

Convair F-102 Delta Dagger



F-102 from the 125th Fighter Interceptor Group, Florida Air National Guard, deploys braking parachute

Role	Interceptor aircraft
Manufacturer	Convair
First flight	24 October 1953
Introduction	April 1956
Retired	1979
Primary users	United States Air Force Greece Turkey
Number built	1,000
Unit cost	US\$1.2 million
Developed from	Convair XF-92
Developed into	F-106 Delta Dart

The Convair F-102 Delta Dagger was a US interceptor aircraft built as part of the backbone of the United States Air Force's (USAF) air defenses in the late 1950s. Entering service in 1956, its main purpose was to intercept invading Soviet bomber fleets. Designed and manufactured by Convair, 1,000 F-102s were built.

A member of the Century Series, the F-102 was the first operational supersonic interceptor and delta-wing fighter of the

USAF. It used an internal weapons bay to carry both guided missiles and rockets. As originally designed, it could not achieve Mach 1 supersonic flight until redesigned with area ruling. The F-102 replaced subsonic fighter types such as the Northrop F-89 Scorpion, and by the 1960s, it saw limited service in the Vietnam War in bomber escort and ground-attack roles. It was supplemented by McDonnell F-101 Voodoos and, later, by McDonnell Douglas F-4 Phantom IIs. Many of the F-102s were transferred to United States Air National Guard duty by the mid-to-late 1960s, and the type was retired from operational service in 1976. The follow-on replacement was the Mach-2 Convair F-106 Delta Dart, which was an extensive redesign of the F-102.

Design and development

On 8 October 1948, the board of senior officers of the U.S. Air Force (USAF) made recommendations that the service organize a competition for a new interceptor scheduled to enter service in 1954; as such, the all-new design would initially be dubbed the "1954 Interceptor". Four months later, on 4 February 1949, the USAF approved the recommendation and prepared to hold the competition the following year. In November 1949, the Air Force decided that the new aircraft would be built around a fire-control system (FCS). The FCS would be designed before the airframe to ensure compatibility. The airframe and FCS together are called the weapon system.

In January 1950, the USAF Air Materiel Command issued request for proposals (RFPs) to 50 companies for the FCS, of which 18 responded. By May, the list was revised downward to 10. Meanwhile, a board at the US Department of Defense headed by Major General Gordon P. Saville reviewed the proposals, and distributed some to the George E. Valley-led Air Defense Engineering Committee. Following recommendations by the committee to the Saville Board, the proposals were further reduced to two competitors, Hughes Aircraft and North American Aviation. Although the Valley Committee thought it

was best to award the contract to both companies, Hughes was chosen by Saville and his team on 2 October 1950.

Proposals for the airframe were issued on 18 June 1950, and in January 1951 six manufacturers responded. On 2 July 1954, three companies, Convair, Republic and Lockheed won the right to build a mock-up. Up until then, Convair had done research into delta-winged aircraft, experimenting with different designs, two of which fall under the name P-92. Of the three, the best design would win the production contract under the name "Project MX-1554". In the end, Convair emerged as the victor with its design, designated "XF-102", after Lockheed dropped out and Republic only built a mock-up. The development of three different designs was too expensive and in November, only Convair was allowed to continue with its Model 8-80. To speed development, it was proposed to equip the prototypes and pre-production aircraft with the less-powerful Westinghouse J40 turbojet. Continued delays to the J67 and MA-1 (formerly "MX-1179") FCS led to the decision to place an interim aircraft with the J40 and a simpler fire control system (dubbed "E-9") into production as the F-102A. The failure of the J40 led to the Pratt & Whitney J57, rated with 10,000 pounds-force (44 kN) of thrust being substituted for the prototypes and F-102As. This aircraft was intended to be temporary, pending the development of the F-102B, which would employ the more advanced Wright J67, a licensed derivative of the Bristol-Siddeley Olympus which was still in development. The F-102B would later evolve to become the F-106A, dubbed the "Ultimate Interceptor".

The prototype YF-102 made its first flight on 24 October 1953, but was lost to an accident nine days later. The second aircraft flew on 11 January 1954, confirming a dismal performance. Transonic drag was much higher than expected, and the aircraft was limited to Mach 0.98 (i.e. subsonic), with a ceiling of 48,000 ft. (14,630 m), far below the requirements.

To solve the problem and save the F-102, Convair embarked on a major redesign, incorporating the recently discovered area rule, while at the same time simplifying production and maintenance. The redesign entailed lengthening the fuselage by 11 ft. (3.35 m) and "pinched" at the mid-section (dubbed the "Coke Bottle configuration"), with two large fairings on either side of the engine nozzle, with revised intakes and a new, narrower canopy. A more powerful model of J57 was fitted, and the aircraft structure was lightened.

The first revised aircraft, designated YF-102A flew on 20 December 1954, 118 days after the redesign started, exceeding Mach 1 the next day. The revised design demonstrated a speed of Mach 1.22 and a ceiling of 53,000 ft. (16,154 m), which was sufficient for the Air Force to allow production of the F-102.

The production F-102A had the Hughes MG-3 fire control system, later upgraded in service to the MG-10. It had a three-segment internal weapons bay under the fuselage for air-to-air missiles. Initial armament was three pairs of GAR-1/2/3/4 (*Later re-designated as AIM-4*) Falcon missiles, which included both infrared and semi-active radar homing variants. The doors of the two forward bays each had tubes for 12 FFAR rockets (for a total of 24) with initially 2 in (5.1 cm) being fitted and later 2.75 in (70 mm) replacing them. The F-102 was later upgraded to allow the carriage of up to two GAR-11/AIM-26 Nuclear Falcon missiles in the center bay. The larger size of this weapon required redesigned center bay doors with no rocket tubes. Plans were considered to fit the MB-1 Genie nuclear rocket to the design, but although a Genie was test fired from an YF-102A in May 1956, it was never adopted.

The F-102 received several major modifications during its operational lifetime, with most airframes being retrofitted with infrared search/tracking systems, radar warning receivers, transponders, backup artificial horizons, and improvements to the fire-control system. A proposed close-support version (never

built) would have incorporated, in addition, an internal Gatling gun, an extra two hard points for bombs (in addition to the two underling pylons for drop tanks that were fitted to all production F-102s), bigger internal fuel tanks, and an in-flight-refueling probe.

To train F-102A pilots, the TF-102A trainer was developed, with 111 eventually manufactured. The aircraft was fitted with a side-by-side cockpit to facilitate ease of pilot training. This required a redesign of the cockpit and nose incorporating a set of vortex generators on the top of the cockpit to prevent flow separation under certain circumstances, and repositioning of the intake ducts. Despite the many changes, the aircraft was combat-capable, although this variant was predictably slower, only reaching subsonic speeds in level flight.

The F-102's intended successor was the improved F-102B "Ultimate Interceptor". The design, which had the originally intended J67 engine replaced by a Pratt & Whitney J75, underwent so many aerodynamic changes including a variable-geometry inlet design that it essentially became an entirely new aircraft and hence was redesignated as the F-106. Convair would also use a delta wing in the Mach 2 class B-58 Hustler bomber.

The first operational service of the F-102A was with the 327th Fighter-Interceptor Squadron at George Air Force Base, in April 1956, and eventually a total of 889 F-102As were built, production ending in September 1958.^[18] TF-102s and F-102s were used in the 1960s by the ADC (Air Defense Command) at Perrin AFB, Texas to train new F-102 pilots. They also provided platform training on flight characteristics of delta-winged aircraft for pilots who were destined to fly the B-58 bomber.

The F-102's official name, "Delta Dagger" was never used in common parlance, with the aircraft being universally known as the "Deuce." The TF-102 was known as the "Tub" because of its wide fuselage.

During the time the F-102A was in service, several new wing designs were used to experiment with the application of increased conical camber to the wings. Ultimately, a design was selected that actually increased elevon area, reduced takeoff speed, improved the supersonic L/D ratio and increased the aircraft's ceiling to 56,000 ft. (17,069 m). A modification was required to the landing gear doors due to the wing redesign.

The USAF Air Defense Command had F-102 Delta Daggers in service in 1960 and the type continued to serve in large numbers with both Air Force and Air National Guard units well into the 1970s. George W. Bush, later President of the United States, flew the F-102 in the 147th Fighter Interceptor Group based at Ellington AFB in Houston, TX as part of his Texas Air National Guard service from 1968 to 1972.

The F-102 served in Vietnam, flying fighter patrols and serving as bomber escorts. A total of 15 aircraft were lost in Vietnam: one to air-to-air combat, several to ground fire and the remainder to accidents.

Initially, F-102 detachments began to be sent to bases in Southeast Asia in 1962, when radar contacts that were detected by ground radars were thought to possibly be North Vietnamese Il-28 "Beagle" bombers, which were considered a very credible threat during that time period. F-102s were sent to Thailand and other nearby countries to intercept these aircraft if they threatened South Vietnam at any time.

Later on, B-52 strikes, codenamed ARC LIGHT, were escorted by F-102s based in the theater. It was during one of these missions that an F-102 was shot down by a North Vietnamese MiG-21 using an AA-2 Atoll heat-seeking missile. The MiGs approached undetected, and one of the F-102s was hit by an air to air missile, which did not explode immediately, but remained lodged in the aft end of the aircraft, causing stability problems.

As the pilot reported his mechanical problem to his wingman, the wingman observed the damaged Delta Dagger explode in midair, killing the pilot. The other F-102 pilot was able to fire AIM-4 missiles at the fleeing MiG-21s, but no hits were recorded. This was the only air-to-air loss for the F-102 during the Vietnam War.

The F-102 was tried with limited success for several years in the air-to-ground role, although neither the aircraft nor training was designed for the role. The 509th Fighter-Interceptor Squadron's Duces arrived at Da Nang Air Base, 4 August 1964 from Clark Air Base, Philippines. The interceptor was equipped with 24 2.75 in (70 mm) FFARs in the fuselage bay doors. These could be used to good effect against various types of North Vietnamese targets in daylight. At night it was less dangerous to use heat-seeking Falcon missiles in conjunction with the F-102's nose-mounted IRST (Infrared Search & Track) on nighttime harassment raids along the Ho Chi Minh trail.

Operations with both the F-102A and TF-102A two-seater (which was used in a Forward Air Control role because its two seats and 2.75 in/70 mm rockets offered good versatility for the mission) in Vietnam until 1968 when all F-102 aircraft were sent back to the United States.

In 1973, six aircraft were converted to target drones as QF-102A and later PQM-102 series, simulating MiG-21s, under project Pave Deuce. This began a program where hundreds of F-102s were converted for use as target drones for F-4 and F-106 aircraft as well as later F-15 aircraft and testing of the US Army's Patriot missile system. Some F-102As were configured to accommodate a single AIM-26 Super Falcon in each side bay in lieu of the two conventional AIM-4 Falcons.

The F-102 left US service in 1976. The last PQM-102 drone was expended in 1986. No F-102s remain in flyable condition today although many can be seen at museums.



MAPS F-102A, Serial Number 56-986

The MAPS F-102A (serial number 56-986) was manufactured by Convair Aircraft Corporation in San Diego, California and delivered to the United States Air Force on February 4, 1957.

Its first assignment was with the 317th Fighter-Interceptor Squadron (part of Air Defense Command – ADC) at McCord Air Force Base (AFB) in near Fort Lewis in the State of Washington. It was re-assigned to the 325th Fighter Group (ADC) also at McCord AFB in May of 1958. During this assignment, it was deployed to Tyndall AFB in Florida.

In May of 1960, 56-986 was sent to the San Antonio Air Material Area at Kelly AFB in Texas and then on to the Mobile Air Material Area at Brookley AFB in Alabama in June of 1960. After refit and upgrades, the aircraft was assigned to the 32nd Fighter-Interceptor Squadron (part of the United States Air Forces Europe – USAFE) at Camp New Amsterdam, Netherlands in November of 1960. While assigned to this station, the aircraft was deployed to Wheelus Air Base in Tripoli, Libya, Ramstein Air Base in Germany, Erding Air Base in Germany, and Torrejon Air Base in Spain.

Upon return to the Continental United States (CONUS), 56-986 was assigned to the 101st Fighter Group of the Maine Air National Guard at Dow Air Force Base in July of 1969. In November of that year, the airframe was re-assigned to the 125th Fighter Group (Air National Guard) located at Jacksonville Naval Air Station (NAS) in Florida.

On May of 1971, the aircraft was dropped from the Air Force inventory and transferred to the Florida Military Aviation

Museum in Clearwater, Florida. When the museum closed a few years later, the F-102 was disassembled and sent to a swampy field south of Winterhaven, Florida.

In the Fall of 2004, a MAPS team traveled to Winterhaven, Florida to prepare the Convair F-102A Delta Dagger (Serial # 51-986) along with a McDonnell F-101F Voodoo (Serial # 57-0342) and North American F-100D (Serial # 56-3081) back to MAPS. Disassembly started on November 12, 2004 with arrival on November 16, 2004. These three aircraft were provided through the U.S. Air Force Museum accreditation that was achieved late in 2002. This initial shipment contained primarily the fuselage sections of the airframes. Restoration started in June of 2005. Retrieval of the wings and other parts was delayed while funds were raised to defray movement costs. These parts were retrieved and moved to MAPS on December 16, 2006.

VARIANTS

YF-102

Prototypes. Non area-ruled fuselage. Powered by 14,500 lbf (64.5 kN) J57-P-11, two built.



The YF-102 with its straight sided fuselage.

YF-102A

Area-ruled prototypes. 16,000 lbf (71.2 kN) J57-P-23. Four converted from pre-production aircraft.

F-102A

Production Model. Initial eight pre-production aircraft built with non-area ruled fuselage. Remainder (879) with area ruled fuselage.



F-102A in the Cold War Gallery of the National Museum of the United States Air Force

TF-102A

Two-seat training version, 111 built.

F-102B

The original designation of the F-106A.

F-102C

Proposed tactical attack version with J57-P-47 engine.
Two converted as YF-102C engineering test beds.

QF-102A

Target drones converted from the F-102A. Six built.

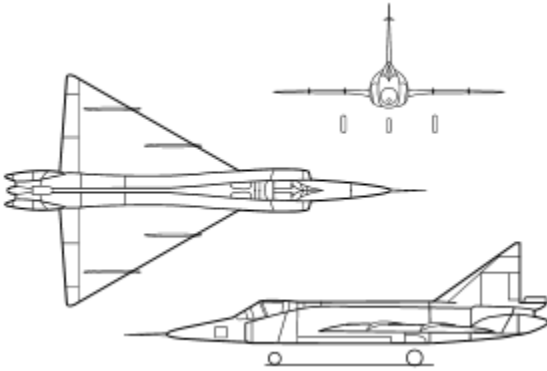
PQM-102A

Unpiloted target drones. 65 converted.

PQM-102B

Revised target drone conversion, capable of being flown remotely or by pilot in cockpit. 146 converted.

General characteristics (F-102A)



- **Crew:** 1
- **Length:** 68 ft. 4 in (20.83 m)
- **Wingspan:** 38 ft. 1 in (11.61 m)
- **Height:** 21 ft. 2 in (6.45 m)
- **Wing area:** 661.5ft²/61.52m² (*Original Wing*) or 695 ft²/64.57m² (*Conically-Cambered Wing*)
- **Airfoil:** NACA 0004-65 mod root and tip
- **Empty weight:** 19,350 lb. (8,777 kg)
- **Loaded weight:** 24,500 lb. (11,100 kg)
- **Max takeoff weight:** 31,500 lb. (14,300 kg)
- **Power plant:** 1 × Pratt & Whitney J57-P-25 afterburning turbojet
 - **Dry thrust:** 11,700 lbf (52.0 kN)
 - **Thrust with afterburner:** 17,200 lbf (76.5 kN)
- **Internal fuel capacity:** 1,085 US gal (4,107 l)
- **External fuel capacity:** 2 × 215 US gal (815 l) drop tanks

Performance

- **Maximum speed:** Mach 1.25 (825 mph, 1,304 km/h) at 40,000 ft. (12,190 m)
- **Range:** 1,350 mi (1,170 nm, 2,175 km)
- **Service ceiling:** 53,400 ft. (16,300 m)
- **Rate of climb:** 13,000 ft./min (66 m/s)

- **Wing loading:** 35 lb./ft² (172 kg/m²)
- **Thrust/weight:** 0.70

Armament

- **Rockets:** 24 × 2.75 in (70 mm) FFAR (Folding Fin Aerial Rocket) unguided rockets in missile bay doors
- **Missiles:**
 - 6 × AIM-4 Falcon air-to-air missiles *or*
 - 3 × AIM-4 Falcon
 - 1 × AIM-26 Falcon with conventional or nuclear warhead

Avionics

- MG-10 fire control system