VII. Pakistan nuclear forces

PHILIP PATTON SCHELL AND HANS M. KRISTENSEN

Pakistan is estimated to possess about 100–120 nuclear weapons for delivery by aircraft and land-based missiles (see table 6.8). It is widely believed that, in peacetime, Pakistan stores its nuclear warheads separate from their delivery vehicles. According to some accounts it is also possible that the warheads are kept in disassembled form. However, the Strategic Plans Division (SPD), which operates Pakistan’s nuclear forces, has never confirmed such arrangements. In 2013 Pakistan continued development and testing trials of most of its nuclear-capable missile types that are currently in operational service or still under development.

Pakistan’s current warhead designs are believed to use highly enriched uranium (HEU). Pakistan continues to produce HEU for military purposes and its stockpile is estimated to have been 3 tonnes in 2013 (see section X below). The enrichment is believed to take place at the uranium centrifuge facilities at Kahuta and Gadwal, Punjab.

The expansion of Pakistan’s plutonium-production capabilities and the development of smaller nuclear-capable ballistic and cruise missiles could indicate a trend towards an arsenal based partly on plutonium. Warheads using plutonium could be lighter and more compact than those using HEU to achieve similar yields. Nevertheless, there is no confirmation of a successful test of a plutonium-based warhead design so far.

Pakistan is expanding its main plutonium-production complex at Khushab, Punjab. The complex currently consists of three heavy water nuclear reactors and a heavy water production plant. Construction of a fourth heavy water reactor is under way and may be nearing completion. It is widely believed that each of the four reactors has a capacity of 40–50 megawatts-thermal. The first reactor at the site, Khushab-I, has been operational since 1998 and is estimated to produce 6–12 kilograms of plutonium annually (depending on operational efficiency), or enough for one to three nuclear warheads, depending on warhead design and fabrication skills. The second reactor, Khushab-II, may have commenced operation in late 2009 or 2010. Construction of the third reactor at Khushab began in 2005.

---


The Khushab nuclear complex, combined with Pakistan’s continuing HEU production, could increase Pakistan’s annual nuclear warhead production capacity several-fold. This will depend, however, on the country having sufficient capacity to reprocess spent fuel as well as an adequate supply of uranium to fuel the reactors at Khushab.

**Land-based missiles**

Pakistan is expanding its nuclear-capable missile arsenal. The SPD currently deploys the Ghaznavi (also designated Hatf-3) and Shaheen I (Hatf-4) solid-fuelled, road-mobile short-range ballistic missiles (SRBMs). An extended-range version of the Shaheen I, the Shaheen IA, appears to be under development.

Pakistan has two types of medium-range ballistic missile (MRBM): the liquid-fuelled, road-mobile Ghauri (Hatf-5), which is believed to be based on the North Korean Nodong missile; and the Shaheen II (Hatf-6), a two-stage, solid-fuelled, road-mobile MRBM.

The status of the Shaheen II is uncertain. The missile was test launched six to seven times between 2004 and 2008, including two army tests in 2008 that indicate the weapon was being inducted into the military. The US Air Force National Air and Space Intelligence Center (NASIC) stated in 2013 that the Shaheen II ‘probably will soon be deployed’, but there have been no reports of the missile being flight tested since 2008.\footnote{US Air Force, National Air and Space Intelligence Center (NASIC), \textit{Ballistic and Cruise Missile Threat}, NASIC-1031-0985-13 (NASIC: Wright-Patterson Air Force Base, OH, July 2013), p. 15.} This could indicate that the programme has encountered serious technical difficulties. It is possible, but unknown, that the extended-range Shaheen I tested in 2012 is intended to temporarily fill the void until Shaheen II becomes operational.
### Table 6.8. Pakistani nuclear forces, January 2014

<table>
<thead>
<tr>
<th>Type</th>
<th>Range (km)&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Payload (kg)</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aircraft</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-16A/B</td>
<td>1 600</td>
<td>4 500</td>
<td>-30 aircraft, deployed in 3 squadrons</td>
</tr>
<tr>
<td>Mirage V</td>
<td>2 100</td>
<td>4 000</td>
<td>Mirage III used to test launch Ra’ad in 2012</td>
</tr>
<tr>
<td>JF-17</td>
<td>2</td>
<td></td>
<td>Rumoured to be equipped to carry the Ra’ad air-launched cruise missile; unclear if this indicates a nuclear-delivery role</td>
</tr>
<tr>
<td><strong>Land-based ballistic missiles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abdali (Hatf-2)</td>
<td>180</td>
<td>200–400</td>
<td>Under development; test launched on 15 Feb. 2013</td>
</tr>
<tr>
<td>Ghaznavi (Hatf-3)</td>
<td>290&lt;sup&gt;b&lt;/sup&gt;</td>
<td>500</td>
<td>Entered service with the Pakistani Army in 2004; fewer than 50 launchers deployed; most recent test-launches on 22 Apr. and 8 May 2014</td>
</tr>
<tr>
<td>Shaheen I (Hatf-4)</td>
<td>750</td>
<td>750–1 000</td>
<td>Entered service with the Pakistani Army in 2003; fewer than 50 launchers deployed; most recent test-launch on 10 Apr. 2013; range has apparently been extended&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Shaheen II (Hatf-6)</td>
<td>2 000</td>
<td>(-1 000)</td>
<td>Under development; last known test-launch on 21 Apr. 2008; deployment possibly soon</td>
</tr>
<tr>
<td>Ghauri (Hatf-5)</td>
<td>1 250</td>
<td>700–1 000</td>
<td>Entered service with the Pakistani Army in 2003; fewer than 50 launchers deployed; last test launched on 28 Nov. 2012</td>
</tr>
<tr>
<td>Nasr (Hatf-9)</td>
<td>60</td>
<td></td>
<td>Under development; test launched on 5 Nov. 2013</td>
</tr>
<tr>
<td><strong>Cruise missiles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Babur (Hatf-7)</td>
<td>350&lt;sup&gt;d&lt;/sup&gt;</td>
<td>400–500</td>
<td>Under development; test launched on 17 Sep. 2012; initially ground-launched, but sea- and air-launched versions reportedly also under development</td>
</tr>
<tr>
<td>Ra’ad (Hatf-8)</td>
<td>350</td>
<td></td>
<td>Under development; air-launched; most recent test-launch on 31 May 2012</td>
</tr>
</tbody>
</table>

<sup>a</sup> 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.

<sup>b</sup> US NASIC estimates the range at 250 km.

<sup>c</sup> The Pakistani military reports the extended range of Shaheen I as 900 km but the US Air Force NASIC set the range at 750 km, up from >450 km reported in 2009.

<sup>d</sup> The Pakistani military reports the range as 700 km.

Pakistan is also developing several nuclear-capable SRBMs that appear to be intended for battlefield missions. According to the Pakistani military, the short-range Abdali (Hatf-2), which was test-fired on 15 February 2013, provides ‘an operational level capability to Pakistan’s Strategic Forces’. The Abdali has been flight tested at least six times since 2002, but the missile is not listed by NASIC.

Similarly, the Pakistani military has described the 60 kilometre-range, road-mobile Nasr (Hatf-9) SRBM as a ‘quick response system’, which ‘add[s] deterrence value’ to the posture ‘at shorter ranges’ in order ‘to deter evolving threats’. The missile is launched from a mobile multi-tube launcher that can ‘fire a four missile salvo’. The development of a nuclear salvo-weapon could potentially be intended for use against large enemy troop formations in case of an Indian invasion of Pakistan.

Pakistan’s missile-development organization, the National Engineering and Scientific Commission (NESCOM), is also developing two types of nuclear-capable cruise missile: the ground-launched Babur (Hatf-7) and the air-launched Ra’ad (Hatf-8).

The development of new types of nuclear-capable SRBM and cruise missile may be an indication that Pakistan’s strategic planning has evolved to include a wider range of contingencies for the use of nuclear weapons, possibly in response to the Indian Army’s Cold Start doctrine, under which India could carry out rapid but limited conventional attacks on Pakistani territory using forward-deployed forces. It further suggests a growing concern in Pakistan about being able to counter India’s superior conventional forces and nascent ballistic missile defences. The deployment of short-range, sub-strategic nuclear forces increases the risk that nuclear weapons could be used sooner in an Indian–Pakistani war and trigger escalation to the use of longer-range missiles.

**Aircraft**

Pakistan procured 40 F-16A/B combat aircraft from the United States in the mid-1980s. It has been suggested that some of these were assigned a nuclear-weapon delivery role. The approximately 30 of these F-16s that remain, together with several more delivered by the USA between 2005

---

and 2008, are being extensively upgraded in a mid-life upgrade (MLU). The USA is heavily involved in the MLU, which was procured through the US Foreign Military Sales (FMS) programme, and in 2006 a senior US official stated ‘these F-16s specifically will not be sold to Pakistan to be capable of carrying a nuclear weapon’. However, once the F-16s arrive in Pakistan, the Pakistani Government can choose what it uses the aircraft for.

The PAF’s Mirage V combat aircraft may be more likely to have a nuclear-delivery role. The fact that the Mirage III has been used for developmental test flights of the nuclear-capable Ra’ad air-launched cruise missile could be seen as a logical extension of a potential strike role with nuclear gravity bombs on the Mirage V. Pakistan has developed a strong indigenous capability to maintain and rebuild these aircraft to keep them operational and comprehensively upgraded this system for long-range precision strike missions, including dedicated night attack. The range of the Mirage aircraft has been extended by the PAF’s development of an aerial refuelling capability using Il-78 aircraft.

The Mirage V is getting old and Pakistan is acquiring the Chinese-designed JF-17 to replace it. There are rumours that the Ra’ad cruise missile might be integrated onto its JF-17 Thunder aircraft or even the F-16, but this remains to be confirmed.