# VIII. Israeli nuclear forces

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Israel continues to maintain its long-standing policy of nuclear opacity: it neither officially confirms nor denies that it possesses nuclear weapons.[1] Like India and Pakistan, Israel has never been a party to the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (Non-Proliferation Treaty, NPT).[2]

Declassified US and Israeli government documents indicate that Israel began building a stockpile of nuclear weapons in the early 1960s, using plutonium produced by the Israel Research Reactor 2 (IRR-2) at the Negev Nuclear Research Center near Dimona.[3] There is little publicly available information about the operating history and power capacity of the unsafeguarded IRR-2, which was commissioned in 1963.[4] It may now be operated primarily to produce tritium.[5] The ageing heavy water reactor remains in operation despite the existence of a number of identified structural problems in its core.[6] The reactor is due to be shut down in 2023, but the Israeli Atomic Energy Commission is reportedly examining ways to extend its service life until the 2040s.[7] Some non-governmental analysts have noted that Israel's ability to refurbish the existing reactor or build a replacement reactor will be constrained by international export restrictions on key components.[8]

It is estimated that Israel has approximately 80–90 operational nuclear weapons (see table 6.9). Of these, approximately 30 are gravity bombs for delivery by combat aircraft. The locations of the storage sites for the warheads, which are thought to be stored partially unassembled, are unknown.

Approximately 50 warheads are for delivery by land-based ballistic missiles. Israel's arsenal includes solid-fuelled, two-stage Jericho II medium-range ballistic missiles, which are believed to be based, along with their mobile transporter-erector-launchers, in caves at an airbase near Zekharia

[1] On the role of this policy in Israel's national security decision making see Cohen, A., 'Israel', eds H. Born, B. Gill and H. Hänggi, SIPRI, *Governing the Bomb: Civilian Control and Democratic Accountability of Nuclear Weapons* (Oxford University Press: Oxford, 2010), pp. 152–70.

[2] For a summary and other details of the NPT see annex A, section I, in this volume.

[3] For a history of Israel's nuclear weapon programme see Cohen, A., *The Worst-kept Secret: Israel's Bargain with the Bomb* (Columbia University Press: New York, 2010).

[4] Glaser, A. and Miller, M., 'Estimating plutonium production at Israel's Dimona reactor', Report presented at the 52nd Annual Institute of Nuclear Materials Management (INMM) Meeting, Palm Desert, 17–21 July 2011.

[5] International Panel on Fissile Materials (IPFM), *Global Fissile Material Report 2015: Nuclear Weapon and Fissile Material Stockpiles and Production* (IPFM: Princeton, NJ, Dec. 2015), p. 26.

[6] Levinson, C., 'Israel's Dimona nuclear reactor plagued by 1,537 defects, scientists say', *Haaretz*, 16 Apr. 2016.

[7] Bob, Y. J., 'Is Israel's nuclear reactor still safe?', *Jerusalem Post*, 29 Sep. 2018.

[8] Kelley, R. and Dewey, K., 'Assessing replacement options for Israel's ageing Dimona reactor', *Jane's Intelligence Review*, 20 Nov. 2018.

**Table 6.9.** Israeli nuclear forces, January 2019

| Type | Range (km)[a] | Payload (kg) | Status | No. of warheads |
|---|---|---|---|---|
| *Aircraft*[b] | | | | . . |
| F-16A/B/C/D/I Falcon | 1 600 | 5 400 | 205 aircraft in the inventory; some are believed to be equipped for nuclear weapon delivery. | 30 |
| *Land-based ballistic missiles* | | | | . . |
| Jericho II | 1 500–1 800 | 750–1 000 | *c.* 50 missiles; first deployed in 1990. | 25 |
| Jericho III[c] | >4 000 | 1 000–1 300 | Became operational in 2011–15 and is gradually replacing Jericho II. | 25 |
| *Cruise missiles* | | | | . . |
| . . | . . | . . | Dolphin class diesel-electric submarines are rumoured to have been equipped with nuclear-armed SLCMs; this is denied by Israeli officials. | (10) |
| **Total** | | | | **80–90**[d] |

. . = not available or not applicable; SLCM = sea-launched cruise missile.

[a] Aircraft range is for illustrative purposes only; actual mission range will vary. Missile payloads may have to be reduced in order to achieve maximum range.

[b] Some of Israel's 25 F-15I aircraft may also have a long-range nuclear delivery role.

[c] A longer-range version of the missile with a new rocket motor may be under development.

[d] SIPRI's estimate, which is approximate, is that Israel has 80–90 stored nuclear warheads. There is significant uncertainty about the size of Israel's nuclear arsenal and its warhead capabilities.

*Sources*: Cohen, A., *The Worst-kept Secret: Israel's Bargain with the Bomb* (Columbia University Press: New York, 2010); Cohen, A. and Burr, W., 'Israel crosses the threshold', *Bulletin of the Atomic Scientists*, vol. 62, no. 3 (May/June 2006); Cohen, A., *Israel and the Bomb* (Columbia University Press: New York, 1998); Albright, D., Berkhout, F. and Walker, W., SIPRI, *Plutonium and Highly Enriched Uranium 1996: World Inventories, Capabilities and Policies* (Oxford University Press: Oxford, 1997); *IHS Jane's Strategic Weapon Systems*, various issues; Fetter, S., 'Israeli ballistic missile capabilities', *Physics and Society*, vol. 19, no. 3 (July 1990); 'Nuclear notebook', *Bulletin of the Atomic Scientists*, various issues; and authors' estimates.

to the south-east of Tel Aviv.[9] A three-stage Jericho III intermediate-range ballistic missile, with a range exceeding 4000 kilometres, was declared operational in 2011.[10] In 2013 Israel tested a Jericho III with a new motor that some sources believe may give the missile an intercontinental range—that is, a range exceeding 5500 km.[11] Its development status is unknown.

There are numerous unconfirmed reports that Israel has modified its fleet of German-built Dolphin class diesel-electric submarines to carry indigenously produced nuclear-armed sea-launched cruise missiles, giving

[9] O'Halloran, J. (ed.), 'Jericho missiles', *IHS Jane's Weapons: Strategic, 2015–16* (IHS Jane's: Coulsdon, 2015), p. 53.

[10] O'Halloran, ed. (note 9).

[11] Ben-David, A., 'Israel tests Jericho III missile', *Aviation Week & Space Technology*, 22 July 2013.

it a sea-based second-strike capability.[12] If this is the case, this arsenal would probably comprise only a small number of warheads, possibly fewer than a dozen. German and Israeli officials have consistently dismissed the reports. Israel has purchased three Dolphin and three modernized Dolphin-2 class submarines from Germany, five of which have been delivered to the Israeli Navy. The sixth submarine is scheduled to be delivered by the end of 2019.[13] In October 2017 the German Government announced that it had agreed to subsidize the sale of three new Dolphin-2 submarines to Israel to replace the first three Dolphin class boats, which were delivered in 1999 and 2000.[14] However, it reportedly reserved the right to cancel the deal depending on the outcome of an Israeli police investigation into alleged improper conduct and corruption in the decision to purchase the submarines.[15] The first of the three new submarines is expected to become operational in 2030.[16]

[12] See e.g. Cohen (note 3), p. 83; Von Bergman, R. et al., 'Israel's deployment of nuclear missiles on subs from Germany', *Der Spiegel*, 4 June 2012; and Gilinsky, V., 'Israel's sea-based nukes pose risks', *Bulletin of the Atomic Scientists*, 8 Feb. 2016.

[13] Opall-Rome, B., 'Israeli Navy backs Netanyahu's submarine scheme', *Defense News*, 19 Apr. 2017.

[14] Opall-Rome (note 13).

[15] Reuters, 'Deutschland beteiligt sich finanziell an U-Booten für Israel' [Germany participates financially in submarines for Israel], *Der Spiegel*, 23 Oct. 2017; and Deutsche Welle, 'Germany approves deal on three submarines for Israel', 23 Oct. 2017.

[16] Lappin, Y., 'Israeli submarine chief outlines future requirements', *Jane's Defence Weekly*, 14 Mar. 2018.