IX. Israeli nuclear forces

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As of January 2024 Israel was estimated to have a stockpile of around 90 nuclear warheads (see table 7.10, end of section), the same number as in January 2023. This estimate is at the lower end of a possible range that some analysts have suggested could reach as high as 300 nuclear weapons.[1] It is assumed that Israel stores its warheads separately from its deployed launchers during peacetime.

Israel continues to maintain its long-standing policy of nuclear ambiguity: it neither officially confirms nor denies that it possesses nuclear weapons.[2] This lack of transparency means that there is significant uncertainty about the size of Israel's nuclear arsenal and the yields and characteristics of its weapons.[3] The estimate here is largely based on calculations of Israel's inventory of weapon-grade plutonium (see section X of this chapter) and the number of operational nuclear-capable delivery systems. The locations of the storage sites for the warheads, which are thought to be stored partially unassembled, are unknown.

This section continues by briefly outlining the role played by nuclear weapons in Israel's military doctrine. It then outlines the country's capabilities for production of fissile material before describing its air-delivered, land-based and sea-based weapons.

The role of nuclear weapons in Israeli military doctrine

Since the late 1960s the Israeli government has repeated that Israel 'won't be the first to introduce nuclear weapons into the Middle East'. However, to accommodate the apparent fact that Israel possesses a significant nuclear arsenal, Israeli policymakers have previously interpreted 'introduce nuclear weapons' as publicly declaring, testing or actually using the nuclear capability, which Israel says it has not yet done.[4]

Given that Israel does not officially acknowledge its apparent possession of nuclear weapons, the circumstances under which it would use them are highly unclear. Reports, based on interviews with a retired Israeli general,

[1] See e.g. Luscombe, B., '10 questions: Jimmy Carter', *Time*, 30 Jan. 2012; and Clifton, E., 'Powell acknowledges Israeli nukes', Lobe Log, 14 Sep. 2016.

[2] On Israel's 'strategic ambiguity' policy see also 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).

[3] Kristensen, H. M. and Korda, M., 'Estimating world nuclear forces: An overview and assessment of sources', SIPRI Commentary, 14 June 2021.

[4] For further detail see Kristensen, H. M. and Korda, M., 'Israeli nuclear forces', *SIPRI Yearbook 2022*, pp. 404–405.

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indicate that Israel would have considered using nuclear weapons if it feared that it would lose the Arab–Israeli War in 1967.[5] In addition, towards the end of 2023 several Israeli policymakers and commentators—including a minister who was later suspended from the cabinet—suggested that Israel should use nuclear weapons against Hamas fighters in Gaza.[6] These two cases are notable as they are rare examples of high-ranking Israeli officials seemingly acknowledging the existence of Israel's nuclear arsenal.

Military fissile material production

Declassified United States government documents indicate that Israel may have assembled its first nuclear weapons in the late 1960s, using plutonium produced by the Israel Research Reactor 2 (IRR-2) at the Negev Nuclear Research Center (NNRC) near Dimona, in southern Israel.[7] This heavy water reactor is not under International Atomic Energy Agency (IAEA) safeguards. There is little publicly available information about its operating history and power capacity (see section X).[8] Commercial satellite imagery has revealed progress on significant construction inside and near to the NNRC site since 2021, although the purpose of this work is unknown.

Israel is estimated to have had a stockpile of 750–1110 kilograms of plutonium at the start of 2023, depending on the rate at which the reactor was also used for tritium production (see section X). Based on this estimate and assuming that Israel's warhead arsenal is likely to consist of single-stage, boosted fission weapons, Israel could hypothetically have built anywhere between 187 and 277 nuclear weapons, assuming approximately 4 kg of plutonium per weapon. However, as with other nuclear-armed states, Israel is unlikely to have converted all of its plutonium into warheads and has probably assigned nuclear weapons to only a limited number of launchers. Moreover, the available tritium required to boost the warheads would represent an additional constraint on the number of weapons Israel could build. As a result, SIPRI estimates that Israel had approximately 90 warheads as of January 2024, rather than several hundred.

[5] See e.g. Broad, W. and Sanger. D., '"Last secret" of 1967 war: Israel's doomsday plan for nuclear display', *New York Times*, 3 June 2017.

[6] Bachner, M., 'Far-right minister says nuking Gaza an option, PM suspends him from cabinet meetings', *Times of Israel*, 5 Nov. 2023. For further detail on the Israel–Hamas war see chapter 1, chapter 2, section I, and chapter 10, section II, in this volume.

[7] 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); Burr, W. and Cohen, A., 'Duplicity and self-deception: Israel, the United States, and the Dimona inspections, 1964–65', Briefing Book no. 733, National Security Archive, 10 Nov. 2020; and Cohen, A. and Burr, W., 'How Israel built a nuclear program right under the Americans' nose', *Haaretz*, 17 Jan. 2021. See also Kristensen and Korda (note 4), pp. 405–407.

[8] Glaser, A. and Miller, M., 'Estimating plutonium production at Israel's Dimona reactor', 52nd annual meeting of the Institute of Nuclear Materials Management (INMM), 17–21 July 2011.

Aircraft and air-delivered weapons

Approximately 30 of Israel's nuclear weapons are estimated to be gravity bombs for delivery by F-16I or F-15 aircraft. The status of Israel's F-15s is unclear, but in 2019 a US official privately referred to them as Israel's 'nuclear squadron'.[9] Nuclear gravity bombs without nuclear cores would probably be stored at protected facilities near one or two air force bases, such as Tel Nof Airbase in central Israel and Hatzerim Airbase in the Negev desert. Israel is also acquiring 50 F-35 combat aircraft from the USA. The USA and some of its North Atlantic Treaty Organization (NATO) allies have assigned a nuclear mission to the F-35A (see section I), but it it is unclear whether Israel plans to assign such a mission to its F-35s.[10]

Land-based missiles

Up to 50 warheads are thought to be assigned for delivery by land-based Jericho ballistic missiles, although the Israeli government has never publicly confirmed that it possesses the missiles. The missiles are believed to be located, along with their mobile transporter-erector-launchers (TELs), in caves or bunkers at Sdot Micha Airbase near Zekharia, about 25 kilometres west of Jerusalem. SIPRI assesses that each of the 23 bunkers might be capable of storing two launchers. A nearby complex with its own internal perimeter has four tunnels to underground facilities that could potentially be used for warhead storage, although SIPRI assesses that the nuclear cores are probably stored elsewhere.

Israel is upgrading its arsenal of missiles from the solid-fuelled, two-stage Jericho II medium-range ballistic missile to the three-stage Jericho III missile with a longer range, exceeding 4000 km. The latter first became operational in 2011 and might already have replaced the Jericho II.[11] In recent years, Israel has conducted several test launches of what it calls 'rocket propulsion systems'. These could be related to upgrades to its ballistic missile force or to the development of Israeli space-launch vehicles, which use solid rocket motors.[12]

[9] US military official, Interview with the author (H. M. Kristensen), Oct. 2019.

[10] Lockheed Martin, 'Israel's 5th generation fighter', [n.d.].

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

[12] Israeli Ministry of Defense (@Israel_MOD), Twitter, 31 Jan. 2020, <https://twitter.com/Israel_MOD/status/1223172528992149504>; and Lewis, J., 'Israeli rocket motor test', Arms Control Wonk, 23 Apr. 2021.

Sea-based missiles

Israel operates five German-built Dolphin-class (Dolphin-I and Dolphin-II) diesel–electric submarines.[13] The submarines are based at Haifa on the Mediterranean coast. There are unconfirmed reports that all or some of the submarines have been equipped to launch an indigenously produced nuclear-armed sea-launched variant of the Popeye cruise missile, giving Israel a sea-based nuclear strike capability.[14] The German government has denied that the submarines have the capability to carry nuclear warheads.[15] However, if the submarines have been equipped with nuclear missiles, SIPRI assesses that around 10 cruise missile warheads might be available for the submarine fleet.

A sixth submarine, INS *Drakon*, was launched in August 2023 but had not entered service by the end of the year. Despite it being part of the Dolphin-II class, INS *Drakon* differs from the other submarines in its class. Most notably, initial images suggest that the boat may be longer and probably has a vertical-launch system embedded in the sail, which could be intended for another type of missile that the submarine would carry in addition to the Popeye sea-launched cruise missile.[16]

In early 2022 Israel signed an agreement with Germany to procure three new submarines, which will be known as the Dakar class, to replace the three oldest Dolphin-I-class boats.[17] Concept art for the Dakar-class submarines includes an enlarged sail that, as with INS *Drakon*, will probably be fitted with a vertical-launch system capable of launching existing or future missile types.[18]

[13] SIPRI Arms Transfers Database, Mar. 2024.

[14] Bergman, R. et al., 'Israel's deployment of nuclear missiles on subs from Germany', *Der Spiegel*, 4 June 2012. See also Frantz, D., 'Israel's arsenal is point of contention', *Los Angeles Times*, 12 Oct. 2003; and Sutton, H. I., 'History of Israeli subs', Covert Shores, 20 May 2017.

[15] Fisher, G., 'Israel's German-built submarines are equipped with nuclear weapons, Der Spiegel reports', *Times of Israel*, 3 June 2012.

[16] Sutton, H. I., 'Israel launches new submarine, first in world with modern missiles in sail', Naval News, 14 Aug. 2023.

[17] 'Israel signs $3.4 bln submarines deal with Germany's Thyssenkrupp', Reuters, 20 Jan. 2022.

[18] Newdick, T., 'Our first look at Israel's new Dakar class submarine reveals a very peculiar feature', The Drive, 20 Jan. 2022.

Table 7.10. Israeli nuclear forces, January 2024

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

Type/designation	No. of launchers	Year first deployed	Range (km)[a]	No. of warheads
Aircraft	*125/50*[b]			*30*
F-16I	100/25	1980	1 600	30
F-15	25/25	1998	4 450	. .[c]
Land-based missiles	*50*[d]			*50*
Jericho II	25	1990	>1 500	25
Jericho III[e]	25	[2011]	[>4 000]	25
Sea-based missiles	*5/20*[f]			*10*
Popeye Turbo SLCM	20	[2002]	[<1 500]	10
Total stockpile	**120**			**90**[g]

. . = not available or not applicable; [ ] = uncertain SIPRI estimate; SLCM = sea-launched cruise missile.

[a] Aircraft range is for illustrative purposes only; actual range will vary according to flight profile, weapon payload and in-flight refuelling.

[b] The first figure is the total number of aircraft in the inventory; the second is the number of aircraft that might be adapted for a nuclear strike mission. It is estimated that aircraft from 2 squadrons might serve a nuclear strike role.

[c] It is not known whether the Israeli Air Force has added nuclear capability to the F-15 aircraft as the United States has done, but one US official has privately described Israel's F-15s as its 'nuclear squadron'.

[d] Commercial satellite images show what appear to be 23 caves or bunkers for mobile Jericho launchers at Sdot Micha Airbase. High-resolution satellite imagery that became available in 2021 indicates that each cave appears to have 2 entrances, which suggests that each cave could hold up to 2 launchers. If all 23 caves are full, this would amount to 46 launchers.

[e] The Jericho III is gradually replacing the older Jericho II, if this has not happened already. A longer-range version with a new solid rocket motor may be under development.

[f] The first figure is the total number of Dolphin-class submarines in the Israeli fleet; the second is the estimated maximum number of large-diameter missiles that they can carry. In addition to 6 standard 533-millimetre torpedo tubes, the submarines are reportedly equipped with 4 other specially designed 650-mm tubes that could potentially be used to launch larger nuclear-armed SLCMs. A sixth submarine, INS *Drakon*, was launched in Aug. 2023 but had not entered service as of Jan. 2024. It appears to be equipped with a vertical launch system for launching additional missiles.

[g] Given the unique lack of publicly available information about Israel's nuclear arsenal, this estimate comes with a considerable degree of uncertainty.

Sources: Cohen, A., *The Worst-kept Secret: Israel's Bargain with the Bomb* (Columbia University Press: New York, 2010); Cohen, A., *Israel and the Bomb* (Columbia University Press: New York, 1998); US National Security Archive, various declassified US government document collections related to Israel's nuclear weapon programme; International Institute for Strategic Studies, *The Military Balance*, various years; *IHS Jane's Strategic Weapon Systems*, various issues; Fetter, S., 'Israeli ballistic missile capabilities', *Physics and Society*, vol. 19, no. 3 (July 1990); *Bulletin of the Atomic Scientists*, 'Nuclear Notebook', various issues; and authors' estimates.