McDonnell Douglas F-4 Phantom II

F-4 Phantom II

An F-4B Phantom II of Marine fighter-attack squadron VMFA-314, the Black Knights

Role	Interceptor fighter, fighter-bomber
National origin	United States
Manufacturer	McDonnell Aircraft / McDonnell Douglas
First flight	27 May 1958
Introduction	30 December 1960
Status	Active as of 2011
Primary users	United States Air Force (historical) United States Navy (historical) United States Marine Corps (historical) Turkish Air Force
Produced	1958–1981
Number built	5,195
Unit cost	US$2.4 million when new (F-4E)

The **McDonnell Douglas F-4 Phantom II** is a tandem two-seat, twin-engined, all-weather, long-range supersonic jet interceptor fighter/fighter-bomber originally developed for the United States Navy by McDonnell Aircraft. It first entered service in 1960 with the U.S. Navy. Proving highly adaptable, it was also adopted by the U.S. Marine Corps and the U.S. Air Force, and by the mid-1960s had become a major part of their respective air wings.

The Phantom is a large fighter with a top speed of over Mach 2.2. It can carry over 18,000 pounds (8,400 kg) of weapons on nine external hard points, including air-to-air and air-to-ground missiles, and various bombs. The F-4, like other interceptors of its time, was designed without an internal cannon, but later models incorporated a M61

Vulcan rotary cannon. Beginning in 1959, it set 15 world records, including an absolute speed record, and an absolute altitude record. The F-4 was used extensively during the Vietnam War, serving as the principal air superiority fighter for both the Navy and Air Force, as well as being important in the ground-attack and reconnaissance roles by the close of U.S. involvement in the war. The Phantom has the distinction of being the last U.S. fighter flown to attain ace status in the 20th Century. During the Vietnam War, the USAF had one pilot and two WSOs, and the US Navy one pilot and one RIO, become aces in air-to-air combat. It continued to form a major part of U.S. military air power throughout the 1970s and 1980s, being gradually replaced by more modern aircraft such as the F-15 Eagle and F-16 in the U.S. Air Force; the Grumman F-14 Tomcat and F/A-18 Hornet in the U.S. Navy; and the F/A-18 in the U.S. Marine Corps.

The F-4 Phantom II remained in use by the U.S. in the reconnaissance and Wild Weasel (suppression of enemy air defenses) roles in the 1991 Gulf War, finally leaving service in 1996. It was also the only aircraft used by both U.S. flight demonstration teams: the USAF Thunderbirds (F-4E) and the US Navy Blue Angels (F-4J). The F-4 was also operated by the armed forces of 11 other nations. Phantoms remain in front line service with seven countries, and in use as an unmanned target in the U.S. Air Force. Phantom production ran from 1958 to 1981, with a total of 5,195 built, making it the most numerous American supersonic military aircraft.

Design

Cockpit of F-4 Phantom II

The F-4 Phantom is tandem-seat fighter-bomber designed as a carrier-based interceptor to fill the U.S. Navy's fleet defense fighter role. Innovations in the F-4 included an advanced pulse-doppler radar and extensive use of titanium in its airframe.

Despite the imposing dimensions and a maximum takeoff weight of over 60,000 lb (27,000 kg), the F-4 had a top speed of Mach 2.23 and an initial climb of over 41,000 ft/min (210 m/s). The F-4's nine external hard points have a capability of up to 18,650 pounds (8,480 kg) of weapons, including air-to-air and air-to-ground missiles, and unguided, guided, and nuclear bombs. Like other interceptors of its day, the F-4 was designed without an internal cannon.

The baseline performance of a Mach 2-class fighter with long range and a bomber-sized payload would be the template for the next generation of large and light/middle-weight fighters optimized for daylight air combat.

In air combat, the Phantom's greatest advantage was its thrust, which permitted a skilled pilot to engage and disengage from the fight at will. The massive aircraft, designed to fire radar-guided missiles from beyond visual range, lacked the agility of its Soviet opponents and was subject to adverse yaw during hard maneuvering. Although thus subject to irrecoverable spins during aileron rolls, pilots reported the aircraft to be very communicative and easy to fly on the edge of its performance envelope. In 1972, the F-4E model was upgraded with leading edge slats on the wing, greatly improving high angle of attack maneuverability at the expense of top speed.

The J79 engines produced noticeable amounts of black smoke, a severe disadvantage in that the enemy could spot the aircraft. This was solved on the F-4S fitted with the −10A engine variant which used a smoke-free combustor.

The F-4's biggest weakness, as it was initially designed, was its lack of an internal cannon. For a brief period, doctrine held that turning combat would be impossible at supersonic speeds and little effort was made to teach pilots air combat maneuvering. In reality, engagements quickly became subsonic. Furthermore, the relatively new heat-seeking and radar-guided missiles at the time were frequently reported as unreliable

and pilots had to use multiple shots (also known as ripple-firing), just to hit one enemy fighter. To compound the problem, rules of engagement in Vietnam precluded long-range missile attacks in most instances, as visual identification was normally required. Many pilots found themselves on the tail of an enemy aircraft but too close to fire short-range Falcons or Sidewinders. Although in 1967 USAF F-4Cs began carrying SUU-16 or SUU-23 external gunpods containing a 20 mm (.79 in) M61 Vulcan Gatling cannon, USAF cockpits were not equipped with lead-computing gunsights, virtually assuring a miss in a maneuvering fight. Some Marine Corps aircraft carried two pods for strafing. In addition to the loss of performance due to drag, combat showed the externally mounted cannon to be inaccurate unless frequently boresighted, yet far more cost-effective than missiles. The lack of a cannon was finally addressed by adding an internally mounted 20 mm (.79 in) M61 Vulcan on the F-4E.

MAPS F-4S – Bureau 155764

The Phantom II that is displayed at the MAPS Air Museum was constructed in July of 1968 as an F-4J at McDonnell-Douglas Aircraft, St. Louis, Missouri. It was officially accepted by the United States Navy on 29 July 1968.

The first assignment for this airframe was with Fighter Squadron (VF)-21 stationed at the Naval Air Station at Miramar, California.

In July of 1970, 155764 was reassigned toVF-142 which was also at the Naval Air Station, Miramar, California. During this assignment, it was deployed aboard U.S.S. Enterprise to the Western Pacific (WESTPAC)/Vietnam/Indian Ocean Area of Operations.

October of 1971 saw the aircraft moved to the Fleet Air West Pacific Repair Facility (FAWPRA) in Atsugi, Japan.

Upon completion of repairs, the Phantom was assigned to VF-213 and returned to the Naval Air Station in Miramar, California in July of 1972. Subsequent assignments at Miramar included VF-121in March of 1973 and a return to VF-213 in December of 1974. During this last assignment, 155764 deployed once again to the Western Pacific (WESTPAC)/Vietnam/Indian Ocean Area of Operations, this time aboard the U.S.S. Kitty Hawk.

In December of 1975, the Phantom was transferred to the United States Marine Corps and assigned to Marine Fighter Attack Squadron (VMFA)-251 then stationed in Beaufort, South Carolina.

Returned to the Navy in March of 1977, the aircraft became part of VF-103 stationed at the Naval Air Station in, Oceana, Virginia. It was deployed aboard U.S.S. Saratoga to the Mediterranean.

In July of 1977, the aircraft was assigned to VF-101 for a shot tour followed by duty withVF-103in August of that year. Both these units were stationed at the Naval Air Station in Oceana. During this last assignment, the Phantom was deployed aboard U.S.S. Saratoga to the Mediterranean.

Moved to the Marines Corps Air Station at Cherry Point, North Carolina in July of 1978, 155764 saw duty with the VF-103. It was deployed with VF-103 aboard the U.S.S. Saratoga to the Mediterranean.

In January of 1979, the aircraft was assigned to VF-74 located at the Naval Air Station, Oceana, Virginia and deployed aboard U.S.S. Forrestal to the Mediterranean.

In January of 1982, the Phantom II was reassigned to VF-171, once again at the Naval Air Station at Oceana, Virginia. A few months later,

in September of that year, the aircraft was moved to the Naval Aircraft Rework/Refit Facility (NARF) at North Island, California. It was her that the F-4J was converted to an F-4S.

Upon return to service in June of 1983, the F-4S returned to United States Marine Corps and duty with VMFA-251 located at the Marine Corps Air Station, (MCAS) Beaufort, South Carolina. During this assignment, it was deployed to MCAS, Cherry Point, North Carolina; Trondheim, Norway and Nellis Air Force Base, Nevada.

In April of 1989, the aircraft was withdrawn from service. It was scheduled to become part of the Navy Drone Program. When that program was cancelled in January of 2003, the airframe was then scheduled to be de-commissioned and either shredded or used for target practice.

On November 10-14, 2003, MAPS recovered the McDonnell-Douglass F-4S Phantom II (Bureau # 155764) from the Cherry Point Marine Corps Air Station in Havelock, North Carolina. It was disassembled and arrived at the MAPS Air Museum on November 18, 2003.

155764 was placed on indefinite loan to MAPS from the United States Navy.

Variants

F-4A, B, J, N and S

Variants for the U.S. Navy and the U.S. Marines. F-4B was upgraded to F-4N, and F-4J was upgraded to F-4S.

A U.S. Navy F-4B from VF-111 dropping bombs over Vietnam, 1971.

F-110 Spectre, F-4C, D and E

Variants for the U.S. Air Force. F-4E introduced an internal M61 Vulcan cannon. The F-4D and E were the most numerously built, widely exported, and also extensively used under the Semi-Automatic Ground Environment (SAGE) U.S. air defense system.

435th TFS F-4Ds over Vietnam.

F-4G Wild Weasel V

A dedicated SEAD (Suppression of Enemy Air Defenses) variant with updated radar and avionics, converted from F-4E. The designation F-4G was applied earlier to an entirely different Navy Phantom.

F-4K and M

Variants for the British military re-engined with Rolls-Royce Spey turbofans.

F-4EJ

Simplified F-4E exported to and license-built in Japan.

F-4F

Simplified F-4E exported to Germany.

QF-4B, E, G, N and S

Retired aircraft converted into remote-controlled target drones used for weapons and defensive systems research.

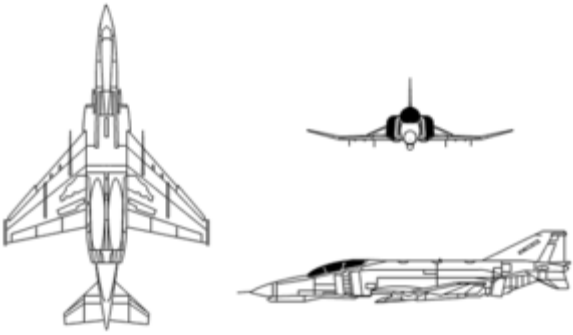
QF-4E AF Serial No. 74-0626 at McGuire AFB in May 2007 with an A-10 in the background.

RF-4B, C, and E

Tactical reconnaissance variants.

A U.S. Marine Corps RF-4B, 1982

General characteristics (F-4E)



- **Crew:** 2
- **Length:** 63 ft. 0 in (19.2 m)
- **Wingspan:** 38 ft. 4.5 in (11.7 m)
- **Height:** 16 ft. 6 in (5.0 m)
- **Wing area:** 530.0 ft² (49.2 m²)
- **Airfoil:** NACA 0006.4–64 root, NACA 0003-64 tip
- **Empty weight:** 30,328 lb. (13,757 kg)
- **Loaded weight:** 41,500 lb. (18,825 kg)
- **Max takeoff weight:** 61,795 lb. (28,030 kg)

- **Power plant:** 2 × General Electric J79-GE-17A axial compressor turbojets, 17,845 lbf (79.4 kN) each
- **Zero-lift drag coefficient:** 0.0224
- **Drag area:** 11.87 ft² (1.10 m²)
- **Aspect ratio:** 2.77
- **Fuel capacity:** 1,994 U.S. gal (7,549 L) internal, 3,335 U.S. gal (12,627 L) with three external tanks (370 U.S. gal (1,420 L) tanks on the outer wing hardpoints and either a 600 or 610 U.S. gal (2,310 or 2,345 L) tank for the centerline station).
- **Maximum landing weight:** 36,831 lb. (16,706 kg)

Performance

- **Maximum speed:** Mach 2.23 (1,472 mph, 2,370 km/h) at 40,000 ft. (12,190 m)
- **Cruise speed:** 506 kn (585 mph, 940 km/h)
- **Combat radius:** 367 nmi (422 mi, 680 km)
- **Ferry range:** 1,403 nmi (1,615 mi, 2,600 km) with 3 external fuel tanks
- **Service ceiling:** 60,000 ft. (18,300 m)
- **Rate of climb:** 41,300 ft./min (210 m/s)
- **Wing loading:** 78 lb./ft² (383 kg/m²)
- **lift-to-drag:** 8.58
- **Thrust/weight:** 0.86 at loaded weight, 0.58 at MTOW
- **Takeoff roll:** 4,490 ft. (1,370 m) at 53,814 lb. (24,410 kg)
- **Landing roll:** 3,680 ft. (1,120 m) at 36,831 lb. (16,706 kg)

Armament

- Up to 18,650 lb. (8,480 kg) of weapons on nine external hardpoints, including general purpose bombs, cluster bombs, TV- and laser-guided bombs, rocket pods (UK Phantoms 6 × Matra rocket pods with 18 × SNEB 68 mm rockets each), air-to-ground missiles, anti-runway weapons, anti-ship missiles, targeting pods, reconnaissance pods, and nuclear weapons. Baggage pods and external fuel tanks may also be carried.
- 4× AIM-7 Sparrow in fuselage recesses plus 4 × AIM-9 Sidewinders on wing pylons; upgraded Hellenic F-4E and German F-4F ICE carry AIM-120 AMRAAM, Japanese F-4EJ Kai carry AAM-3, Hellenic F-4E will carry IRIS-T in future. Iranian F-4s could potentially carry Russian and Chinese missiles. UK Phantoms carried Skyflash missiles

- 1× 20 mm (0.787 in) M61 Vulcan 6-barreled Gatling cannon, 640 rounds
- 4× AIM-9 Sidewinder, Python-3 (F-4 Kurnass 2000), IRIS-T (F-4E AUP Hellenic Air Force)
- 4× AIM-7 Sparrow, AAM-3(F-4EJ Kai)
- 4× AIM-120 AMRAAM for F-4F ICE, F-4E AUP (Hellenic Air Force)
- 6× AGM-65 Maverick
- 4× AGM-62 Walleye
- 4× AGM-45 Shrike, AGM-88 HARM, AGM-78 Standard ARM
- 4× GBU-15
- 18× Mk.82, GBU-12
- 5× Mk.84, GBU-10, GBU-14
- 18× CBU-87, CBU-89, CBU-58
- Nuclear weapons, including the B28EX, B61, B43 and B57.