGUN school , using the F @-@ 5 to simulate the MiG @-@ 21 . In November 1984 , Congress directed the Navy and Air Force to study the use of a single aircraft type to fill similar aggressor roles for both services . In January 1985 the Navy announced they had selected a specially configured version of the F @-@ 16 . It was rumored that the aircraft was sold at a loss to keep Northrop 's F @-@ 20 out of the market .

Another chance for the F @-@ 20 was as an upgrade for the Air National Guard ( ANG ) . Northrop claimed that the F @-@ 20 's fast scramble time made it a natural fit for this role , its lower cost would allow the ANG to operate larger aircraft numbers , and that it supported the AIM @-@ 7 while the F @-@ 16 did not . Additionally , the ANG would not be competing with the Air Force for production quotas , they would be able to replace their aircraft more quickly . However , the Air Force 's requirements had priorities favoring the F @-@ 16 for the role ; if the ANG flew the F @-@ 16 , they would further lower unit costs , maintain commonality between the ANG and USAF , and better equip ANG units to perform front line combat roles . The Congressional Budget Office had also disputed Northrop 's lower cost claim in their own research . On 31 October 1986 , the Air Force announced that the F @-@ 16C had been selected , which had been upgraded to support the AIM @-@ 7 . As several nations had suggested they would accept the F @-@ 20 on the condition that it was inducted into the USAF , the selection was a heavy blow to Northrop .

= = = Cancellation = = =

After six years with no buyers , in late 1986 Northrop cancelled the $ 1 @.@ 2 billion project . Northrop was reluctant to protest perceived favoritism of the F @-@ 16 in fear of losing support for the project for the Northrop Grumman B @-@ 2 Spirit stealth bomber . Ongoing negotiations with the Royal Moroccan Air Force for 20 F @-@ 20s were canceled ; along with the small order by Bahrain . Later on , a bribery scandal would emerge from the attempts to market the F @-@ 20 to South Korea , leading to several Northrop managers resigning and the reprimanding of chief executive Thomas V. Jones , who retired in 1989 .

In the late 1980s , local production of the F @-@ 20 was discussed with India . A move was also made in the 1980s to market the aircraft to the Pakistan Air Force with a license production manufacture of the aircraft . It was evaluated by a Pakistani contingent in the United States , with the F @-@ 20 being flown by Abbas Mirza , a senior Pakistani air force fighter pilot . Of the components of the F @-@ 20 , the radar would end up being the most successful ; Taiwan selected it for the Ching @-@ kuo , South Korea also adopted it for the KAI T @-@ 50 Golden Eagle trainer aircraft , and the radar was used in the multinational FMA IA 63 Pampa . As sales prospects were not apparent early on , GE sold their radar division , which was eventually acquired by Lockheed @-@ Martin .

Aviation author Steve Pace wrote of the F @-@ 20 as " one of the best fighters that never went into production . " While discussing military procurement , Thomas McNaugher stated that competition between the F @-@ 20 and the F @-@ 16 served to lower prices and generate " massive savings " for the U.S. government . Writing prior to cancellation , Ralph Nader and William Taylor noted that the F @-@ 20 had been commonly described as " the first privately funded U.S. combat aircraft in recent history . " Mazher A. Hameed commented in 1986 that the F @-@ 20 was a " logical choice "

for the Gulf States and Saudi Arabia ; however , it had " scant chance of being selected " due to political factors , as well as competition from other candidates such as the Mirage 2000 and Panavia Tornado ADV .

= = Aircraft disposition = =

82 @-@ 0062 ( Northrop serial number GG.1001 ) - crashed at Suwon Air Base , South Korea on 10 October 1984 . Pilot killed .
82 @-@ 0063 ( Northrop serial number GI.1001 ) - crashed at CFB Goose Bay , Canada on 14 May 1985 . Pilot killed .
82 @-@ 0064 ( Northrop serial number GI.1002 ) - California Science Center in Exposition Park , Los Angeles , California .

= = Specifications ( F @-@ 20 ) = =

Data from Northrop F @-@ 5 / F @-@ 20 / T @-@ 38 , Complete Encyclopedia of World Aircraft
General characteristics
Crew : 1 pilot
Length : 47 ft 4 in ( 14 @.@ 4 m )
Wingspan : 27 ft 11 @.@ 9 in / 8 @.@ 53 m ; with wingtip missiles ( 26 ft 8 in / 8 @.@ 13 m ; without wingtip missiles )
Height : 13 ft 10 in ( 4 @.@ 20 m )
Wing area : 200 ft ² ( 18 @.@ 6 m ² )
Empty weight : 13 @,@ 150 lb ( 5 @,@ 964 kg )
Loaded weight : 15 @,@ 480 lb ( 7 @,@ 021 kg )
Max. takeoff weight : 27 @,@ 500 lb ( 12 @,@ 474 kg )
Powerplant : 1 × General Electric F404 @-@ GE @-@ 100 turbofan , 17 @,@ 000 lbf ( 76 kN )
Performance
Maximum speed : Mach 2 ( 1 @,@ 319 miles , 2 @,@ 123 km per hour )
Combat radius : 300 nmi ( 345 mi , 556 km ) ; for hi @-@ lo @-@ hi mission with 2 × 330 US gal ( 1 @,@ 250 L ) drop tanks
Ferry range : 1 @,@ 490 nmi ( 1715 mi , 2759 km ) ; with 3 × 330 US gal ( 1 @,@ 250 L ) drop tanks
Service ceiling : 55 @,@ 000 ft ( 16 @,@ 800 m )
Rate of climb : 52 @,@ 800 ft / min ( 255 m / s )
Wing loading : 81 @.@ 0 lb / ft ² ( 395 kg / m ² )
Thrust / weight : 1 @.@ 1
Armament
Guns : 2 × 20 mm ( 0 @.@ 79 in ) Pontiac M39A2 cannons in the nose , 280 rounds each
Hardpoints : 5 external hardpoints with a capacity of 8 @,@ 000 lb ( 3 @,@ 600 kg ) of bombs , missiles , rockets and up to 3 drop tanks for extended range
Rockets : 2 × CRV7 rocket pods Or
2 × LAU @-@ 10 rocket pods with 4 × Zuni 5 in ( 127 mm ) rockets each Or
2 × Matra rocket pods with 18 × SNEB 68 mm rockets each
Missiles : 2 × AIM @-@ 9 Sidewinders on wingtip launch rails ( similar to F @-@ 16 and F / A @-@ 18 )
Up to 4 x AIM @-@ 7 Sparrows on underwing launch railsAGM @-@ 65 Maverick air @-@ to @-@ surface missiles on hardpoints
Bombs : Various air @-@ to @-@ ground ordnance such as Mark 80 series of unguided iron bombs ( including 3 kg and 14 kg practice bombs ) , CBU @-@ 24 / 49 / 52 / 58 cluster bomb munitions , M129 Leaflet bomb
Avionics
General Electric AN / APG @-@ 67