

McDonnell F-101 Voodoo

F-101 Voodoo



McDonnell F-101A Voodoo

Role	Fighter aircraft
Manufacturer	McDonnell Aircraft
First flight	29 September 1954
Introduction	May 1957
Retired	1972, USAF 1982, US ANG 1984, Canada
Primary users	United States Air Force Royal Canadian Air Force
Number built	807
Unit cost	US\$1,276,145 (RF-101C) US\$1,754,066 (F-101B)
Developed from	XF-88 Voodoo
Variants	McDonnell CF-101 Voodoo

The **McDonnell F-101 Voodoo** was a supersonic military jet fighter which served the United States Air Force (USAF) and the Royal

Canadian Air Force (RCAF). Initially designed by McDonnell Aircraft as a long-range bomber escort (known as a *penetration fighter*) for the Strategic Air Command (SAC), the Voodoo was instead developed as a nuclear-armed fighter-bomber for the Tactical Air Command (TAC), and as a photo reconnaissance aircraft based on the same airframe. Extensively modified versions were produced as an all-weather interceptor aircraft, serving with the Air Defense Command, later renamed the Aerospace Defense Command (ADC), the Air National Guard, the Royal Canadian Air Force and the unified Canadian Forces after 1968.

The Voodoo's career as a fighter-bomber was relatively brief, but the reconnaissance versions served for some time. Along with the US Air Force's U-2 and US Navy's RF-8 Crusaders, the RF-101 reconnaissance variant of the Voodoo was instrumental during the Cuban Missile Crisis and saw extensive service during the Vietnam War. Interceptor versions served with the Air National Guard until 1982, and in Canadian service they were a front line part of NORAD until their replacement with the McDonnell Douglas CF-18 Hornet in the 1980s.

While the Voodoo was a moderate success, it may have been more important as an evolutionary step towards its replacement in most roles, the McDonnell Douglas F-4 Phantom II, one of the most successful Western fighter designs of the 1960s. The Phantom would retain the twin engines, twin crew for interception duties, and a tail mounted well above and behind the jet exhaust but was an evolution of the F3H Demon while the Voodoo was developed from the earlier XF-88 Voodoo.

Design and development

Initial design on what would eventually become the Voodoo began just after World War II in response to a USAAF Penetration Fighter Competition in 1946 for a long-range high performance fighter to escort bombers, much as the P-51 Mustang had done in its time. After being awarded a contract (AC-14582) on 14 February 1947, McDonnell built two prototypes, designated the XF-88 Voodoo. The first prototype (serial number 46-6525), powered by two 3,000 lbf (13.3 kN) Westinghouse XJ34-WE-13 turbojets, flew from Muroc on 20 October 1948. Preliminary testing revealed that while handling and range was adequate, the top speed was a disappointing 641 mph

(1,032 km/h) at sea level. After fitting McDonnell-designed afterburners to the second prototype, thrust was increased to 3,600 lbf (16.1 kN) with corresponding performance increases in top speed, initial rate of climb and reduced takeoff distance. Fuel consumption was greatly increased by use of the afterburners, however, reducing the range.

Although the XF-88 won the "fly-off" competition against the competing Lockheed XF-90 and North American YF-93, the detonation of the first nuclear weapon by the Soviet Union resulted in the USAF (created in 1947) reevaluating its fighter needs, with interceptors being more important and bomber escorts being of reduced priority, and it terminated the Penetration Fighter program in 1950. Analysis of Korean War missions, however, revealed that contemporary USAF strategic bombers were vulnerable to fighter interception. In 1951, the USAF issued a new requirement for a bomber escort with all major US manufacturers submitting designs. The McDonnell design was a larger and higher powered version of the XF-88, and won the bid in May 1951. The F-88 was redesignated the F-101 Voodoo in November 1951.

Design changes for new engines

The new design was considerably larger, carrying three times the initial fuel load and designed around larger, more powerful Pratt & Whitney J57 turbojets. The greater dimensions of the J57 engines required modifications to the engine bays, and modification to the intakes to allow a larger amount of airflow to the engine. The new intake also was designed to be more efficient at higher Mach numbers. In order to increase aerodynamic efficiency, reduce structural weight and alleviate "pitch-up" phenomena recently identified in flight testing of the D-558-2, an aircraft with a control surface configuration similar to the XF-88, the horizontal tail was relocated to the top of the vertical stabilizer, giving the F-101 its signature "T-tail". In late 1952, the mission of the F-101 was changed from "penetration fighter" to "strategic fighter", which entailed equal emphasis on both the bomber escort mission and on nuclear weapons delivery. The new Voodoo mock-up with the reconfigured inlets, tail surfaces, landing gear, and dummy nuclear weapon was inspected by Air Force officials in March 1953. The design was approved, and an initial order for 29 F-101As was placed on 28 May 1953, no prototypes being required as the F-101 was

considered a simple development of the XF-88, with the Cook-Cragie production policy, in which initial low-rate production would be used for testing without the use of separate prototypes, chosen instead.

First production

Serial number 53-2418 was the first production A-model delivered to Edwards AFB in August 1954. Its maiden flight was on 29 September 1954, with a McDonnell test pilot Robert C. Little. Test flight results: Mach 0.9 at 35,000 ft (10,500 m), with a maximum test speed to Mach 1.4. This aircraft, which is privately owned, has been moved the Evergreen Maintenance Center in Marana, Arizona to undergo restoration for display at the Evergreen Aviation & Space Museum in McMinnville, Oregon. It was previously on display at the Pueblo Weisbrod Aircraft Museum.



F-101A, AF Serial No. 53-2418, at Pueblo Weisbrod Aircraft Museum, Pueblo, CO

The end of the war in Korea and the development of the jet-powered B-52 negated the need for fighter escort and Strategic Air Command withdrew from the program.

Operational history

Despite SAC's loss of interest, the aircraft attracted the attention of Tactical Air Command (TAC), and the F-101 was reconfigured as a fighter bomber, intended to carry a single nuclear weapon for use against tactical targets such as airfields. With the support of TAC, testing was resumed, with Category II flight tests beginning in early 1955. A number of problems were identified during development, with

many of these fixed. The aircraft had a dangerous tendency toward severe pitch-up at high angle of attack that was never entirely solved. Around 2,300 improvements were made to the aircraft in 1955–56 before full production was resumed in November 1956.

The first F-101A was delivered on 2 May 1957 to the 27th Strategic Fighter Wing, which transferred to TAC in July that year, replacing their F-84F Thunderstreak. The F-101A was powered by two Pratt & Whitney J57-P-13 turbojets, allowing good acceleration, climb-performance, ease in penetrating the sound barrier in level flight, and a maximum performance of Mach 1.52. The F-101's large internal fuel capacity allowed a range of approximately 3,000 mi (4,828 km) nonstop. The aircraft was fitted with an MA-7 fire-control radar for both air-to-air and air-to-ground use, augmented by a Low Altitude Bombing System (LABS) system for delivering nuclear weapons, and was designed to carry a Mk 28 nuclear bomb. The original intended payload for the F-101A was the McDonnell Model 96 store, a large fuel/weapons pod similar in concept to that of the Convair B-58 Hustler, but was cancelled in March 1956 before the F-101 entered service. Other operational nuclear payloads included the Mk 7, Mk 43, and Mk 57 weapons. While theoretically capable of carrying conventional bombs, rockets, or Falcon air-to-air missiles, the Voodoo never used such weapons operationally. It was fitted with four 20mm M39 cannon, with one cannon often removed in service to make room for a TACAN beacon-receiver.

The F-101 set a number of speed records, including: a JF-101A (the ninth F-101A modified as a test bed for the more powerful J-57-P-53 engines of the F-101B) setting a world speed record of 1,207.6 mph (1,943.4 km/h) on 12 December 1957 during "Operation Firewall", beating the previous record of 1,132 mph (1,811 km/h) set by the Fairey Delta 2 in March the previous year. The record was then subsequently taken in May 1958 by a Lockheed F-104 Starfighter. On 27 November 1957, during "Operation Sun Run," an RF-101C set the Los Angeles-New York-Los Angeles record in 6 hours 46 minutes, the New York to Los Angeles record in 3 hours, 36 minutes, and the Los Angeles to New York record in 3 hours 7 minutes. An **F-101A** flew from Carswell, Texas to Bermuda without refueling.

A total of 77 F-101As were built. They were gradually withdrawn from service starting in 1966. Twenty-nine survivors were converted to **RF-**

101G specifications with a modified nose, housing reconnaissance cameras in place of cannons and radar. These served with the Air National Guard through 1972.



MAPS F-101F, Serial Number 57-0342

The F-101F that is displayed at the MAPS Air Museum was manufactured as an F-101B by McDonnell Aircraft, St. Louis, Missouri and delivered to the United States Air Force on 20 August 1950. Its initial assignment was with the 52nd Consolidated Maintenance Squadron of the Air Defense Command (ADC) located at Suffolk Air Force Base (AFB), New York.

In January of 1960, 57-0342 was reassigned to the 444th Fighter-Interceptor Squadron of Air Defense Command while they were stationed at Charleston Air Force Base, South Carolina. During this assignment, the aircraft was deployed to Hamilton Air Force Base in California.

February of 1961 saw the F-101F returned to McDonnell Aircraft and converted to its final configuration of F-101F.

Upon completion of that conversion, 57-0342 was assigned in October 1962 to the 4756th Air Defense Group of Air Defense Command located at Tyndall Air Force Base, Florida. In January of 1968 the aircraft was reassigned to the Air Defense Weapons Center, Air Defense Command also located at Tyndall.

May of 1971 saw the aircraft left active service with an assignment to the 147th Fighter-Interceptor Group of the Texas Air National Guard while was located at the Naval Air Station, Ellington, Texas. The F-101F's next assignment occurred in April of 1978 when it flew with the 111th Fighter-Interceptor Squadron of the Texas Air National Guard, Ellington Naval Air Station, Texas.

In July of 1982, 57-0342 was moved to the Military Aircraft Storage and Disposition Center, Davis-Monthan, AFB, Arizona. In May of 1985 it was dropped from the Davis-Monthan inventory by transfer to museum status and assigned to the United States Air Force Museum.

In June of 1998 the aircraft was placed on loan to the Florida Military Aviation Museum in St. Petersburg, Florida by the United States Air Force Museum.

In 2004, after the Florida museum went out of business the United States Air Force Museum notified MAPS of the availability of this and a number of other airframes. A team of volunteers went to Florida, recovered the parts of the aircraft and transported them to Ohio. The aircraft arrived at MAPS in November of 2004 and is on indefinite loan MAPS from the U.S. Air Force Museum.

Variants

F-101A

Initial production fighter bomber, 77 produced.



F-101A Voodoo

NF-101A

One F-101A used by General Electric for testing of the General Electric J79 engine.

YRF-101A

Two F-101As built as prototype reconnaissance models.

RF-101A

First reconnaissance version, 35 built.

F-101B

Two-seat interceptor, the most numerous version with 479 built (including CF-101B)



A two-seat McDonnell F-101B Voodoo of the Oregon Air National Guard

CF-101B

112 F-101Bs transferred to Royal Canadian Air Force (RCAF).

RF-101B

22 ex-RCAF CF-101B modified for reconnaissance use.



The prototype RF-101B (s/n 57-0301).

TF-101B

Dual-control trainer version of F-101B, redesignated **F-101F**, 79 built.

EF-101B

Single F-101B converted for use as a radar target and leased to Canada.

NF-101B

F-101B prototype based on the F-101A airframe; the second prototype was built with a different nose.

F-101C

Improved fighter-bomber, 47 built.

RF-101C

Reconnaissance version of F-101C airframe, 166 built.



RF-101C-55-MC (56-0220), assigned to 18th TRS, 460th TRW. This aircraft was shot down by a SAM over North Vietnam on 7 March 1966, killing the pilot.

F-101D

Proposed version with General Electric J79 engines, not built.

F-101E

Another J79 proposal, not built.

F-101F

Dual-control trainer version of F-101B; 79 re-designated TF-101Bs plus 152 converted F-101B.

CF-101F

RCAF designation for 20 TF-101B/F-101F dual-control aircraft.

TF-101F

24 dual-control versions of F-101B, re-designated F-101F (these are included in the -F total).

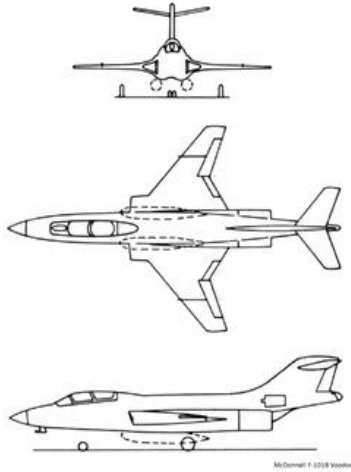
RF-101G

29 F-101As converted for ANG reconnaissance.

RF-101H

32 F-101Cs converted for reconnaissance use.

General characteristics (F-101)



- **Crew:** 2
- **Length:** 67 ft 5 in (20.55 m)
- **Wingspan:** 39 ft 8 in (12.09 m)
- **Height:** 18 ft 0 in (5.49 m)
- **Wing area:** 368 ft² (34.20 m²)
- **Airfoil:** NACA 65A007 mod root, 65A006 mod tip
- **Empty weight:** 28,495 lb (12,925 kg)
- **Loaded weight:** 45,665 lb (20,715 kg)
- **Max takeoff weight:** 52,400 lb (23,770 kg)
- **Power plant:** 2 × Pratt & Whitney J57-P-55 afterburning turbojets
 - **Dry thrust:** 11,990 lbf (53.3 kN) each
 - **Thrust with afterburner:** 16,900 lbf (75.2 kN) each
- **Internal fuel capacity:** 2,053 gal (7,771 l) or 2,953 gal (11,178 l) with two external tanks

Performance

- **Maximum speed:** Mach 1.72 (1,134 mph, 1,825 km/h) at 35,000 ft (10,500 m)
- **Range:** 1,520 mi (1,320 nm, 2,450 km)
- **Service ceiling:** 58,400 ft (17,800 m)
- **Rate of climb:** 49,200 ft/min (250 m/s)
- **Wing loading:** 124 lb/ft² (607 kg/m²)
- **Thrust/weight:** 0.74

Armament

- **Missiles:**
 - 4 (originally 6)× AIM-4 Falcon, *or*
 - 2× AIR-2 Genie nuclear rockets, plus 2× AIM-4 Falcon
 - Falcon missile variants: AIM-4A, AIM-4B, AIM-4C only. The range was about 5 mi (8 km).

Avionics

- Hughes MG-13 fire control system