

AIM-4 Falcon

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A pair of AIM-4D Falcons in the weapons bay of the F-102 Delta Dagger fighter

Specifications

Length	1.98 m (6 ft 6 in)
Diameter	163 mm (6.4 in)
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Warhead	3.4 kg (7.5 lb)
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Wingspan	508 mm (20.0 in)
Propellant	solid fuel rocket
Operational range	9.7 km (6.0 mi)
Speed	Mach 3
Guidance system	semi-active radar homing and rear-aspect infrared homing

The Hughes AIM-4 Falcon was the first operational guided air-to-air missile of the United States Air Force.

Development of a guided air-to-air missile began in 1946. Hughes Aircraft was awarded a contract for a subsonic missile under the project designation MX-798, which soon gave way to the supersonic MX-904 in 1947. The original purpose of the weapon was as a self-defense weapon for bomber aircraft, but after 1950 it was decided that it should arm fighter aircraft instead, particularly in the interception role.

The first test firings took place in 1949, at which time it was designated AAM-A-2 and given the popular name Falcon. A brief policy of awarding fighter and bomber designations to missiles led it to be redesignated F-98 in 1951. In 1955 the policy changed again, and the missile was again redesignated GAR-1.

The initial GAR-1 and GAR-2 models entered service in 1956. It armed the F-89 Scorpion, F-101B Voodoo and F-102 Delta Dagger interceptors. The only other users were Canada, Finland, Sweden and Switzerland, whose CF-101 Voodoo, Saab 35 Draken and Mirage IIIS carried the AIM-4 Falcon. Canada also hoped to use them on the CF-105 Arrow interceptor, which was never realized because of the Arrow's cancellation.

Fighters carrying the Falcon were often designed with internal weapons bays for carrying this missile. The Scorpion carried them on wingtip pods, while the Delta Dagger and Delta Dart had belly bays with a trapeze mechanism to move them into the airstream for launch (see picture above). The F-101B had an unusual bay arrangement where two were stored externally, and then the bay door would rotate to expose two more missiles. It is likely the F-111 internal bay would have accommodated the missile as well, but by the time of service, the Air Force had already dropped the Falcon for use against fighters, as well as the idea of using the F-111 as an air combat fighter.

The GAR-1 had semi-active radar homing (SARH), giving a range of about 5 miles (8 km). About 4,000 rounds were produced. It was replaced in production by the GAR-1D (later AIM-4A), with larger control surfaces. About 12,000 of this

variant were produced, the major production version of the SARH Falcon.

The GAR-2 (later AIM-4B) was a heat-seeker, generally limited to rear-aspect engagements, but with the advantage of being a 'fire and forget' weapon. As would also be Soviet practice, it was common to fire the weapon in salvos of both types to increase the chances of a hit (a heat-seeking missile fired first, followed moments later by a radar-guided missile). The GAR-2 was about 1.5 in (40 mm) longer and 16 lb (7 kg) heavier than its SARH counterpart. Its range was similar. It was replaced in production by the GAR-2A (later AIM-4C), with a more sensitive infrared seeker. A total of about 26,000 of the infrared-homing Falcons were built.



119th Fighter Wing weapons handlers with an AIM-4C, 1972.

All of the early Falcons had a small 7.6 lb (3.4 kg) warhead, limiting their lethal radius. Also limiting them tactically was the fact that Falcon lacked a proximity fuse: the fusing for the missile was in the leading edges of the wings, requiring a direct hit to detonate.

In 1958 Hughes introduced a slightly enlarged version of the Falcon, initially dubbed Super Falcon, with a more powerful, longer-burning rocket engine, increasing speed and range. It had a larger warhead (28.7 lb / 13 kg) and better guidance systems. The SARH versions were GAR-3 (AIM-4E) and the improved GAR-3A (AIM-4F). The infrared version was the GAR-4A (AIM-4G). About 2,700 SARH missiles and 3,400 IR Super

Falcons were produced, replacing earlier versions of the weapon in service.

The Falcon was redesigned Ted AIM-4 in September 1962.

The final version of the original Falcon was the GAR-2B (later AIM-4D), which entered service in 1963. This was intended as a fighter combat weapon, combining the lighter, smaller airframe of the earlier GAR-1/GAR-2 weapon with the improved IR seeker of the GAR-4A/AIM-4G.

A larger version of the Falcon carrying a 0.25-kiloton nuclear warhead was developed as the GAR-11 (later designated the AIM-26 Falcon), while a long-range version was developed for the XF-108 Rapier and the Lockheed YF-12 interceptors as the GAR-9 (later AIM-47 Falcon).

The USAF deployed AIM-4 in May 1967 during the Vietnam War on the new F-4D Phantom II, which carried it on the inner wing pylons and was ostensibly not wired to carry the Navy-designed AIM-9 Sidewinder. The missile's combat performance was very poor. The Falcon, already operational on Air Defense Command aircraft, was designed to be used against bombers and its slow seeker cooling times requiring as much as 6 to 7 seconds to obtain a lock on a target rendered it largely ineffective against maneuvering fighters. Moreover it could only be cooled once. Limited coolant supply meant that once cooled, the missile would expend its supply of liquid nitrogen in two minutes, rendering it useless on the rail. The missile also had a small warhead, and lacked proximity fusing. As a result, only five kills were scored, all with the AIM-4D version. (The Falcon was also experimentally fired by the F-102 Delta Dagger against ground targets at night using its infrared seeker.)



A New Jersey ANG F-106A launching an AIM-4, 1984.

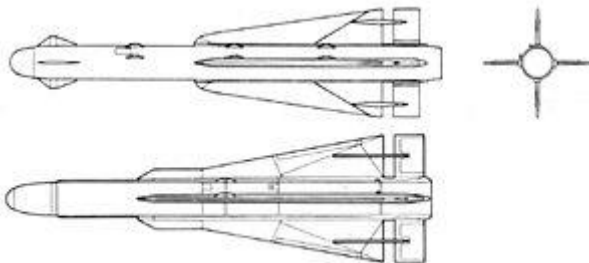
The weapon was unpopular with pilots from the onset and was formally withdrawn in 1969, to be replaced in the F-4D by the Sidewinder after retrofitting the proper wiring.

An effort to address the limitations of AIM-4D led to the development in 1970 of the XAIM-4H, which had a laser proximity fuse, new warhead, and better maneuverability. It was cancelled the following year without entering service.

The AIM-4F/AIM-4G Super Falcon remained in USAF and ANG service, primarily with F-102 Delta Dagger and F-106 Delta Dart interceptors, until the final retirement of the F-106 in 1988.

The AIM-4C was also produced as the HM-58 for the Swiss Air Force for use on Dassault Mirage IIIS, and the Swedish Air Force (as the Rb 28) for the Saab 35 Draken.

Specifications (GAR-1D/ -2B / AIM-4C/D)



Hughes AIM-4A and AIM-4G Falcon

- Length: 78 in (2.0 m) / 79.5 in (2.02 m)
- Wingspan: 20 in (510 mm)
- Diameter: 6.4 in (160 mm)
- Weight: 119 lb (54 kg) / 135 lb (61 kg)
- Speed: Mach 3
- Range 6 mi (9.7 km)
- Guidance: semi-active radar homing / rear-aspect infrared
- Warhead: 7.6 lb (3.4 kg) high explosive