

## VII. Pakistani nuclear forces

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It is estimated that Pakistan possessed approximately 165 nuclear warheads as of January 2021, an increase of 5 from the previous year (see table 10.8). The Pakistani Government has never publicly disclosed the size of its nuclear arsenal; the estimate made here is based on analysis of Pakistan's nuclear posture, previous statements by Western officials, and private conversations with officials. Analysing the number and types of Pakistani warheads and delivery vehicles is fraught with uncertainty, due to limited official public data and widespread exaggerated news stories about nuclear weapons. Pakistan's nuclear weapon arsenal and fissile material stockpile are likely to continue expanding over the next decade, although projections vary considerably.<sup>1</sup>

### **The role of nuclear weapons in Pakistani military doctrine**

Pakistan is pursuing the development and deployment of new nuclear weapons and delivery systems as part of its 'full spectrum deterrence posture' in relation to India.<sup>2</sup> 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.<sup>3</sup> Pakistan's emphasis on non-strategic nuclear weapons is specifically intended to be a reaction to India's perceived 'Cold Start' doctrine. This alleged doctrine 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 retaliate with nuclear weapons.<sup>4</sup> In 2015 a retired member of Pakistan's National Command Authority suggested that 'by introducing the variety of tactical nuclear

<sup>1</sup> 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', *Regional Insight*, Carnegie Endowment for International Peace, 30 June 2016. On Pakistan's fissile material stockpile see Kile, S. N. and Kristensen, H. M., 'Pakistani nuclear forces', *SIPRI Yearbook 2019*, pp. 332–33; and section X of this chapter.

<sup>2</sup> Kidwai, K., Keynote address and discussion session, Workshop on 'South Asian Strategic Stability: Deterrence, Nuclear Weapons and Arms Control', 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).

<sup>3</sup> Pakistani Inter Services Public Relations, Press Release PR-94/2011-ISPR, 19 Apr. 2011.

<sup>4</sup> Kidwai (note 2). 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.

**Table 10.8.** Pakistani nuclear forces, January 2021

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

Type/designation	No. of launchers	Year first deployed	Range (km) <sup>a</sup>	Warheads x yield <sup>b</sup>	No. of warheads <sup>c</sup>
<i>Aircraft<sup>d</sup></i>	36				36
Mirage III/V	36	1998	2 100	1 x 5–12 kt bomb or Ra'ad ALCM (in development) <sup>e</sup>	36
<i>Land-based missiles</i>	118 <sup>f</sup>				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 (Hatf-4) <sup>g</sup>	–	..	900	1 x 5–12 kt	–
Shaheen-II (Hatf-6)	16	2014	2 000	1 x 10–40 kt	16
Shaheen-III (Hatf-. ) <sup>h</sup>	–	[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	– <sup>i</sup>
Babur GLCM (Hatf-7)	12	2014	350 <sup>j</sup>	1 x 5–12 kt	12
Babur-2 GLCM (Hatf-. )	–	.. <sup>k</sup>	700	1 x 5–12 kt	–
<i>Sea-based missiles</i>					
Babur-3 SLCM (Hatf-. )	–	.. <sup>l</sup>	450	1 x 5–12 kt	–
<b>Total stockpile</b>	<b>154</b>				<b>154</b>
Other stored warheads <sup>m</sup>					11
<b>Total inventory</b>	<b>154</b>				<b>165<sup>m</sup></b>

.. = not available or not applicable; – = nil or a negligible value; [] = 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.

<sup>a</sup> For aircraft, the listed range is for illustrative purposes only; actual mission range will vary according to flight profile, weapon loading and in-flight refuelling.

<sup>b</sup> 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.

<sup>c</sup> 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-based and sea-based missiles) can carry more than 1 missile. This estimate counts an average of 1 nuclear warhead per launcher. Warheads are not deployed on launchers but are kept in separate storage facilities.

<sup>d</sup> 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. 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.

<sup>e</sup> 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 so 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.

<sup>f</sup> Some launchers might have 1 or more missile reloads.

<sup>g</sup> It is unclear whether the Shaheen-IA has the same designation as the Shaheen-I.

<sup>h</sup> The designation for the Shaheen-III is unknown.

<sup>i</sup> According to the Pakistani military, the missile is ‘capable of delivering multiple warheads, using [MIRV] technology’.

<sup>j</sup> The Pakistani Government claims that the range of the Babur GLCM is 700 km, double the range reported by the United States Air Force’s National Air and Space Intelligence Center (NASIC).

<sup>k</sup> 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. A failed test in 2020 indicates additional development is needed before it can be fielded.

<sup>l</sup> The first test launch of a Babur-3 SLCM was carried out from an underwater platform in 2017. A second test occurred in 2018.

<sup>m</sup> In addition to the c. 154 warheads estimated to be assigned to operational forces, a small number of additional warheads (c. 11) are thought to have been produced to arm future Shaheen-III and cruise missiles, for a total estimated inventory of c. 165 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*, various years; International Institute for Strategic Studies (IISS), *The Military Balance*, various years; *Bulletin of the Atomic Scientists*, ‘Nuclear notebook’, various issues; and authors’ estimates.

weapons in Pakistan’s inventory . . . , we have blocked the avenues for serious military operations by the other side’.<sup>5</sup>

### **Aircraft and air-delivered weapons**

Pakistan has a small stockpile of gravity bombs. The Ra’ad (Hatf-8) air-launched cruise missile (ALCM) is being developed to supplement this stockpile by providing the Pakistan Air Force (PAF) with a nuclear-capable standoff capability at a range of 350 kilometres. The most recent reported flight test—believed to be the seventh test since 2007—was in 2016.<sup>6</sup> An improved version, the Ra’ad-II, was displayed for the first time in 2017 and is reported to have a range of 600 km due to its more advanced engine.<sup>7</sup> This would theoretically allow Pakistan’s aircraft to reach critical targets inside India while remaining within Pakistani airspace. The Ra’ad-II was tested for the first time in February 2020.<sup>8</sup> There is no available evidence to suggest that either version of the Ra’ad ALCM had been deployed as of January 2021.

The aircraft that are most likely to have a nuclear delivery role are the PAF’s Mirage III and Mirage V aircraft. The Mirage III has been used for developmental test flights of the nuclear-capable Ra’ad ALCM, while the

<sup>5</sup> Kidwai, K. (Gen.), Conversation transcript, Carnegie Endowment for International Peace, 23 Mar. 2015, p. 5.

<sup>6</sup> Pakistani Inter Services Public Relations, Press Release PR-16/2016-ISPR, 19 Jan. 2016.

<sup>7</sup> Pakistani 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.

<sup>8</sup> Pakistani Inter Services Public Relations (note 7).

Mirage V is believed to have been given a strike role with Pakistan's small arsenal of nuclear gravity bombs.<sup>9</sup>

The nuclear capability of Pakistan's F-16 fighter-bombers is uncertain. Many analysts continue to assign a potential nuclear role to these aircraft due to reports in the late 1980s that Pakistan was in the process of modifying them to deliver nuclear weapons.<sup>10</sup> In the light of this uncertainty, Pakistan's F-16s are not identified here as having a dedicated nuclear weapon delivery system (and so are omitted from table 10.8).

Pakistan also operates about 100 JF-17 aircraft, which it has acquired from China. It intends to acquire a total of approximately 150 to replace the ageing Mirage III and Mirage V aircraft.<sup>11</sup> Initial reports from 2016 on upgrades to the JF-17 suggested that the PAF aimed to integrate the dual-capable Ra'ad ALCM onto the aircraft.<sup>12</sup> More recent reporting has not mentioned the weapon, which could indicate that its primary carrier will remain the Mirage III for the foreseeable future. When the Mirage aircraft are eventually phased out, it is possible that the JF-17 will take over their nuclear role in the PAF.<sup>13</sup>

### Land-based missiles

Pakistan's current nuclear-capable ballistic missile arsenal comprises short- and medium-range systems.

As of January 2021, Pakistan deployed the Abdali (also designated Hatf-2), Ghaznavi (Hatf-3), Shaheen-I (Hatf-4) and Nasr (Hatf-9) solid-fuelled, road-mobile short-range ballistic missiles. In an important milestone for testing the readiness of Pakistan's nuclear forces, the Ghaznavi was test launched at night in January 2020.<sup>14</sup> The Shaheen-IA, an extended-range version of the Shaheen-I, is still in development.

<sup>9</sup> Kerr, P. and Nikitin, M. B. D., *Pakistan's Nuclear Weapons*, Congressional Research Service (CRS) Report for Congress RL34248 (US Congress, CRS: Washington, DC, 1 Aug. 2016), p. 7.

<sup>10</sup> For a more detailed consideration of the role of the F-16s see Kristensen, H. M. and Kile, S. N., 'Pakistani nuclear forces', *SIPRI Yearbook 2020*, p. 370.

<sup>11</sup> 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', FlightGlobal, 20 June 2019; 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; and 'Pakistan Aeronautical Complex delivers new JF-17B batch', Quwa Defence News and Analysis Group, 2 Jan. 2021.

<sup>12</sup> Fisher, R., 'JF-17 Block II advances with new refuelling probe', *Jane's Defence Weekly*, 27 Jan. 2016.

<sup>13</sup> 'Ra'ad ALCM: The custodian of Pakistan's airborne nuclear deterrence', PakDefense, 6 Dec. 2020.

<sup>14</sup> Pakistani Inter Services Public Relations, 'Pakistan today conducted a successful training launch of surface to surface ballistic missile Ghaznavi, capable of delivering multiple types of war-heads up to a range of 290 kilometers', Press Release PR-8/2020-ISPR, 23 Jan. 2020.

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.<sup>15</sup> The Shaheen-II has been test launched seven times since 2004, with the most recent launch taking place in 2019.<sup>16</sup> A longer-range variant, the Shaheen-III, is currently in development but has been test launched only twice—in 2015 and early 2021—and is not yet deployed.<sup>17</sup> This missile has a claimed 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, is also in development. After the most recent test launch of the Ababeel in 2017, the Pakistani Government claimed that the missile would be ‘capable of delivering multiple warheads, using Multiple Independent[ly Targetable] Re-entry Vehicle (MIRV) technology’.<sup>18</sup>

In addition to expanding its arsenal of land-based ballistic missiles, in 2020 Pakistan continued to develop the nuclear-capable Babur (Hatf-7) ground-launched cruise missile. The United States Air Force’s National Air and Space Intelligence Center (NASIC) claims the Babur has a range of 350 km.<sup>19</sup> It has been test launched at least 12 times since 2005 and has been used in army field training since 2011, indicating that the system is likely to be operational. An extended-range version, which is known as the Babur-2 and sometimes referred to as Babur Weapon System-1 (B), has a claimed range of 700 km. It was first test launched in 2016 and was subsequently tested in 2018 and 2020, the latter of which failed.<sup>20</sup>

## 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) is intended to

<sup>15</sup> US 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.

<sup>16</sup> Pakistani 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.

<sup>17</sup> Pakistani Inter Services Public Relations, ‘Shaheen 3 missile test’, Press Release PR-61/2015-ISPR, 9 Mar. 2015; and Jamal, S., ‘Pakistan tests nuclear-capable Shaheen-III ballistic missile’, *Gulf News*, 20 Jan. 2021.

<sup>18</sup> Pakistani Inter Services Public Relations, Press Release PR-34/2017-ISPR, 24 Jan. 2017. The US National Air and Space Intelligence Center also describes the 2017 test as involving ‘the MIRV version of the Ababeel’. US Air Force (note 15), p. 25. On the Ababeel see also Kile and Kristensen (note 1), p. 335.

<sup>19</sup> 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.

<sup>20</sup> 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; and Gupta, S., ‘Pakistan’s effort to launch 750km range missile crashes’, *Hindustan Times*, 23 Mar. 2020.

establish a nuclear capability for the Pakistan Navy's Hashmat-class diesel-electric submarines.<sup>21</sup> The Babur-3 was first test launched in 2017 and was tested for a second time in 2018.<sup>22</sup>

Pakistan has ordered eight air-independent propulsion-powered submarines from China, the first of which is expected to be delivered in 2022. It is possible that these Hangor-class submarines might also be given a nuclear role with the Babur-3 SLCM.<sup>23</sup>

<sup>21</sup> Panda, A. and Narang, V., 'Pakistan tests new sub-launched nuclear-capable cruise missile. What now?', *The Diplomat*, 10 Jan. 2017.

<sup>22</sup> Pakistani 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.

<sup>23</sup> Khan, B., 'Profile: Pakistan's new Hangor submarine', *Quwa Defence News and Analysis Group*, 11 Nov. 2019.