

VII. Pakistani nuclear forces

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According to SIPRI estimates, Pakistan possessed approximately 165 nuclear warheads as of January 2022, around the same number as the previous year (see table 10.8). The Pakistani government has never publicly disclosed the size of its nuclear arsenal. Limited official public data and widespread exaggerated news stories about Pakistan's nuclear weapons mean that analysing the number and types of Pakistani warheads and delivery vehicles is fraught with uncertainty.¹ The estimates in this section are based on the authors' analysis of Pakistan's nuclear posture, fissile material production, public statements by Western officials, and private conversations with Pakistani officials. The development of several new delivery systems and growing accumulation of fissile materials suggests that Pakistan's nuclear weapon arsenal and fissile material stockpile are likely to continue to expand over the next decade, although projections vary considerably.²

The role of nuclear weapons in Pakistani military doctrine

Pakistan has been pursuing the development and deployment of new nuclear weapons and delivery systems as part of its 'full spectrum deterrence posture' in relation to India.³ According to Pakistan, its full spectrum nuclear weapon posture includes long-range missiles and aircraft as well as several short-range, lower-yield nuclear-capable weapon systems.⁴ Pakistan's emphasis on non-strategic (tactical) nuclear weapons is specifically intended to be a reaction to India's 'Cold Start' doctrine, which revolves around maintaining the capability to launch large-scale conventional strikes or incursions against Pakistani territory at a level below the threshold at which Pakistan would

¹ Kristensen, H. M. and Korda, M., 'Estimating world nuclear forces: An overview and assessment of sources', SIPRI Topical Backgrounder, 14 June 2021.

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); Salik, N., 'Pakistan's nuclear force structure in 2025', Regional Insight, Carnegie Endowment for International Peace, 30 June 2016; and Jones, G. S., 'Pakistan's nuclear material production for nuclear weapons', Proliferation Matters, 16 Feb. 2021. See also Berrier, S., Director, US Defense Intelligence Agency, 'Worldwide threat assessment', Statement for the record, US Senate Armed Services Committee, 26 Apr. 2021. On Pakistan's fissile material stockpile see Kile, S. N. and Kristensen, H. M., 'Pakistani nuclear forces', *SIPRI Yearbook 2019*; International Panel on Fissile Materials, 'Pakistan', 31 Aug. 2021; and section X of this chapter.

³ Kidwai, K., Keynote address and discussion session, South Asian Strategic Stability: Deterrence, Nuclear Weapons and Arms Control (Workshop), International Institute for Strategic Studies (IISS) and Centre for International Strategic Studies (CISS), 6 Feb. 2020. 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).

⁴ Pakistani Inter Services Public Relations (ISPR), Press release no. PR-94/2011-ISPR, 19 Apr. 2011.

retaliate with nuclear weapons.⁵ In 2015 a retired member of Pakistan's National Command Authority suggested that 'by introducing the variety of tactical nuclear weapons in Pakistan's inventory', Pakistan has 'blocked the avenues for serious military operations by the other side'.⁶ In June 2021 Pakistani Prime Minister Imran Khan stated in an interview, 'I'm not sure whether we're growing [the nuclear arsenal] or not because as far as I know ... the only one purpose [of Pakistan's nuclear weapons]—it's not an offensive thing', further noting that 'Pakistan's nuclear arsenal is simply as a deterrent, to protect ourselves'.⁷

Aircraft and air-delivered weapons

At the end of December 2021, Pakistan had a small stockpile of gravity bombs. Two versions of the Ra'ad (Hatf-8) air-launched cruise missile (ALCM) were being developed to supplement this stockpile by providing the Pakistan Air Force (PAF) with a nuclear-capable standoff capability at ranges of 350–600 kilometres.⁸ There is no publicly available evidence to suggest that either version of the Ra'ad ALCM had been operationally deployed as of January 2022.

Pakistan has several types of combat aircraft with performance characteristics that make them suitable as nuclear delivery platforms, including the Mirage III, the Mirage V, the F-16 and the JF-17. However, no official sources have confirmed their nuclear-capable roles. Given this significant uncertainty, SIPRI assesses that the Mirage III and possibly the Mirage V are the most likely to have a nuclear-delivery role. The Mirage III has been used for developmental test flights of the nuclear-capable Ra'ad ALCM, while the Mirage V is believed to have been given a strike role with Pakistan's small arsenal of nuclear gravity bombs.⁹ The nuclear capability of Pakistan's F-16 fighter-bombers is uncertain. Many analysts continue to assign a potential nuclear role to these aircraft based on reports in the late 1980s that

⁵ Kidwai (note 3); and Saalman, L. and Topychkanov, P., *South Asia's Nuclear Challenges*, SIPRI Report (SIPRI: Stockholm, Apr. 2021). For a US diplomatic assessment of India's 'Cold Start' strategy see Roemer, T., US Ambassador to India, 'Cold Start: A mixture of myth and reality', Cable New Delhi 000295, 16 Feb. 2010. Although Indian officials had previously denied the existence of the Cold Start doctrine, India's chief of the army staff acknowledged its existence in an interview with *India Today* in 2017. Unnithan, S., "'We will cross again'", *India Today*, 4 Jan. 2017.

⁶ Kidwai, K., Conversation transcript, Carnegie Endowment for International Peace, 23 Mar. 2015, p. 5.

⁷ Laskar, R. H., 'Pakistan PM Imran Khan again seeks US intervention on Kashmir', *Hindustan Times*, 21 June 2021.

⁸ For further detail on the Ra'ad ALCM see Kristensen, H. M. and Korda, M., 'Pakistani nuclear forces', *SIPRI Yearbook 2021*, p. 387.

⁹ International Institute for Strategic Studies (IISS), *The Military Balance 2022* (Routledge: London, 2022), p. 297; and Dominguez, G., 'Pakistan test-launches longer-range variant of Ra'ad II ALCM', *Janes*, 19 Feb. 2020.

Table 10.8. Pakistani nuclear forces, January 2022

All figures are approximate and some are based on assessments by the authors.

Type/designation	No. of launchers	Year first deployed	Range (km) ^a	Warheads x yield ^b	No. of warheads ^c
<i>Aircraft^d</i>	36				36
Mirage III/V	36 ^e	1998	2 100	1 x 5–12 kt bomb or Ra'ad ALCM (in development) ^f	36
<i>Land-based missiles</i>	118 ^g				118
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 ^h	–	..	900	1 x 5–12 kt	–
Shaheen-II (Hatf-6)	16	2014	2 000	1 x 10–40 kt	16
Shaheen-III ⁱ	–	[2023]	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	–	..	2 200	MRV or MIRV ^j	–
Babur/-1A GLCM (Hatf-7) ^k	12	2014/[early 2020s]	350/450	1 x 5–12 kt	12
Babur-2 GLCM ^l	–	..	900	1 x 5–12 kt	–
<i>Sea-based missiles</i>					
Babur-3 SLCM	–	[2025]	450	1 x 5–12 kt	–
<i>Other stored warheads^m</i>					11
Total stockpile	154				165^m

.. = not available or not applicable; – = nil or a negligible value; [] = uncertain SIPRI estimate; 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 For aircraft, the listed range is for illustrative purposes only; actual mission range will vary according to flight profile, weapon payload and in-flight refuelling.

^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—that is, they can be armed with either conventional or nuclear warheads. Cruise missile launchers (aircraft and land- and sea-based missiles) can carry more than one missile. This estimate counts an average of one nuclear warhead per launcher. Pakistan does not deploy its warheads on launchers but keeps them in separate storage facilities.

^d There are unconfirmed reports that Pakistan modified for a nuclear weapon delivery role some of the 40 F-16 aircraft procured from the United States in the 1980s. However, it is assumed here that the nuclear weapons assigned to aircraft are for use by Mirage aircraft. When the Mirage IIIs and Vs are eventually phased out, it is possible that the JF-17 will take over their nuclear role in the Pakistan Air Force.

^e Pakistan possesses many more than 36 Mirage aircraft, but this table only includes those that are assumed to have a nuclear weapon delivery role.

^f The Ra'ad (Hatf-8) ALCM has a claimed 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 and therefore it is not included in the operational warhead count. In 2017 the Pakistani military displayed a

Ra'ad-II variant with a reported range of 600 km. It was test flown for the first time in 2020 and several additional flights will be needed before it becomes operational.

^g Some launchers might have one or more missile reloads.

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

ⁱ The designation for the Shaheen-III is unknown.

^j The Pakistani military in 2017 claimed that the Ababeel can deliver multiple warheads using MIRV technology, but does not appear to have provided any further information since then.

^k Pakistan has been upgrading its original Babur GLCMs to Babur-1As by improving their avionics and target engagement systems to enable engagement against both land and sea targets. The original Babur's range is listed as 350 km by the US Air Force's National Air and Space Intelligence Center, while Pakistan claims that the improved Babur-1A's range is 450 km.

^l The Babur-2 GLCM is sometimes referred to as the Babur-1B.

^m In addition to the approximately 154 warheads estimated to be assigned to operational forces, SIPRI estimates that around 11 warheads have been produced to arm future Shaheen-III and cruise missiles, for a total estimated stockpile of about 165 warheads. Pakistan's warhead stockpile is expected to continue to increase.

Sources: Pakistani Ministry of Defence, various documents; US Air Force, National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat*, various years; International Institute for Strategic Studies, *The Military Balance*, various years; *Bulletin of the Atomic Scientists*, 'Nuclear notebook', various issues; and authors' estimates.

Pakistan was modifying them to deliver nuclear weapons.¹⁰ At the end of 2021, Pakistan was also operating more than 100 JF-17 aircraft, and intended to acquire around another 188 JF-17s to replace the ageing Mirage III and Mirage V aircraft.¹¹ When the Mirage aircraft are eventually phased out, it is possible that the JF-17 will take over their nuclear role in the PAF and that the Ra'ad ALCM will be integrated onto the JF-17.¹² However, in the light of these considerable uncertainties, it is not possible for SIPRI to make an assessment as to whether Pakistan's F-16s and JF-17s have a dedicated nuclear weapon-delivery role and therefore they are omitted from table 10.8.

Land-based missiles

As of January 2022, Pakistan's nuclear-capable ballistic missile arsenal comprised short- and medium-range systems.

Pakistan has deployed four types of solid-fuelled, road-mobile short-range ballistic missiles: Abdali (also designated Hatf-2), Ghaznavi (Hatf-3), Shaheen-I (Hatf-4) and Nasr (Hatf-9). The dual-capable Ghaznavi was test

¹⁰ For further detail on the role of the F-16s see Kristensen, H. M. and Kile, S. N., 'Pakistani nuclear forces', *SIPRI Yearbook 2020*, p. 370.

¹¹ International Institute for Strategic Studies (IISS), *The Military Balance 2019* (Routledge: London, 2019), pp. 298–99; Warnes, A., 'PAC Kamra rolls out final 14 JF-17B fighters for Pakistan Air Force', *Janes*, 31 Dec. 2020; Khan, B., 'Why is the Pakistan Air Force procuring 26 JF-17B fighters?', *Quwa*, 19 Jan. 2020; and 'Pakistan aeronautical complex delivers new JF-17B batch', *Quwa*, 2 Jan. 2021.

¹² Fisher, R., 'JF-17 Block II advances with new refuelling probe', *Jane's Defence Weekly*, 27 Jan. 2016; 'Ra'ad ALCM: The custodian of Pakistan's airborne nuclear deterrence', *PakDefense*, 6 Dec. 2020; and 'Update on Pakistan: "JF-17 Thunder's integration with RA'AD II ALCM"', *Pakistan Strategic Forum*, 8 July 2020.

launched twice in 2021, after which the PAF listed its range as 290 km.¹³ The Shaheen-IA, an extended-range version of the Shaheen-I that was still in development, was test launched twice in 2021—once to a range of 900 km.¹⁴ With the exception of the Abdali, Pakistan displayed all its nuclear-capable short-range missiles at the Pakistan Day Parade in March 2021.¹⁵

The arsenal also included two types of medium-range ballistic missile: the liquid-fuelled, road-mobile Ghauri (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.¹⁶ The Shaheen-II has been test launched seven times since 2004, with the most recent launch taking place in 2019.¹⁷ A longer-range variant in development, the Shaheen-III, has been test launched only twice—in 2015 and early 2021—and had not yet been deployed as of January 2022.¹⁸ This missile has a claimed range of 2750 km, making it the longest-range system that Pakistan has tested to date. Notably, the Shaheen-III, but not the Shaheen-II, was displayed at the Pakistan Day Parade in March 2021.¹⁹ The Pakistani government claimed in 2017 that the Ababeel (a variant of the Shaheen-III under development) could deliver multiple warheads, using multiple independently targetable re-entry vehicle (MIRV) technology, but has not conducted any subsequent test launches of the missile.²⁰

In addition to expanding its arsenal of land-based ballistic missiles, Pakistan continued in 2021 to develop the nuclear-capable Babur (Hatf-7) ground-launched cruise missile. The United States Air Force's National Air and Space Intelligence Center has claimed that the Babur has a range of

¹³ Pakistani Inter Services Public Relations (ISPR), 'Pakistan conducted a training launch of surface to surface ballistic missile Ghaznavi', Press release no. PR-141/2021-ISPR, 12 Aug. 2021; and ISPR, 'Pakistan today conducted a successful training launch of surface to surface ballistic missile Ghaznavi, capable of delivering nuclear and conventional warheads up to a range of 290 kilometers', Press release no. PR-19/2021-ISPR, 3 Feb. 2021.

¹⁴ Pakistani Inter Services Public Relations (ISPR), 'Pakistan conducted successful flight test of Shaheen-IA surface to surface ballistic missile', Press release no. PR-199/2021-ISPR, 25 Nov. 2021; and ISPR, 'Pakistan conducted successful flight test of Shaheen-IA surface to surface ballistic missile, having a range of 900 kilometers', Press release no. PR-59/2021-ISPR, 26 Mar. 2021.

¹⁵ Pakistani Inter Services Public Relations (ISPR), DG ISPR (@OfficialDGISPR), 'Pakistan Day Parade: March 2021', Twitter, 24 Mar. 2021.

¹⁶ United States Air Force, National Air and Space Intelligence Center (NASIC), *Ballistic and Cruise Missile Threat 2020* (NASIC: Wright-Patterson Air Force Base, OH, July 2020), p. 25.

¹⁷ Pakistani Inter Services Public Relations (ISPR), 'Pakistan conducted successful training launch of surface to surface ballistic missile Shaheen-II', Press release no. PR-104/2019-ISPR, 23 May 2019.

¹⁸ Pakistani Inter Services Public Relations (ISPR), 'Shaheen 3 missile test', Press release no. PR-61/2015-ISPR, 9 Mar. 2015; and Jamal, S., 'Pakistan tests nuclear-capable Shaheen-III ballistic missile', *Gulf News*, 20 Jan. 2021.

¹⁹ Pakistani Inter Services Public Relations (note 15).

²⁰ Pakistani Inter Services Public Relations (ISPR), Press release no. PR-34/2017-ISPR, 24 Jan. 2017. The US Air Force's National Air and Space Intelligence Center (NASIC) also describes the 2017 test as involving 'the MIRV version of the Ababeel'. US Air Force (note 16), p. 25. On the Ababeel see also Kile and Kristensen (note 2), p. 335.

350 km.²¹ Pakistan has test launched the Babur approximately a dozen times since 2005 and has used it in army field training since 2011, which indicates that the system is probably operational. Pakistan has been upgrading the Babur's avionics and navigation systems to enable target engagement both on land and at sea; the upgraded version is known as the Babur-1A. Following the system's most recent test in February 2021, the Pakistani military stated that the Babur-1A's range was 450 km.²² An extended-range version known as the Babur-2 (sometimes referred to as the Babur-1B) has a claimed range of 900 km—double that of the Babur-1A. Pakistan test launched the Babur-2 in 2016, 2018, 2020 (which resulted in a failure) and most recently in December 2021.²³

Sea-based missiles

As part of its efforts to achieve a secure second-strike capability, Pakistan has sought to create a nuclear triad by developing a sea-based nuclear force. The Babur-3 submarine-launched cruise missile (SLCM) is intended to establish a nuclear capability for the Pakistan Navy's three Agosta-90B diesel-electric submarines.²⁴ Pakistan test launched the Babur-3 first in 2017 and again in 2018.²⁵

China was still expected to deliver the first of eight air-independent propulsion-powered Hangor-class submarines to Pakistan in 2022, possibly for a nuclear role with the Babur-3 SLCM.²⁶ If Pakistan does intend to deploy both nuclear and conventional missiles on its attack submarines, this could ultimately create issues around entanglement of nuclear and non-nuclear capabilities, with the potential risk of unintended escalation.²⁷

²¹ US Air Force, National Air and Space Intelligence Center (NASIC), *Ballistic and Cruise Missile Threat 2017* (NASIC: Wright-Patterson Air Force Base, OH, June 2017), p. 37.

²² Pakistani Inter Services Public Relations (ISPR), ISPR Official, 'Press release no. PR24/2021, Pak conducted successful launch of Babur cruise missile -11 Feb 2021(ISPR)', YouTube, 11 Feb. 2021.

²³ Pakistani Inter Services Public Relations (ISPR), 'Pakistan conducted a successful test of an enhanced range version of the indigenously developed Babur cruise missile', Press release no. PR-142/2018-ISPR, 14 Apr. 2018; Gupta, S., 'Pakistan's effort to launch 750km range missile crashes', *Hindustan Times*, 23 Mar. 2020; and ISPR, 'Pakistan conducted a successful test of an enhanced range version of the indigenously developed Babur cruise missile 1B', Press release no. PR-222/2021-ISPR, 21 Dec. 2021.

²⁴ Pakistani Inter Services Public Relations (ISPR), Press release no. PR-10/2017-ISPR, 9 Jan. 2017; and Panda, A. and Narang, V., 'Pakistan tests new sub-launched nuclear-capable cruise missile. What now?', *The Diplomat*, 10 Jan. 2017.

²⁵ Pakistani Inter Services Public Relations (ISPR), 'Pakistan conducted another successful test fire of indigenously developed submarine launched cruise missile Babur having a range of 450 kms', Press release no. 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.

²⁶ Khan, B., 'Profile: Pakistan's new Hangor submarine', *Quwa*, 11 Nov. 2019.

²⁷ For further discussion on entanglement in the South Asian context see Saalman and Topychkanov (note 5).