

VII. Pakistani nuclear forces

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Pakistan continues to prioritize the development and deployment of new nuclear weapons and delivery systems as part of its ‘full spectrum deterrence posture’ vis-à-vis India.¹ It is estimated that Pakistan possessed approximately 160 nuclear warheads as of January 2020 (see table 10.8). Pakistan’s nuclear weapon arsenal is likely to continue to expand over the next decade, although projections vary considerably.²

Pakistan is believed to be gradually increasing its military fissile material holdings, which include both weapon-grade plutonium and highly enriched uranium (see section X).³

Aircraft

The aircraft that are most likely to have a nuclear delivery role are the Pakistan Air Force’s (PAF) Mirage III and Mirage V aircraft. The Mirage III has been used for developmental test flights of the nuclear-capable Ra’ad (Hatf-8) air-launched cruise missile (ALCM; see below), while the Mirage V is believed to have been given a strike role with nuclear gravity bombs.⁴ The PAF currently operates about 160 Mirage aircraft, of which approximately 120 are fighter-bombers.⁵ According to reports in 2019, Pakistan plans to buy an additional 36 Mirage V aircraft from Egypt.⁶

The nuclear capability of Pakistan’s F-16 fighter-bombers is unclear but many analysts continue to assign a potential nuclear role to the aircraft (see box 10.1).⁷ In the light of this, the table in this edition of the Yearbook has been updated: Pakistan’s F-16s are listed as having a potential nuclear role but the nuclear weapons carried by airborne nuclear forces are assigned to Mirage aircraft.

¹ For a detailed assessment of Pakistan’s nuclear posture see Tasleem, S. and Dalton, T., ‘Nuclear emulation: Pakistan’s nuclear trajectory’, *Washington Quarterly*, vol. 41, no. 4 (winter 2019), pp. 135–55.

² See e.g. Sundaresan, L. and Ashok, K., ‘Uranium constraints in Pakistan: How many nuclear weapons does Pakistan have?’, *Current Science*, vol. 115, no. 6 (25 Sep. 2018); and Salik, N., ‘Pakistan’s nuclear force structure in 2025’, Carnegie Endowment for International Peace, Regional Insight, 30 June 2016.

³ For further detail on Pakistan’s plutonium production and uranium enrichment facilities see Kile, S. N. and Kristensen, H. M., ‘Pakistani nuclear forces’, *SIPRI Yearbook 2019*, pp. 332–33.

⁴ Kerr, P. and Nikitin, M. B., *Pakistan’s Nuclear Weapons*, Congressional Research Service (CRS) Report for Congress RL3248 (US Congress, CRS: Washington, DC, 1 Aug. 2016), p. 7.

⁵ International Institute for Strategic Studies, *The Military Balance 2019* (Routledge: London, 2019), pp. 298–99.

⁶ *News International*, ‘Pakistan to buy 36 Mirage V jets from Egypt’, 5 Sep. 2019.

⁷ See e.g. International Institute for Strategic Studies (note 5), p. 297.

Box 10.1. The uncertain nuclear capability of Pakistan's F-16s

Pakistan procured 40 F-16A/B aircraft from the United States between 1983 and 1987. In 1989 the US Department of Defense assured the US Congress that Pakistan did not have the capability to convert the aircraft to deliver nuclear weapons, even though experts at US nuclear weapon laboratories and the Central Intelligence Agency reportedly concluded that the F-16s could carry a nuclear payload with relatively minor modifications that were well within the capabilities of Pakistani technicians. In 1990 the USA cancelled the sales of additional F-16s to Pakistan in response to Pakistan's ongoing development of nuclear weapons. At the time, Western intelligence sources stated that Pakistan, 'in violation of agreements with Washington, is busily converting US-supplied F-16 fighter planes ... into potential nuclear-weapons carriers'.^a In 1993 the US National Security Council informed the US Congress that 'Currently, Pakistan probably would rely on its F-16 fighters, and possibly Mirage III and V aircraft' for a nuclear mission.^b

In 2006 the USA controversially decided to restart sales of F-16s to Pakistan, apparently under tightened use requirements. During a congressional hearing in 2006, the US State Department gave an assurance that 'The F-16s we are giving them ... will not be nuclear capable'.^c In response to concerns that it might be possible for Pakistan to equip the F-16s with its own technology to deliver Pakistani nuclear weapons, the US State Department stated that a new security programme involving US personnel on the ground in Pakistan would make it difficult for Pakistan to convert the aircraft in secret. Extension of the onsite security programme was most recently authorized by the US State Department in July 2019.

The mechanisms under the security programme were triggered in 2019 after India complained that Pakistan had used an F-16 to shoot down one of its aircraft during a border dispute. The US Government subsequently reprimanded Pakistan for violating the conditions of use, which are to operate the F-16s and their USA-produced air-defence missiles at the Mushaf and Shahbaz air bases only for counterterror operations. It is unclear whether the restrictions also cover the original 40 F-16s acquired by Pakistan in the 1980s, but the aircraft have since been upgraded and might therefore be covered.

Whether the restrictions make it impossible for Pakistan to use some of the F-16s in a nuclear role is uncertain. However, it is possible that they might have prompted Pakistan to focus the nuclear mission on its Mirage aircraft, which do not appear to be subject to similar user restrictions.

^a US Senate, Congressional Record, 20 Sep. 1995, p. S 13966.

^b US National Security Council, 'Report to Congress on status of China, India and Pakistan nuclear and ballistic missile programs', July 1993, p. 7.

^c US House of Representatives, Committee on International Relations, 'Proposed sale of F-16 aircraft and weapons systems to Pakistan', Serial no. 109-220, 20 July 2006, p. 41.

Sources: US National Security Council, 'Report to Congress on status of China, India and Pakistan nuclear and ballistic missile programs', July 1993; US Senate, Congressional Record, 20 Sep. 1995; US House of Representatives, Committee on International Relations, 'Proposed sale of F-16 aircraft and weapons systems to Pakistan', Serial no. 109-220, 20 July 2006; Frantz, D. and Collins, C., *The Nuclear Jihadist: The True Story of the Man Who Sold the World's Most Dangerous Secrets ... and How We Could Have Stopped Him* (Hachette Book Group: New York, 2007), pp. 162-80; US Department of Defense, Defense Security Cooperation Agency, 'Pakistan: Technical Security Team (TST) in continued support of F-16 program', News Release no. 19-29, 26 July 2019; and Shinkman, P. D., 'State Department reprimanded Pakistan for misusing F-16s, document shows', US News and World Report, 11 Dec. 2019.

Pakistan is acquiring a significant number of JF-17 aircraft, jointly developed with China, to replace the ageing Mirage aircraft. Pakistan currently operates about 100 JF-17s in four to six squadrons, with upgraded aircraft being added.⁸ Initial reports on upgrades to the JF-17 suggested that the PAF aimed to integrate the dual-capable Ra'ad ALCM onto the aircraft, but more recent reports on upgrades have not mentioned the weapon.⁹

The Ra'ad ALCM is intended to provide the PAF's fighter-bombers with a standoff nuclear capability. It has been flight tested seven times since 2007. The last reported flight test was in 2016.¹⁰ An improved version, the Ra'ad-II, was displayed for the first time in 2017 and is reported to have a range of 600 kilometres. The Ra'ad-II appears to have new engine air-intake and tail-wing configurations.¹¹

Land-based missiles

Pakistan is expanding its nuclear-capable ballistic missile arsenal, which consists of short- and medium-range systems (see table 10.8). It currently deploys the Abdali (also designated Hatf-2), the Ghaznavi (Hatf-3), Shaheen-I (Hatf-4) and Nasr (Hatf-9) solid-fuelled, road-mobile short-range ballistic missiles. An extended-range version of the Shaheen-I, the Shaheen-IA, is still in development. The Ghaznavi, Nasr and Shaheen-I were all test launched in 2019.¹²

The arsenal currently includes two types of medium-range ballistic missile: the liquid-fuelled, road-mobile Gauri (Hatf-5), with a range of 1250 km; and the two-stage, solid-fuelled, road-mobile Shaheen-II (Hatf-6) with a range of 2000 km.¹³ The Shaheen-II was test launched in May 2019.¹⁴ A longer-range variant, the Shaheen-III, is currently in development but

⁸ Khan, B., 'Pakistan inches closer to inducting the JF-17 Block 3', Quwa Defence News and Analysis Group, 1 July 2019; Waldron, G., 'Paris: JK-17 Block III to have first flight by year-end', Flight Global, 20 June 2019; and International Institute for Strategic Studies (note 5), pp. 298–99.

⁹ Fisher, R., 'JF-17 Block II advances with new refuelling probe', *Jane's Defence Weekly*, 27 Jan. 2016.

¹⁰ Pakistan Inter Services Public Relations, Press Release PR-16/2016-ISPR, 19 Jan. 2016.

¹¹ Pakistan Inter Services Public Relations, 'Pakistan conducted successful flight test of air launched cruise missile "Ra'ad-II"', Press Release PR-27/2020-ISPR, 18 Feb. 2020.

¹² Pakistan Inter Services Public Relations, 'Pakistan today conducted another successful launch of short range surface to surface ballistic missile "Nasr"', Press Release PR-37/2019-ISPR, 31 Jan. 2019; Pakistan Inter Services Public Relations, 'Pakistan successfully carried out night training launch of surface to surface ballistic missile Ghaznavi, capable of delivering multiple types of warheads up to a range of 290 kilometers', Press Release PR-156/2019-ISPR, 29 Aug. 2019; and Pakistan Inter Services Public Relations, 'Pakistan today successfully conducted training launch of surface to surface ballistic missile Shaheen-1', Press Release PR-194/2019-ISPR, 18 Nov. 2019.

¹³ US Air Force, National Air and Space Intelligence Center (NASIC), *Ballistic and Cruise Missile Threat* (NASIC: Wright-Patterson Air Force Base, OH, July 2017), p. 25.

¹⁴ Pakistan Inter Services Public Relations, 'Pakistan conducted successful training launch of surface to surface ballistic missile Shaheen-II', Press Release PR-104/2019-ISPR, 23 May 2019.

Table 10.8. Pakistani nuclear forces, January 2020

Type (US/Pakistani designation)	Launchers deployed	Year first deployed	Range (km) ^a	Warheads x yield ^b	No. of warheads ^c
<i>Aircraft</i>	36				36
F-16A/B ^d	..	1998	1 600	1 x bomb	..
Mirage III/V	36	1998	2 100	1 x bomb or Ra'ad ALCM ^e	36
<i>Land-based missiles</i>	120 ^f				120
Abdali (Hatf-2)	10	2015	200	1 x 5–12 kt	10
Ghaznavi (Hatf-3)	16	2004	300	1 x 5–12 kt	16
Shaheen-I (Hatf-4)	16	2003	750	1 x 5–12 kt	16
Shaheen-IA (Hatf-4) ^g	..	[2020]	900	1 x 5–12 kt	..
Shaheen-II (Hatf-6)	18	2014	2 000	1 x 10–40 kt	18
Shaheen-III (Hatf-.) ^h	..	[2022]	2 750	1 x 10–40 kt	..
Ghauri (Hatf-5)	24	2003	1 250	1 x 10–40 kt	24
Nasr (Hatf-9)	24	2013	70	1 x 5–12 kt	24
Ababeel (Hatf-.)	2 200	MIRV or MRV	.. ⁱ
Babur GLCM (Hatf-7)	12	2014	350 ^j	1 x 5–12 kt	12
Babur-2 GLCM (Hatf-.) ^k	700	1 x 5–12 kt	..
<i>Sea-based missiles</i>					
Babur-3 SLCM (Hatf-.)	0	.. ^l	450	1 x 5–12 kt	0
<i>Other stored warheads^m</i>					4
Total	156				160^m

.. = not available or not applicable; [] = uncertain figure; ALCM = air-launched cruise missile; GLCM = ground-launched cruise missile; kt = kiloton; MIRV = multiple independently targetable re-entry vehicle; MRV = multiple re-entry vehicle; SLCM = sea-launched cruise missile.

^a Aircraft range is for illustrative purposes only; actual mission range will vary according to flight profile and weapon loading. Missile payloads may have to be reduced in order to achieve maximum range.

^b The yields of Pakistan's nuclear warheads are not known. The 1998 nuclear tests demonstrated a yield of up to 12 kt. Since then, it is possible that boosted warheads have been introduced with higher yields. There is no open-source evidence that Pakistan has developed two-stage thermonuclear warheads.

^c Aircraft and several missile types are dual capable. Cruise missile launchers carry more than 1 missile. This estimate counts an average of 1 warhead per launcher. Warheads are not deployed on launchers but kept in separate storage facilities.

^d There are unconfirmed reports that some of the 40 F-16 aircraft procured from the USA in the 1980s were modified by Pakistan for a nuclear weapon delivery role (see box 10.1). However, it is assumed here that the nuclear weapons carried by airborne nuclear forces are assigned to Mirage aircraft.

^e The Ra'ad (Hatf-8) ALCM has a declared range of 350 km and an estimated yield of 5–12 kt. However, there is no available evidence to suggest that the Ra'ad has been deployed. In 2017 the Pakistani military displayed a Ra'ad-II variant with a reported range of 600 km. It is estimated here that the new version might be deployed in around 2021 in place of the original version.

^f Some launchers might have 1 or more reloads of missiles.

^g It is unclear whether the Shaheen-IA has the same designation as the Shaheen-I.

^h The designation for the Shaheen-III is unknown.

ⁱ According to the Pakistani military, the missile is 'capable of delivering multiple warheads', using MIRV technology.

^j The Pakistani Government claims the range is 700 km, double the range reported by the US Air Force National Air and Space Intelligence Center (NASIC).

^k The Babur-2, which was first test launched on 14 Dec. 2016, is an improved version of the original Babur GLCM and will probably replace it.

^l The first test launch of a Babur-3 SLCM was carried out from an underwater platform on 9 Jan. 2017.

^m In addition to the c. 156 warheads estimated to be assigned to operational forces, a small number of additional warheads are thought to have been produced (or be in production) to arm future Shaheen-III and cruise missiles, for a total estimated stockpile of c. 160 warheads. Pakistan's warhead inventory is expected to continue to increase.

Sources: Pakistani Ministry of Defence; various documents; US Air Force, National Air and Space Intelligence Center (NASIC), *Ballistic and Cruise Missile Threat* (NASIC: Wright-Patterson Air Force Base, OH, July 2017); International Institute for Strategic Studies, *The Military Balance 2019* (Routledge: London, 2019); *Bulletin of the Atomic Scientists*, 'Nuclear notebook', various issues; and authors' estimates.

has been test launched once—in 2015.¹⁵ The missile has a declared range of 2750 km, making it the longest-range system to be tested by Pakistan to date. A variant of the Shaheen-III, the Ababeel, which is possibly equipped with multiple independently targetable re-entry vehicle (MIRV) technology, is also in development. It was last test launched in 2017.¹⁶

In addition to expanding its arsenal of land-based ballistic missiles, Pakistan continues to develop the nuclear-capable Babur (Hatf-7) ground-launched cruise missile. The Babur has been test launched at least 12 times since 2005 and has been used in army field training since 2011. An extended-range version, which is known as Babur-2 and sometimes referred to as Babur Weapon System-1 (B), has a claimed range of 700 km, as against the 350-km range of the original version. It was first test launched in 2016 and was tested for a second time in 2018.¹⁷

Sea-based missiles

As part of its efforts to achieve a secure second-strike capability, Pakistan is seeking to create a nuclear triad by developing a sea-based nuclear force. The Babur-3 submarine-launched cruise missile (SLCM) appears to be intended to develop a nuclear capability for the Pakistan Navy's three diesel-electric

¹⁵ Pakistan Inter Services Public Relations, 'Shaheen 3 missile test', Press Release PR-61/2015-ISPR, 9 Mar. 2015.

¹⁶ For further detail on the Ababeel see Kile and Kristensen (note 3), p. 335.

¹⁷ Pakistan Inter Services Public Relations, 'Pakistan today conducted a successful test of an enhanced range version of the indigenously developed Babur cruise missile', Press Release PR-142/2018-ISPR, 14 Apr. 2018.

Agosta class submarines.¹⁸ The Babur-3 was first test launched in 2017 and was tested for a second time in 2018.¹⁹

Pakistan has ordered eight air-independent propulsion-powered conventional submarines from China, the first of which is expected to be delivered in 2022. It is possible that these submarines, known as the Hangor class, might also be given a nuclear role with the Babur-3 SLCM.²⁰

¹⁸ Panda, A. and Narang, V., 'Pakistan tests new sub-launched nuclear-capable cruise missile. What now?', *The Diplomat*, 10 Jan. 2017.

¹⁹ Pakistan Inter Services Public Relations, 'Pakistan conducted another successful test fire of indigenously developed submarine launched cruise missile Babur having a range of 450 kms', Press Release PR-125/2018-ISPR, 29 Mar. 2018.

Reports of a ship-launched cruise missile test in 2019 might have been for a different missile. Gady, F. S., 'Pakistan's navy test fires indigenous anti-ship/land-attack cruise missile', *The Diplomat*, 24 Apr. 2019.

²⁰ Khan, B., 'Profile: Pakistan's new Hangor submarine', *Quwa Defence News and Analysis Group*, 11 Nov. 2019.