Israel: Possible Military Strike Against Iran’s Nuclear Facilities

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Potential Factors in an Israeli Decision: Possible Operational Aspects of an Israeli Strike\textsuperscript{161}

Another factor in Israel’s deliberations is the question of operational capability: Can Israeli forces conduct a successful strike, however they define “success”? One Israeli journalist has written:

> While a large-scale operation against Iran … would stretch the [Israel Air Force’s] resources, it is still within its capabilities. This is exactly what the lion’s share of the defense budget has been spent on for over more than a decade. On fighter jets, airborne tankers, long-range reconnaissance drones and electronic warfare aircraft.\textsuperscript{162}

According to another Israeli report, “military thinkers acknowledge the objective difficulties but argue that, with the out-of-the-box improvisation and planning the Israel Air Force is renowned for, they can be surmounted.”\textsuperscript{163} Not all Israeli assessments agree, however. One Israeli analyst has written:

> Would such an attack by Israel be likely to succeed even in doing maximum damage to Iranian facilities? No, a great deal could go wrong, especially against multiple hardened targets at the planes’ maximum range. Planes could get lost or crash or have to turn back. Planes arriving over the targets could miss, or accidentally drop their bombs on civilians, or simply not do much damage. Many targets would remain unscathed.\textsuperscript{164}

A senior Israeli official was cited in one report as quoting a senior commander who reportedly told the Israeli cabinet in September 2011 that “we have no ability to hit the Iranian nuclear program in a meaningful way.”\textsuperscript{165} A March 2012 poll indicated that 65% of Jewish Israelis believe that the Israeli military has the “ability to damage Iran's nuclear program substantially,”\textsuperscript{166} while a late February 2012 poll indicated by a 53%-39% margin that Jewish Israelis do not believe that an Israeli attack conducted without U.S. cooperation would stop “Iran’s nuclearization for a substantial period of time.”\textsuperscript{167}

In open source assessments mainly in non-Israeli media, analysts assert that although the Israel Air Force (IAF) is formidable, an attempt to destroy Iran’s nuclear capability would be a challenge due to both the IAF’s technical capabilities and the limited numbers of aircraft in its fleet that are equipped to simultaneously operate over long ranges, carry the necessary ordnance, and thwart foreign air defenses. Former Central Intelligence Agency and National Security Agency Director Michael Hayden said, for example, “that airstrikes capable of seriously setting

\textsuperscript{161} Prepared by Jeremiah Gertler, Specialist in Military Aviation.

\textsuperscript{162} Anshel Pfeffer, “Israel could strike Iran’s nuclear facilities, but it won’t be easy,” haaretz.com, February 20, 2012.

\textsuperscript{163} Susser, op. cit.

\textsuperscript{164} Rubin, op. cit.

\textsuperscript{165} Vick, op. cit. Following this quote, the article states, “The key word is meaningful [emphasis original]. The working assumption behind Israel’s military preparations has been that a strike, to be worth mounting, must delay Tehran’s nuclear capabilities by at least two years.” Ibid.

\textsuperscript{166} Poll of 505 Jewish Israelis conducted by Professor Camil Fuchs of Tel Aviv University for the Jerusalem Center for Public Affairs. Details of the poll, whose margin of error is unspecified, available at http://jcpa.org/JCPA/Templates/ShowPage.asp?DBID=1&LNGID=1&T MID=111&FID=254&PID=0&IID=13295.

back Iran’s nuclear program were ‘beyond the capacity’ of Israel.”168 Multiple reports have asserted that military analysts believe that reaching all critical Iranian nuclear facilities “would require an air campaign of hundreds of sorties and would have to last for weeks.”169 However, a U.S. defense analyst has said that any Israeli attack would probably be a one-time event: “Given the unfriendly airspace Israeli strike aircraft would have to traverse to reach Iran’s facilities as well as Israel’s geographic distance from Iran, the likelihood of Israel being able to carry out repeated strikes is low. Israeli strike aircraft would only have one opportunity to strike at Iran’s nuclear facilities.”170 Nevertheless, the same defense analyst has said, “One wave can do a lot, depending on the quality of the penetrating munitions and the targeting abilities.”171

Access

The distance from Israeli bases to Iranian nuclear facilities imposes two significant difficulties. The first involves airspace. Depending on the route selected, Israeli aircraft would have to cross the sovereign airspace of Saudi Arabia, Jordan, Iraq, Syria, and/or Turkey both en route and on the return trip. According to one report, “The route over Iraq would be the most direct and likely, defense analysts say, because Iraq effectively has no air defenses and the United States, after its December withdrawal, no longer has the obligation to defend Iraqi skies.”172

Each route involves different diplomatic considerations, but Israel has shown a willingness and ability to operate in foreign airspace for limited periods with little or no detection and without targeting air defense sites, as in the 2007 raid on the suspected Syrian nuclear site near Deir al Zur.173 However, although Israel may be able to hide comparatively small combat aircraft from foreign air defense systems through electronic and other means, large tankers and other support aircraft required for a long-range strike on Iran may be another matter. According to a 2010 book by two U.S. analysts, “It seems likely that Jordan, Saudi Arabia, and Kuwait would be able to detect the overflight of Israeli aircraft. Syria might not see ingressing aircraft, but the ability to blind the Syrians again, after doing so in 2007, is not something Israel can take for granted.”174

Although there have been past reports—officially denied—that Saudi Arabia has granted or would grant advance permission for Israel to overfly its territory,175 Israel may rely on

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171 Vick, op. cit.
173 An article by former German Defense Ministry director of planning (1982-1988) Hans Rühle for Switzerland’s Neuer Zürcher Zeitung on the 2007 Syria raid claimed that seven Israeli F-15s “flew along the Mediterranean coast, brushed past Turkey and pressed on into Syria. Fifty kilometers (30 miles) from their target they fired 22 rockets at the three identified objects inside the Kibar complex.” Article translated and quoted in “Iranian defector tipped Syrian nuke plans,” Associated Press, March 19, 2009. In the 1981 strike on Iraq’s Osirak reactor, the eight Israeli F-16s that carried out the bombing and six supporting F-15s transited Jordanian and Saudi airspace en route and on the return trip. An overflight of present-day Jordan might have more complicated political ramifications, given that Israel and Jordan signed a peace treaty in 1994.
175 Hugh Tomlinson, “Saudi Arabia gives Israel clear skies to attack Iranian nuclear sites,” The Times (UK), June 12, 2010.
technological and logistical advantages mentioned in the above paragraph to elude interception during its overflight of third-party countries. Additionally, according to a book by two U.S. analysts, “For all these countries except Syria, the balance of incentives might well lie on the side of silence … a humbled Iran would be the overriding interest, especially if intercepting aircraft were likely to be shot to pieces by Israeli fighters.”\textsuperscript{176} Active resistance to Israeli overflight using surface-to-air missiles or intercepting aircraft could, at a minimum, derail Israel’s “intricate attack plan”\textsuperscript{177}—for example, by lengthening Israeli flight routes and complicating refueling plans.

A second challenge is that the distance to targets and the size of a possible strike package would require all of Israel’s aerial refueling capability, with little or no margin for equipment or operational failures. A February 2012 \textit{Economist} article anticipated the facilities that an Israeli strike might target:

> Israel would probably pay particular attention to the enrichment plants at Natanz and Fordow; after them would come the facility at Isfahan that turns uranium into a gas that the centrifuges can work with and the heavy-water reactor under construction at Arak, both of which are above the ground. The larger Russian-built reactor at Bushehr would probably escape unscathed; it is less relevant to weapons work and damage to it could spread contamination across the Gulf.\textsuperscript{178}

Israel has five KC-130s and four 707-based tankers similar to American KC-135s.\textsuperscript{179} A 2009 study estimated a need for 12 tanker equivalents per mission simply to attack Iranian nuclear facilities at Esfahan, Natanz, and Arak (the Fordow facility had not yet been revealed).\textsuperscript{180} Without additional tankers, the fighters would have to refuel twice over the duration of the mission. This need may be somewhat reduced by the fact that Israel is also believed to have “mastered the operation of ‘buddy refueling,’”\textsuperscript{181} using the F-15s’ drop tanks to refuel the shorter-range F-16s en route.\textsuperscript{182} Additionally, one Israeli report states, “For the last few years, Israeli representatives have been snapping up every old Boeing 707 airliner in good condition … and converting them into airborne tankers. According to various sources, the IAF has by now eight or nine such tankers.”\textsuperscript{183}

Analysts differ in assessing the effectiveness of Iranian air defenses. Iran’s defensive missile systems are among the least modern in the Middle East, relying on Hawk systems supplied by the United States before the Iranian Revolution and Vietnam-era Russian SA-2s, along with a few more modern SA-5s. But they are controlled, some argue, by a modern, coordinated network. One analyst has said, “They're not using wax pencils on glass…. [t]hey have updated

\begin{itemize}
\item Allin and Simon, op. cit., pp. 99-100.
\item Ibid., p. 49.
\item “Attacking Iran: Up in the air,” op. cit. Former Deputy Assistant Secretary of Defense Colin Kahl has said that an Israeli attack might also target “multiple centrifuge production facilities in and around populated areas of Tehran and Natanz.” Kahl, “An Israeli strike on Iran would backfire,” op. cit.
\item \textit{The Military Balance 2011}, Chapter Seven: Middle East and North Africa, International Institute for Strategic Studies, March, 2011. Israel has supported distant deployments before, most notably a 2,600-kilometer deployment to Poland, albeit only three fighters were involved.
\item Hans Rühle, “Wie Israel Irans Atomprogramm zerstören könnte (How Israel could destroy Iran's nuclear program),” \textit{Die Welt} (Germany), February 16, 2012 (CRS translation).
\item Pfeffer, “Israel could strike Iran's nuclear facilities, but it won't be easy,” op. cit.
\end{itemize}
computerized modern air defenses." Another has raised the possibility, however slight, that Russia might have “in recent years secretly supplied [Iran] with the SA-12 Giant or the latest variants of the S-300 series’’ air defense systems. If that is the case, analysts estimate that the attrition rate of Israeli aircraft in an air strike could be significantly higher than otherwise.

Aircraft

Although an attack on Esfahan, Natanz, and Arak might require deploying only 20% of Israel’s top-line fighters purchased from the United States, it would probably require 100% of the most capable—the IAF’s 25 F-15Is. Undertaking additional strikes on Fordow and possibly other facilities—such as those related to research, centrifuge production, uranium mining and processing, or even possible weapons production—would probably require diverting some of these aircraft from the first three targets and possibly addressing some targets through alternative means (see below). According to a Center for Strategic and International Studies (CSIS) report, “Israeli aircraft would probably need to carry close to their maximum payloads to achieve the necessary level of damage against most targets suspected of WMD activity, although any given [above-ground] structure could be destroyed with 1-3 weapons.” Striking Natanz, Esfahan, and Arak simultaneously would probably require 90 tactical fighters, including a 10% margin for reliability. With support, this yields an Israeli strike “involving at least 100 aircraft.”

Most sources indicate that Israel has a total of “around 350 fighter jets, a larger aerial combat force than countries of the likes of Britain and Germany.”

Weapons

The facilities at Esfahan and Arak are above ground, meaning they can be attacked with a variety of weaponry. Those that are underground, such as the commercial enrichment facility at Natanz, or above-ground structures that have been hardened, can be struck with precision-guided “bunker-buster” weapons, two types of which the United States has sold to Israel. The Guided Bomb Unit (GBU)-27 2000-lb class weapon carries 550 lbs of high explosives, and can penetrate more than six feet of reinforced concrete. The GBU-28 5000-lb class weapon penetrates at least 20 feet of concrete and 100 feet of earth. According to CSIS, “The key weapon to be used against hard targets and underground sites like Natanz might be the GBU-28, although the US may have quietly given Israel much more sophisticated systems or Israel may have developed its own.”

184 Rühle, op. cit.
185 Toukan and Cordesman, op. cit.
186 Ibid. The IAF also has 101 F-16Is (per Military Balance, op. cit.).
187 Cordesman, op. cit.
188 Toukan and Cordesman, op. cit.
190 Pfeffer, “Israel could strike Iran's nuclear facilities, but it won't be easy,” op. cit.
191 Toukan and Cordesman, op. cit.
192 Cordesman, op. cit. Although small nuclear warheads, in the event Israel has them, could be effective against targets too hardened for Israel’s conventional weapons to address, their use would, in the words of CSIS, “generate severe diplomatic and military consequences for Israel.” Ibid.
Because the GBU-27 and -28 can be laser-guided, other aircraft or special operations forces inserted on the ground may be used to designate the target.\textsuperscript{193}

Israel possesses Jericho II medium-range ballistic missiles with ranges capable of striking Iran.\textsuperscript{194} They could be used against above-ground targets and free up aircraft to focus on hardened targets or those less amenable to missile attack. However, whether these ballistic missiles have the accuracy and capacity to destroy such targets in Iran is unclear.

From a weaponeering perspective, Fordow offers a unique challenge. Because the facility is reportedly built inside a mountain an estimated 295 feet deep,\textsuperscript{195} Israel’s current earth-penetrating munitions may be ineffective.\textsuperscript{196} Observers suggest strikes against the reinforced entrance doors may be necessary, which would require a great degree of precision. Such an attack would not be possible with missiles, as the angle of approach required would not be possible from a ballistic trajectory. According to CSIS, “The hard target bombs [Israel] has acquired from the US are bunker-busters, however, not systems designed to kill underground facilities. They could damage entrances but not the facilities. What is not known is whether Israel has its own ordnance or has secretly acquired more sophisticated systems.”\textsuperscript{197}

However, it may not be necessary to damage a facility directly in order to disrupt its functionality. Centrifuges, for example, require an enormous degree of precision to work, and even a relatively minor shock or other event can destroy a centrifuge’s utility. In the case of Natanz, even if the reinforced building is not breached, an explosion strong enough to significantly damage the walls could still ruin centrifuges—and the consensus of planners is that one to two GBU-28s would be sufficient to shatter the reinforced dome.\textsuperscript{198} At Fordow, assuming that munitions would not be able to penetrate the mountainous terrain over the facility, the question would be how well the centrifuges have been isolated from shock and the possible blast effects of an attack on the facility’s entrances.\textsuperscript{199} In a Washington Post interview apparently contemplating a hypothetical U.S. strike on Fordow, a U.S. defense analyst was cited as a source for the following statement: “‘There are good outcomes short of destroying’ the centrifuge hall. Strikes against more accessible targets—from tunnel entrances and air shafts to power and water systems—can effectively knock the plant out of action.”\textsuperscript{200}

See Figure 3 below for a graphic with reported details on the underground facilities at Natanz and Fordow and on penetrating munitions that could be used to target the facilities.

\textsuperscript{193} Rühle, op. cit., states that Israel used special operations forces to designate targets in the strike on Syria’s nuclear facility in 2007.

\textsuperscript{194} Toukan and Cordesman, op. cit.

\textsuperscript{195} Lindeman and Webster, op. cit.

\textsuperscript{196} A former RAND Corporation analyst has argued, however, that a highly coordinated and precise attack using GBU-27s and GBU-28s could conceivably incapacitate Fordow’s centrifuges. Austin Long, “Can They?”, Tablet, November 8, 2011.

\textsuperscript{197} Cordesman, op. cit.

\textsuperscript{198} Rühle and Toukan/Cordesman evaluate the use of GBU-28s against Natanz; Long dedicates all GBU-28 strikes to Fordow, but finds GBU-27s sufficient for Natanz.

\textsuperscript{199} Long, op. cit.

\textsuperscript{200} Anthony Cordesman of CSIS cited in Warrick, “Underground sites vulnerable, experts say,” op. cit.
Figure 3. Underground Nuclear Facilities and Penetrating Munitions

Operational since 2003, the facility has two main buildings—about 270,000 square feet—and contains an estimated 9,000 centrifuges for enriching uranium. The facility is 26 feet underground and protected by a concrete wall 8 feet thick. The roof was hardened in 2004 with reinforced concrete and covered with 72 feet of dirt.

Secretly built by Iran into the side of a small mountain outside the ancient city of Qom and made public in 2009, the plant is designed to house up to 3,000 centrifuges. Main enrichment hall is protected by an estimated 286 feet of rock.

Bunker busting capabilities

The Pentagon has some powerful weapons designed specifically to penetrate underground bunkers. Israel’s military is not equipped with the larger bomb.

Guided Bomb Unit (GBU-28) with BLU-122 warhead

- Weight: About 4,600 pounds
- Explosive’s weight: Nearly 650 pounds
- Guidance: Laser-guided conventional munition

GBU-57/B Massive Ordnance Penetrator (MOP)

- Weight: 30,000 pounds
- Explosive’s weight: About 6,000 pounds
- Guidance: GPS-aided navigation

Penetration capability

- More than 20 feet of concrete; more than 100 feet of earth.
- Up to 200 feet underground before exploding. By some reports, it was expected to penetrate as much as 200 feet through 5,000 psi reinforced concrete, and 25 feet into 10,000 psi reinforced concrete.

Sources: Washington Post (from DigitalGlobe via Google Earth Pro, GlobalSecurity.org), adapted by CRS

Note: CRS does not claim to confirm this information independently.
In a February 2012 Bipartisan Policy Center report, former Senator Charles S. Robb and retired Air Force General Charles Wald suggested that the United States provide Israel with 200 GBU-31 bunker-busting munitions and additional aerial refueling assets. GBU-31s have the same warhead as Israel’s existing GBU-28s (the BLU-122), but with a more precise guidance kit. Although its warhead would cause little to no more damage than a GBU-28’s, the report asserts that “The GBU-31 would augment the IAF’s existing capabilities, in this case by increasing the likelihood that any given sortie would score a direct hit on its target.”

Reports indicate that Prime Minister Netanyahu might have requested additional GBU-28s and tanker aircraft from U.S. officials during his early March 2012 Washington, DC, trip, though White House Press Secretary Jay Carney claimed that the topic was not discussed in Netanyahu’s meeting with the President.

201 Senator Charles S. Robb and General (USAF ret.) Charles Wald, Co-Chairs, Meeting the Challenge: Stopping the Clock, Bipartisan Policy Center, Washington, DC, February 2012. They make these suggestions under the following rationale: “While we do not advocate an Israeli military strike, we believe a more credible Israeli threat can only increase the pressure on Iran to negotiate.” Ibid.

202 Robb and Wald, op. cit.

203 Kent Klein, “White House Denies Report of Deal With Israel Over Iran,” Voice of America, March 8, 2012. According to Reuters, a report in Israel’s Ma’ariv newspaper that President Obama agreed to provide the equipment on the condition that Israel not attack in 2012 was dismissed in Israeli government circles as “unrealistic.” “Iran-Konflikt - Israel fordert in USA bunkerbrechende Bomben an (Israel requests bunker-buster bombs in USA),” Reuters Deutschland, March 8, 2012 (CRS translation).