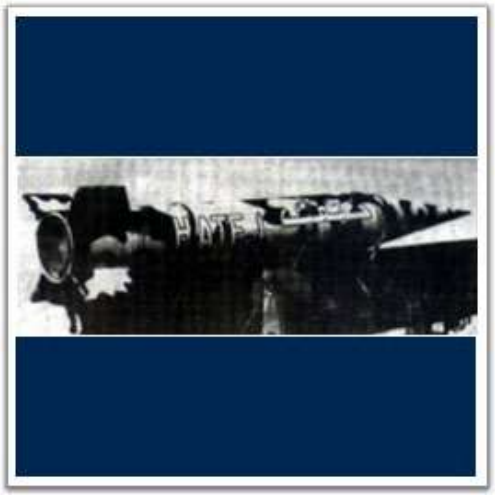
NUCLEAR WEAPONS DATABASE
Pakistani Nuclear Delivery Systems

Land-Based Strategic Weapons

Hatf-1

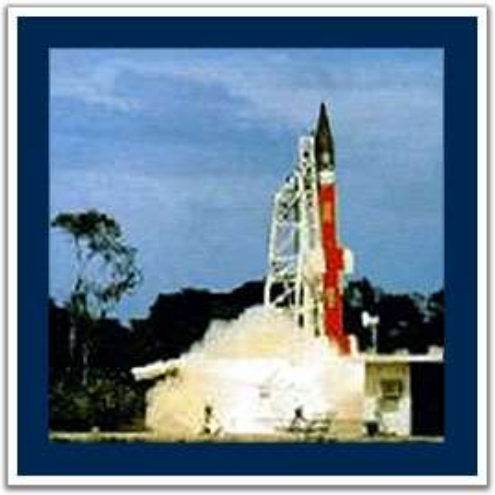


- Year Deployed: ~1995
- Dimensions: 6.0 meters length, 0.55 meters diameter
- Weight: 1,500 kilograms
- Propulsion: Solid propellant
- Throw-weight: 500 kilograms
- Range: 80 kilometers
- Guidance: Inertial
- Circular Error Probable: Unknown
- Warhead: Single
- Yield: Conventional, chemical, or nuclear possible
- Locations: Unknown
- Number Deployed: 18 missiles
- Primary Contractor: Unknown

The Hatf-1 (which means "Deadly" in Pakistani) is a short-range ballistic missile. The missile's development began in the early 1980s, reportedly with China's aid, though Pakistan maintains it was produced without outside assistance. However, the Hatf missiles resemble the Chinese M-series missiles, so technical aid seems likely. Little is known about the missile or its role. It is likely that Pakistan's nuclear warheads are allocated to its longer-range missiles, the Ghauris, or Haft-5 and Haft-6, and the Shaheen 1 and 2.

Hatf-2

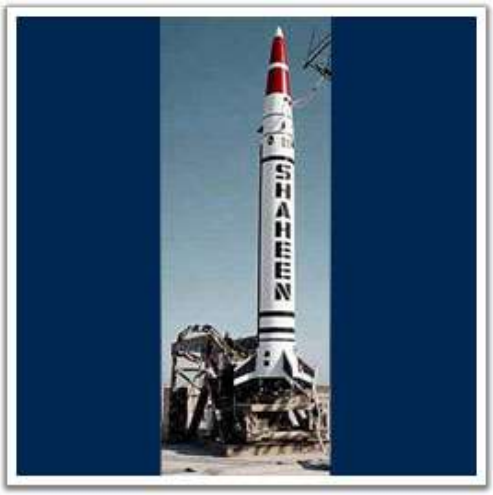
- Year Deployed: Testing
- Dimensions: 9.75 meters length, 0.82 meters diameter
- Weight: 5,500 kilograms
- Propulsion: Two stage solid propellant
- Throw-weight: 500 kilograms
- Range: 300 kilometers
- Guidance: Inertial
- Circular Error Probable: Unknown
- Warhead: Single
- Yield: Conventional, chemical, or nuclear possible
- Locations: Unknown
- Number Deployed: 1 missiles
- Primary Contractor: Unknown



The Hatf-2 missile was apparently developed in tandem with the Hatf-1 in the early 1980s, possibly with Chinese aid. There was some confusion as to the name of the program, and it may have also been referred to as the Shadoz (King Hawk). The two Hatf missile variants were revealed in 1989. Little information is available on deployment. Both stages of the Hatf-2 are believed to have solid propellant. It is reportedly a mobile system, but it is carried on converted World War-II-era antiaircraft gun trailers instead of modern transporter erector vehicles. The Hatf-2 is similar to the Chinese M-series missiles, reinforcing the allegations of Chinese technical aid with the Pakistani ballistic missile program. In particular, the mastery of the more advanced solid-fuel technology — which the Chinese are now fielding after years of development — points to covert Chinese assistance.

A follow-on Hatf-3, perhaps with a range of 600 kilometers, may be under development, but this is unconfirmed. This would build on the experience of the SUPARCO multi-stage space launch vehicle, which launched a 150 kilogram payload to an altitude of 480 kilometers in 1989. However, it appears that development of Haft-3 has been superceded by other efforts, and the missile will not be deployed.

Hatf-4 (Sheehan 1 or Eagle)

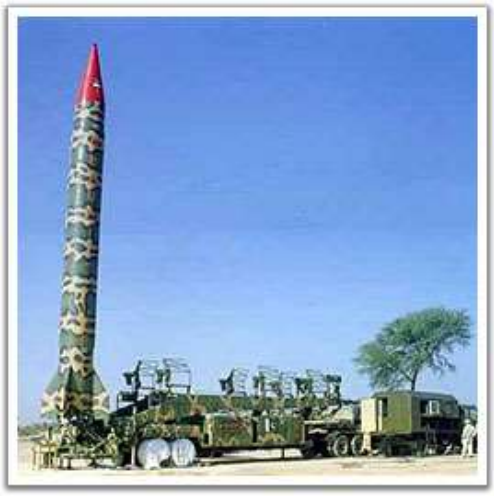


- Year Deployed: 2000
- Dimensions: 9 meters length, 1 meter diameter
- Weight: 6200 kilograms
- Propulsion: Single-stage solid propellant
- Throw-weight: 1,000 kilograms
- Range: 750 kilometers
- Guidance: Inertial
- Circular Error Probable: Unknown
- Warhead: Single
- Yield: Conventional, chemical, or nuclear
- Locations: Unknown
- Number Deployed: 20 missiles

The Shaheen is a single stage solid-fuel missile. It is believed that it was reversed-engineered from the Chinese M-9 missile, probably with Chinese technical assistance. It was test fired in April 1999 and February 2000 to a range of more than 600 kilometers. Pakistan's ballistic missile program supposedly follows two parallel tracks. The Khan Research Laboratories developed the Ghauri, while the Shaheen is the work of the Pakistan Atomic Energy Commission. The Shaheen project is directly managed by the National Defense Complex, a subsidiary of the Pakistan Atomic Energy Commission. To an extent, development of delivery vehicles may be driven by competition between the two institutions. Unlike the liquid-fueled Ghauri, the Shaheen uses solid fuel. Solid fuel can be left in the missile indefinitely, unlike liquid fuel, and therefore dramatically decreases the time it takes to launch the missile, heightening deterrence.

Pakistan is also developing a two-stage longer-range version of Shaheen, the Shaheen-2, which may also be called the Haft-7. Its range is estimated to approach 2,500 kilometers and it was displayed at the Pakistan Day parade in March 2000. Both versions of the Shaheen are carried on mobile launchers. It is not clear whether the Shaheen-2 has been tested or equipped to carry nuclear weapons, but both developments are likely.

Hatf-5 (Ghuari)



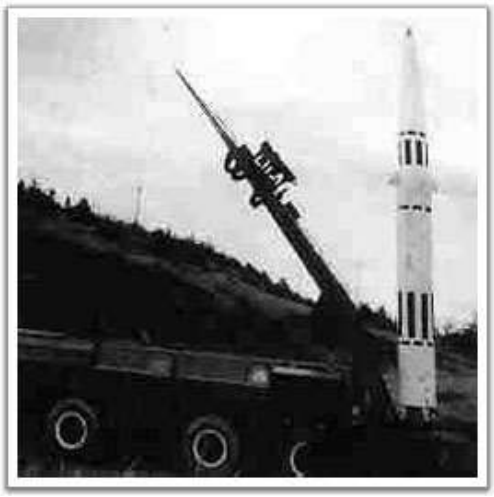
- Year Deployed: 1998
- Dimensions: 16 meters length, 1.35 meters diameter
- Weight: 16,000 kilograms
- Propulsion: Single-stage liquid
- Throw-weight: 700 kilograms
- Range: 1300-1500 kilometers
- Guidance: Inertial, with terminal guidance
- Circular Error Probable: Unknown
- Warhead: Single
- Yield: Conventional, chemical, or nuclear
- Locations: Unknown
- Number Deployed: 5-10
- Primary Contractor: Khan Research Laboratories

Named for a 12th century Afghan king who won territory by defeating the Indian Prithvi Rag Chauhan (Prithvi is the name of an Indian ballistic missile), the Ghauri (Haft-5) marks an upgrade over previous missiles, allowing Pakistan to reach deep into India with heavier payloads.

Development of the missile began in 1993 in cooperation with North Korea. The Ghauri is similar to the North Korean No Dong missile, although Pakistani President Pervez Musharaff insists that Pakistan develops all its missiles indigenously. The Ghauri was flight tested in April 1998 and traveled 1,100 km. Shortly thereafter, Pakistan announced its ability to equip the Ghauri with nuclear warheads.

Following an Indian test of its Agni missile in April 1999, Pakistan test fired a Ghauri-2 (Haft-6) missile. Although the missile traveled only 1,100 kilometers to hit its target, the limit was likely imposed by Pakistan's territorial boundaries. The Ghauri-2's range has been estimated at up to 2,300 kilometers. Because of their liquid-fuel and consequent long preparation time before a launch, the versions of the Ghauri may be vulnerable to Indian strikes. Additionally, a Ghauri-3 missile is under development. Pakistan reportedly envisions a range of approximately 3,000 kilometers for it.

M-11 (CSS-7)



- Year Deployed: 1992
- Dimensions: Unknown
- Weight: Unknown
- Propulsion: Two stage solid
- Throw-weight: 800 kilograms
- Range: 300 kilometers
- Guidance: Inertial, with terminal guidance
- Circular Error Probable: Unknown
- Warhead: Single
- Yield: Conventional, chemical, or nuclear possible
- Locations: Sargodha Air Force Base (reportedly stored in crates)
- Number Deployed: 40 missiles
- Primary Contractor: First Academy of the Ministry of Aero-Space Industry (China)

The Chinese M series of tactical short-range ballistic missiles began development in the early 1980s. Three versions are known, the M-9, M-11, and M-18 -- the M designations are used for the export versions. The Pakistanis reportedly have purchased the M-11 (which the Chinese refer to as the Dong Feng-11). The missile was first revealed at a Chinese exhibition in 1988, and was displayed with a transporter erector vehicle similar to that used with the M-9 (DF-15). The M-11 has two solid fueled stages as well as terminal guidance, which provides increased accuracy and a range of 300 kilometers.

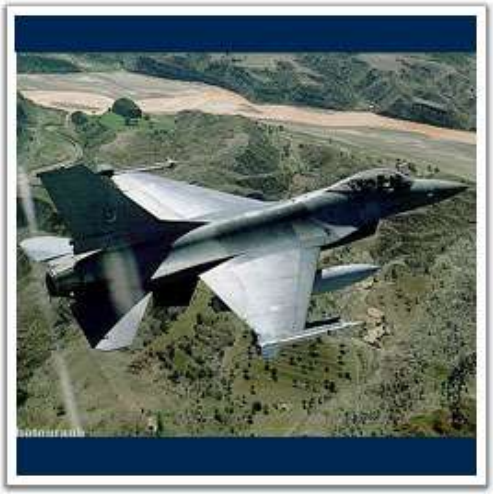
A series of press leaks of U.S. intelligence community findings lend credence to the claims of the Pakistani M-11 sales. The intelligence community has claimed since 1992 that China

sold more than 30 missiles to Pakistan, despite denials by both governments. The missiles are allegedly stored in crates at Pakistan's Sargodha Air Force Base. The most recent leak claims "high confidence" that the missiles are in Pakistan, and that Pakistan has finished developing warheads for the missiles. U.S. intelligence agencies are almost unanimous in the belief that Pakistan could assemble the missiles within a few days. Chinese experts have reportedly trained the Pakistani unit assigned to fire the missiles.

Pakistan may be using the M-11 to reverse engineer its own missile, the Tarmuk. It is uncertain whether the M-11 has nuclear capacity, but in order to fit nuclear warheads to the missile Pakistan would likely require Chinese help.

Air-Based Strategic Weapons

F-16 Falcon



- Year Deployed: 1983
- Dimensions: 15.03 meters length, 5.09 meters height, 9.45 meters wingspan
- Weight: empty - 8,273 kilograms, maximum takeoff - 19,187 kilograms
- Propulsion: F-16A-10 - F100PW200, F-16C-30 - F110GE100A, F-16C-40 - F110GE100
- Range: (hi-lo-lo-hi) 1600 kilometers
- Speed: Mach 2+
- Maximum Loadout: 1 fuselage hardpoint, 6 wing hardpoints, two wingtip air-to-air missile mounts -- carries various munitions, including nuclear gravity bombs
- Weapon Load: 4,500 kilograms
- Locations: Squadrons 9, 11 and 4
- Number Deployed: 32 aircraft
- Primary Contractor: Lockheed (General Dynamics)

The F-16 Fighting Falcon has been a very successful American fighter, produced in great numbers (approximately 4,000 aircraft) and widely exported. The design goal was to produce a capable, but inexpensive multi-role fighter. The A and C versions are single seat, while the B and D versions have two seats. The F-16 is a flexible design, capable of high performance in both the air superiority and ground attack roles. The flight controls are digital computer-controlled fly-by-wire, complemented by advanced navigation and avionics systems.

Given that the F-16 is undoubtedly the most capable Pakistani attack aircraft, it would likely be tasked with the delivery of nuclear air-to-ground munitions.. Pakistan also has other attack aircraft such as the Mirage III and Mirage 5, but given the few bombs in their arsenal, the F-16 would probably be the only aircraft to have a nuclear role.

The United States had agreed to sell Pakistan another 28 F-16s, but subsequently refused to export them. The United States has withheld these aircraft because of Pakistan's nuclear capability; in 1989 President George H.W. Bush declared that the United States could no longer verify that Pakistan did not have nuclear weapons, and was therefore required by law (the so-called Pressler amendment) to halt all military aid to Pakistan. In the wake of the Sept. 11 attacks, President George W. Bush waived the Pressler amendment. Six months later, however, the aircraft had still not been released, perhaps owing to pressure by India.

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