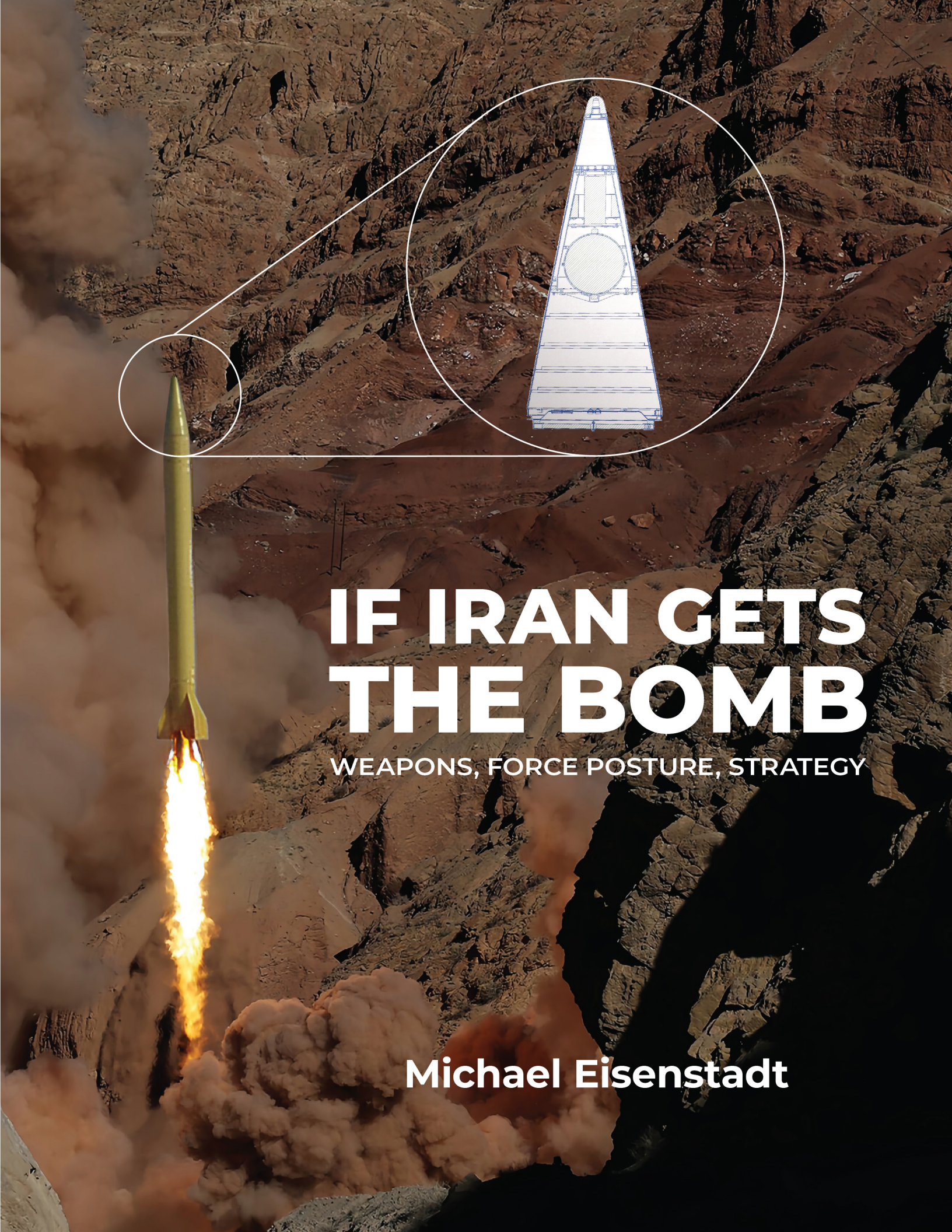

IF IRAN GETS THE BOMB

WEAPONS, FORCE POSTURE, STRATEGY

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Cover image: Photo montage of a Shahab-3 ballistic missile, Iran's intended delivery system for its planned nuclear weapon, rising from a launch site during a military exercise. The schematic of this weapon on the cover and on page 6 of the text is courtesy of David Albright, Institute for Science and International Security.

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Abbreviations

EMP	electromagnetic pulse
HEU	high-enriched uranium
IAEA	International Atomic Energy Agency
ICBM	intercontinental ballistic missile
IED	improvised explosive device
IRGC	Islamic Revolutionary Guard Corps
IRIAF	Islamic Republic of Iran Air Force
IRIN	Islamic Republic of Iran Navy
JCPOA	Joint Comprehensive Plan of Action
MARV	maneuverable reentry vehicle
MIRV	multiple independently targetable reentry vehicle
MODAFL	Ministry of Defense and Armed Forces Logistics
NPT	Nuclear Nonproliferation Treaty
PAL	permissive action link
PIJ	Palestinian Islamic Jihad
RV	reentry vehicle
TEL	transporter erector launcher
TNT	trinitrotoluene

Executive Summary

Four decades after launching its nuclear weapons program, the Islamic Republic is now a nuclear threshold state that could produce sufficient weapons-grade uranium for a nuclear device within about a week after a decision to do so. Iran thus faces a choice: continue hedging while accumulating ever growing quantities of enriched uranium, or attempt to break out and build a bomb—thereby becoming a nuclear-armed state.

The United States might yet dissuade or deter Iran from building nuclear weapons. But for analytical purposes, this paper assumes Iran will eventually get the bomb, and it assesses: (1) Iran's weapons, force structure and posture, and strategy options; (2) the implications of a nuclear-armed Iran; and (3) options for shaping Iran's nuclear choices in order to bolster deterrence and stability in a proliferated Middle East.

Weapons Design and Delivery Options

Iran's crash effort in the late 1990s and early 2000s under the Amad Plan to produce five missile-delivered nuclear devices will likely provide the departure point for future weapons work—assuming it has not since then conducted significant clandestine nuclear R&D work or obtained more advanced designs from abroad.

Iran's military R&D establishment often pursues multiple, parallel paths in weapons development. Accordingly, if Iran were to build more than a small number of devices, it would probably explore multiple weapons designs—including smaller, more efficient designs such as boosted fission weapons—to permit additional delivery options and greater yields. It might even eventually develop thermonuclear weapons (hydrogen bombs), because even though large-yield weapons may be unnecessary to fulfill the armed forces' operational requirements, ownership could confer power and prestige.

Iran—like nearly every other nuclear-armed state—would prioritize ballistic missiles as its primary delivery system because they are more survivable, responsive, and likely to penetrate enemy defenses than any other option. Iran has more than three thousand ballistic missiles and a massive infrastructure—mobile launchers, underground missile cities, and hardened silos—to support this arsenal. Iran might also consider deploying nuclear-armed missiles in container erector launchers aboard cargo vessels for use against enemies beyond range of its land-based missiles, and to enable attacks from unexpected directions. But because Iran often aspires to many of the capabilities possessed by the great powers, it might eventually consider other delivery means such as: aerial bombs and air-to-ground missiles; naval mines, torpedoes, and antiship cruise missiles; aerial and naval drones; and man-portable nuclear suitcase bombs for use by the Islamic Revolutionary Guard Corps–Qods Force (IRGC-QF).

Force Structure and Posture

Decisions regarding Iran's nuclear force structure and posture will depend on: (1) constraints on the availability of fissile material or weapons manufacturing capacity; (2) the regime's proliferation strategy: i.e., whether it opts for a large arsenal from the start, or builds only a handful of weapons while retaining as leverage a large fissile-material stockpile to enable small "bump-ups" or an eventual larger "breakout" (i.e., expansion of its arsenal); and (3) its assessment of the domestic and external threat environment. Given domestic unrest and persistent foreign intelligence penetration of Iran's nuclear program, concerns about

sabotage, diversion, and unauthorized use will be central to this assessment. The result is three possible nuclear postures:

- Weapons in an unassembled, "non-weaponized" state, in order to secure them against sabotage or diversion and to project a less provocative posture
- A hybrid force consisting of a small number of weapons kept at various readiness states, along with a reserve of unassembled weapons, to strike a balance between stockpile security and readiness
- Assembled weapons kept at various readiness states to maximize the ability to credibly deter, intimidate, and respond to potential threats

GO SMALL, GO BIG, OR SOMETHING IN BETWEEN?

Iran might need only a handful of low-yield devices to achieve its minimal objectives: to intimidate Israel and the Gulf states while holding at risk U.S. carrier strike groups and the half-dozen major U.S. military bases in and around the Gulf. But a small stockpile would have drawbacks. It could be vulnerable to a disarming first strike, while design flaws, sabotage, or enemy missile defenses might produce unacceptable attrition rates. As a result, such an arsenal might not be considered militarily credible.

Alternatively, a nuclear-armed Iran might "go big" and build an arsenal that eventually exceeds one hundred devices, perhaps believing that only a large arsenal could ensure that at least some would survive a first strike, or attrition due to sabotage, malfunctions, or enemy missile defenses. And it might decide that a large arsenal is a necessity for reasons of national honor and pride. Or Iran might settle for a midsize arsenal of several dozen devices, striking a balance between stockpile security, survivability, and military credibility.

Strategy: How Would Iran Use Nuclear Weapons?

Based on Iran's past use of its strategic missile forces and lessons learned from other nuclear-armed states, Iran would most likely use nuclear weapons to deter and intimidate its enemies and pursue a more assertive regional policy.

A "SWORD," A "SHIELD," AND A "WEDGE"

If Iran gets the bomb, the regime will be emboldened, portraying the event as a triumph over enemies that worked for decades to prevent such an outcome. Like other new nuclear-armed states, it will be more assertive, testing to see what it can get away with. In particular, it may hope that the potential threat of nuclear annihilation will—like a Sword of Damocles over the head of Israelis—cast doubt on the future of the Jewish state and encourage mass emigration. Iran may also hope to use its nuclear weapons as a shield to deter Israeli and American military action as it wages proxy warfare against them, and as a wedge to deepen the divide between Washington and its Arab partners.

NUCLEAR WAR?

There is no evidence that Supreme Leader Ali Khamenei believes nuclear weapons have a role in warfighting. Four decades of experience offer no evidence, moreover, that Iran is led by a "messianic apocalyptic cult" for which mutual assured destruction is an inducement rather than a constraint. Iran's risk-averse behavior in its conventional conflicts with the United States and Israel thus far suggests that Iran would use nuclear weapons only in extremis: if the survival of the Islamic Republic were threatened. And Israel's ability to inflict mass destruction on Iran with its own nuclear arsenal—consisting of perhaps 90 devices—would undoubtedly affect Tehran's own nuclear calculus. Yet the notorious 2001 sermon by Akbar Hashemi Rafsanjani, in which the former Iranian president mused about employing nuclear weapons to destroy Israel, raises troubling questions about whether policymakers in today's Islamic Republic might seriously consider such an option. Indeed, the rise of a new generation of hardline Islamic Revolutionary Guard Corps (IRGC) officers may portend a change in Tehran's nuclear risk calculus.

Policy Recommendations

More than any other factor, U.S. words and actions will shape Iranian nuclear decisionmaking. U.S. policymakers will therefore need to reacquire the deterrence and competitive strategy skills acquired by their Cold War–era predecessors in a series of nuclear crises—and near disasters. And they will need to embrace a more holistic approach that combines all the instruments of national power to bolster deterrence and stability.

To accomplish this, the United States and its partners should seek synergies between economic sanctions (to limit Tehran's resources) and military and other measures (to force choices and tradeoffs in the allocation of resources), with the goals of inducing Iran to: spend less on guns and more on butter; allocate more of its resources to conventional defense; and adopt a less threatening and destabilizing nuclear force posture. To this end, the United States and its partners should:

- Demonstrate a persistent ability to penetrate Tehran's nuclear program by cyber and other means to highlight its vulnerability, and to thereby discourage the production of weapons in large numbers and their deployment in a high state of readiness.

- Further strengthen regional air and missile defenses while providing maritime forces with the means to detect and interdict nuclear-armed naval drones, cargo vessels, or warships—including perhaps a regional network of seaborne radiation monitors.

- Deploy conventional hypersonic weapons that can strike Iran's leaders to deter the use of nuclear weapons and cause Tehran to divert resources to defend against this threat.

- Revive the Cold War–era policy of deploying non-strategic nuclear weapons on warships to cause Tehran to divert resources to defend against them, deter nuclear weapons use, and help counter a more assertive China, Russia, and North Korea.

- Integrate B-2 stealth bombers more fully into regional military exercises and operations to demonstrate a readiness to use this system to launch a disarming first strike against a nascent arsenal.

- Feed Tehran's paranoia about foreign "soft warfare" plots to destabilize the Islamic Republic so that it devotes more resources to building up its internal security forces and ensuring nuclear stockpile security, and less to building up its nuclear forces.

In sum, should Iran get the bomb, shaping its choices regarding weapons, force structure and posture, and strategy will be key to bolstering deterrence and stability in a nuclearized Middle East. Figuring out how to do so will be a major challenge for U.S. policy.

1

Introduction

After the United States pulled out of the 2015 Joint Comprehensive Plan of Action (JCPOA) with Iran—nearly three years after agreeing to the multilateral nuclear deal—the Islamic Republic gradually resumed its nuclear activities. In recent months, it has accelerated these efforts dramatically—ramping up the accumulation of high-enriched uranium (HEU), installing more advanced gas centrifuges at its enrichment plants at Fordow and Natanz, and engaging in possible weapons-related activities.[1] Such steps could enable a nuclear breakout—the production of sufficient weapons-grade uranium for its first nuclear device—within about a week after a decision to do so, and about a dozen bombs' worth in three months.[2] Producing its first nuclear device could take from several months to a year or more—depending on the type of weapon the Islamic Republic aims for.[3]

Iran has also recently shown greater risk acceptance than previously in its dealings with Israel and the United States, launching a massive drone and missile strike against the Jewish state on April 13, 2024, nearly two weeks after Israel killed three Islamic Revolutionary Guard Corps–Qods Force generals and their staff in an airstrike on an annex of the Iranian embassy in Damascus.[4] At around the same time, Iranian officials began hinting that under certain circumstances the Islamic Republic might reconsider its nuclear hedging strategy.[5]

As an emboldened Iran accumulates ever growing quantities of enriched uranium and reduces its breakout time by deploying increasingly sophisticated gas centrifuges, the temptation to finally cross the nuclear weapons threshold may prove hard to resist. The recent election of a reformist president, Masoud Pezeshkian, will not necessarily change that dynamic. After all, Iran's crash program to produce a handful of nuclear weapons was launched in the late 1990s, during the tenure of reformist president Mohammad Khatami, who served until 2005.

Iran is now a *nuclear threshold state*. It may continue *hedging* (preserving an option to build a bomb) as this status provides it with a degree of *latent deterrence* (i.e., nuclear deterrence without the bomb), since potential adversaries know Iran could respond to a perceived threat by building a nuclear weapon. Or it could attempt a breakout and actually build a bomb, thereby becoming a *nuclear-armed state*.[6]

The United States might yet dissuade or deter Iran from building nuclear weapons. But for analytical purposes, this paper assumes that the Islamic Republic will eventually get the bomb, and it assesses: (1) its weapons, force structure and posture, and strategy options; (2) the implications of a nuclear-armed Iran for the United States and its partners; and (3) options for shaping its nuclear choices in order to bolster deterrence and stability in a proliferated Middle East.

This paper therefore offers a glimpse of what the emerging "third nuclear age" will look like in the Middle East should the United States and its partners fail to prevent Iran from getting the bomb (for more on the three nuclear ages, see "Nuclear Weapons 101," in chapter 2).

Iran's Nuclear Hedging Strategy and Pathway to the Bomb

How Tehran gets the bomb will to some extent influence what it does with the bomb, as the context of its breakout and its nuclear proliferation strategy will influence its weapons design choices, force structure and posture, and nuclear strategy.

The Islamic Republic's nuclear program dates from the mid-1980s, when at the height of the Iran-Iraq War it started secretly investigating options for producing fissile material and building nuclear weapons. By the late 1990s, fearing that Iraq might be reconstituting

its nuclear program (which U.S. forces had bombed in 1991 and UN inspectors largely dismantled thereafter), Iran initiated a clandestine crash nuclear weapons program.[7] After the program's exposure in 2002 and the U.S. invasion of Iraq in 2003—which led Tehran to conclude that it might be next in Washington's crosshairs—Iran largely halted weapons work to avoid giving the United States a pretext to attack. By 2009, after it was revealed that Iran was building a clandestine enrichment facility at Fordow—indicating that it had probably still harbored hopes of continuing clandestine weapons work—it adopted a cautious hedging strategy that enabled it to incrementally build an option to manufacture a nuclear weapon, while managing the risks of doing so.

Iran adopted a hedging strategy because it concluded that the potential risks and costs of getting the bomb—diplomatic isolation, economic sanctions, a military strike, and perhaps a regional nuclear proliferation cascade—were too high.[8] And it agreed to the terms of the JCPOA (along with Britain, China, France, Russia, the United States, Germany, and the EU), which temporarily halted, capped, and reversed key components of its nuclear program, to obtain relief from sanctions that threatened the regime's stability. Had it considered the bomb essential to its survival, Tehran never would have agreed to the JCPOA. Once the United States withdrew from the deal in 2018, however, Iran gradually ceased complying with its terms.

By contrast, Iran has steadfastly refused to negotiate over its ballistic missiles. These form the backbone of its conventional strategic forces and are likely to form the backbone of a future nuclear arsenal. Nevertheless, Iran's nuclear program remains its foremost national prestige project. The regime has sacrificed hundreds of billions of dollars of potential income by enduring nuclear and other sanctions to preserve its nuclear program, which embodies its great power aspirations and provides leverage over its enemies.

Tehran, however, may still harbor concerns about the risks and costs of attempting a nuclear breakout, and doubts about the relative benefits of nuclear weapons. Some senior policymakers—including Supreme Leader Ali Khamenei—may consider nuclear weapons a two-edged sword that could potentially jeopardize the regime's vital interests. It is therefore not a foregone conclusion that Iran will go for the bomb—at least in the near future. Accordingly, the United States and its partners should do everything possible to "keep the hedger hedging" for as long as possible.[9]

Yet if Tehran were convinced that it could get the bomb without paying too high a price, it might try to do so. In the months prior to the devastating Israeli strikes against Hezbollah in September–October 2024, Iranian officials expressed confidence in the growing strength of their country and its proxies, and the apparent weakness of the United States and Israel, raising concerns that Iran might alter its approach to nuclear weapons. In two speeches delivered in early May 2024, Gen. Hossein Salami, the commander of the IRGC, boasted triumphantly, "We are living in an era in which God has given a clear victory to the front of Islam." Although "the enemy [used] all possible means," he added, Iran emerged "mighty, dominant, and strong." He concluded that "nothing but divine [favor] could [explain] this amazing fact," adding that while "every [other] country in the world is weakened by war," Iran "grows stronger from war." A week later, Salami gloated about apparent Israeli and American weakness, claiming, "The al-Aqsa Flood [the Hamas-led October 7, 2023, attack on Israel]…show[ed] how vulnerable this regime [Israel] is, and how [it is as fragile as] a spider's web…We are nearing the end of this regime's political life." Meanwhile, he commented that "America's geopolitical dominion has receded in the world," adding that "its power has been in a downward spiral for years."[10]

Meanwhile, there have been unsettling signs that Iran is reconsidering its nuclear hedging strategy. In late May 2024, senior diplomat and former nuclear negotiator Abbas Araqchi, who is now foreign minister, stated that Israeli attacks "could force [regional states] to rethink…their nuclear postures." Also in May, Kamal Kharazi, a foreign policy advisor to Supreme Leader Khamenei and a former foreign minister, stated, "If Iran's existence is threatened, we will have no choice but to reverse our nuclear doctrine." And in late April, the commander of the IRGC's Nuclear Protection and Security Corps, Gen. Ahmad Haghtalab, stated that "if the false Zionist regime wants to threaten to attack our country's nuclear centers, as a way of pressuring Iran, it's possible…that the Islamic Republic will reconsider its nuclear doctrine and policies and reverse its previously stated positions."[11] While Iranian officials have previously discussed abandoning the country's hedging strategy,[12] the concern that it might do so is greater now than ever before—with Iran making alarming nuclear progress and undertaking direct attacks on Israel.

A somewhat incongruous combination of factors—brimming overconfidence, nagging insecurity, and an opportunistic streak—may be behind the Islamic

Republic's recent decision to ramp up its nuclear program. In June, the UN nuclear watchdog reported that Iran had started installing advanced centrifuges at its enrichment sites at Fordow and Natanz;[13] the following month, Israeli and American officials told journalists that Iran recently engaged in metallurgical research and computer modeling that could be related to weapons work;[14] and a U.S. intelligence assessment released in July asserts that Iran has "undertaken activities that better position it to produce a nuclear device, if it chooses to do so."[15]

At the same time, a string of audacious Israeli military actions has underscored the limits of Iranian deterrence. These include the killing of three Qods Force generals in Damascus on April 13; the killing of Hamas leader Ismail Haniyeh in Tehran on July 31 (widely attributed to Israel); the September 27 killing in Beirut of Hezbollah secretary-general Hassan Nasrallah, together with yet another Qods Force general; and a series of airstrikes on air-defense-related and ballistic missile production facilities in Tehran and elsewhere on October 26. So Tehran faces a conundrum: while this deterrence deficit might cause it to reconsider its nuclear hedging strategy in order to obtain a nuclear deterrent, Iran may conclude that this very same deterrence deficit makes it too risky to do so—at least for now, with Israel on a roll and the United States seemingly by its side.

The future course of Iran's nuclear program will depend, then, on Tehran's assessment of: (1) the risks, costs, and benefits of acquiring nuclear weapons; (2) the likelihood of getting caught attempting a nuclear breakout; (3) the odds of a U.S. or Israeli military response to such an attempt; and (4) whether its conventional deterrence deficit creates an urgent need for nuclear weapons. More than any other actor, the United States has the ability to shape these assessments and dissuade Iran from going down this path. But if the Islamic Republic goes down this path, it will have to consider various choices and tradeoffs regarding weapons, force structure and posture, and strategy.

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2

Weapons and Delivery Systems

Iran's nuclear weapons design and delivery options will be influenced by its past nuclear R&D efforts and its existing military force structure—since at least some of its conventional arms were developed to be nuclear capable.

The Amad Plan

Iran launched a crash nuclear weapons program in the late 1990s. The so-called Amad Plan had as its goal the production of Iran's first nuclear weapon by late 2002, and a total of five nuclear missile warheads by early 2003. One of these devices was designated for use in a possible underground weapons test. This proposed production timeline proved overoptimistic, however, and the program soon fell behind schedule.[1]

At the time, Iran was building a fissile material production infrastructure capable of making enough weapons-grade uranium and plutonium—at an enrichment facility at Natanz and a reactor at Arak, respectively—for twenty-five to thirty devices a year.[2] It is not clear whether the five devices to be built under the Amad Plan were intended to provide a minimal deterrent capability, or if they were intended as the initial installment on a much larger arsenal. Iran halted its crash program and most weapons design work in 2003, however, after the program's existence was made public. Some low-level weapons work may have continued for nearly a decade more, and may have resumed recently. The main sources of information regarding the Amad Plan are two comprehensive reports by the International Atomic Energy Agency (IAEA) published in 2011 and 2015, and documents taken from Iran's nuclear archive by Israel's foreign intelligence service (the Mossad) in 2018. The latter may provide an incomplete picture, however, because the documents taken constituted only about 20 percent of the archive.

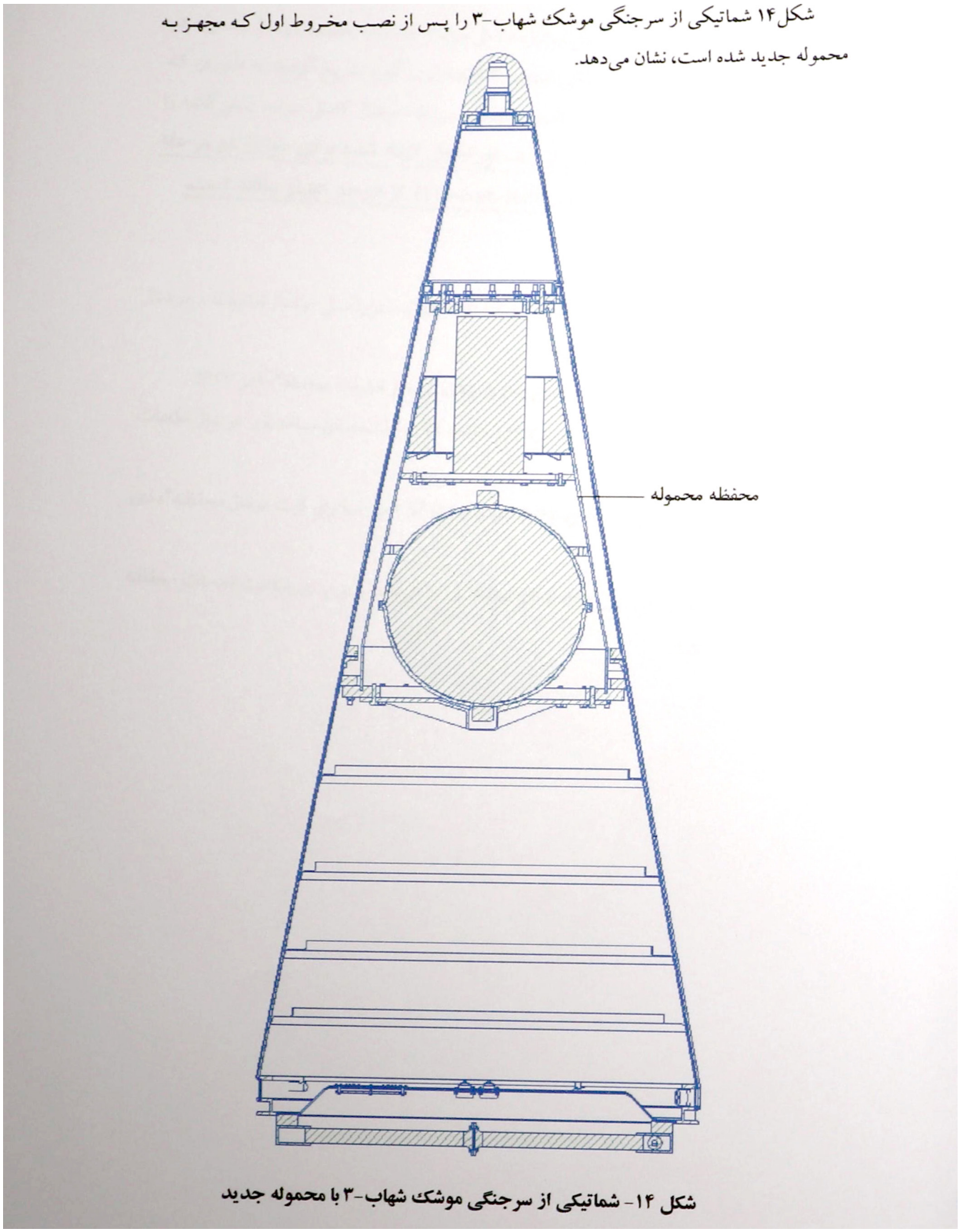
THE AMAD PLAN'S LEGACY

Under the Amad Plan, Iran was reportedly working on an implosion device based on a levitated pit design using weapons-grade uranium, which was intended to fit in the reentry vehicle (RV) of a Shahab-3 missile (see figure 1).[3] Prior to its 2003 decision to halt most weapons work, Iran apparently completed most design and testing of the major components required for a device.[4] These include the high-explosive triggering system and the conventional-explosive package used to compress the uranium bomb core,[5] the neutron initiator that starts the nuclear chain reaction,[6] and the fusing system that would set off the high-explosive trigger over the target or upon impact.[7] Iran had also conducted preparatory experiments for a weapons test.[8]

Yet according to David Albright, who has studied Iran's nuclear archive, more work may be required on the design and testing of components not yet completed when Iran halted weapons work in the 2000s. These include the triggering system, the neutron initiator, and the casting and machining of the uranium bomb core. Iran might also need to conduct a cold test of a weapon, if it has not done so already—a demonstration of a complete nuclear device in which a surrogate material, such as depleted uranium, is substituted for the weapons-grade uranium core in order to assess the overall functioning of the design.[9]

Work done under the Amad Plan will likely serve as the baseline for future Iranian weapons work, unless the regime has been able to do significant clandestine weapons R&D work or testing since the early 2000s—or obtained a more advanced design since then. Iran's ability to build smaller designs or to develop weapons with higher yields will, moreover, depend on the resumption of weapons R&D work, although help from nuclear-armed states or freelancing foreign nuclear scientists could greatly facilitate such efforts.

Figure 1. Iranian Schematic of Shahab-3 Reentry Vehicle with Spherical Payload



Source: David Albright, Sarah Burkhard, et al., *Iran's Perilous Pursuit of Nuclear Weapons* (Institute for Science and International Security, 2021), 190.

Nearly every nuclear weapons program, including Iran's, has received help from abroad. For instance, Iran acquired the designs for its first-generation gas centrifuges and plans for a nuclear weapon—and perhaps multiple designs—from the nuclear smuggling network headed by the late Pakistani scientist A. Q. Khan. It likewise received help in designing and producing a conventional explosives package for nuclear weapons from former Soviet nuclear weapons scientist Vyacheslav Danilenko, and mathematical formulas and codes for theoretical design work from North Korea.[10] According to an Israeli assessment, more than a dozen foreign individuals from several countries have assisted Iran's nuclear weapons program.[11]

It is possible, moreover—given the extent of Iran's military assistance to Russia in its war with Ukraine—that Russia might compensate Iran by doing what was once unthinkable: providing assistance in the design and development of nuclear weapons.[12]

Weapons Type, Size, and Yield

Iran's first weapon might be a fission device based on the one developed under the Amad Plan for delivery by a Shahab-3 ballistic missile, which would also fit the Ghadr-1, Emad, and Khoramshahr missiles. Iran might also initially build smaller fission devices to accommodate the smaller RVs of the Fateh-110 family of missiles. And it might build a weapon—a bomb or an air-to-surface missile—for delivery by aircraft.

Tehran might also consider boosted fission designs, which require less fissile material and thus allow for a smaller weapons package.[13] Boosted designs require tritium (an isotope of hydrogen),[14] which Iran could produce in its nuclear power plant at Bushehr. Indeed, the United States uses commercial light water reactors to produce tritium for its own nuclear weapons program.[15] Past attempts by Iran to acquire the know-how to produce tritium may indicate an interest in boosted fission designs and could provide an option, many years down the road, for thermonuclear weapons—which can produce much larger yields.[16] However, Iran might not be confident in a thermonuclear design if it had not already demonstrated the weapon's fission primary in a full-yield explosive test. (The primary or first stage in a thermonuclear device is used to trigger the fusion second stage.)

Iran might also eventually want to produce miniature, low-yield nuclear weapons for tactical employment by its air and naval forces, and as terror weapons for the Qods Force, to diversify its delivery options and provide additional rungs on the nuclear escalation ladder.[17] One way to build smaller weapons would be to construct a plutonium-based device,[18] which would require significantly smaller quantities of fissile material than one using uranium. Iran could try to rebuild its heavy water reactor at Arak to original specifications to produce small quantities of weapons-grade plutonium (it was modified under the JCPOA so that it could not produce plutonium). If this proved unfeasible, it could use its safeguarded power plant at Bushehr to produce much larger quantities of plutonium by reprocessing low-enriched uranium reactor fuel at low burn-up (i.e., after having been in the reactor only briefly). The latter option, however, would require building a spent-fuel reprocessing facility to separate and divert the plutonium—in violation of Iran's safeguards agreement with the IAEA.[19] The loading and subsequent unloading of the fuel after only a few weeks, moreover, would create visual, thermal, and other signatures that would draw attention and possibly prompt a diplomatic crisis or military response. In addition to miniaturization, the production of plutonium would provide Iran with additional weapons design options, including composite designs that use both uranium and plutonium.[20]

Iran might eventually also try to develop thermonuclear weapons, although this might take decades without foreign assistance.[21] For instance, whereas the United States tested its first thermonuclear device in 1952 (seven years after testing its first fission device) and China tested its first thermonuclear device in 1967 (nearly three years after testing its first fission device),[22] North Korea claims to have tested a thermonuclear weapon in 2017—more than two decades after it produced its first fission device—although analysts remain divided over whether it actually did so.[23] It is not clear, however, that Iran would need large-yield weapons; most military targets can be dealt with by relatively small-yield weapons, as can most Middle East cities, which are relatively compact compared to the extensive urban sprawl that characterizes settlement patterns in much of Europe and the United States. And because Iran's ballistic missiles are relatively accurate, there is no need for large-yield weapons to compensate for a lack of accuracy. Yet Iran might still want to eventually develop such weapons for reasons of national pride and status.

NUCLEAR WEAPONS 101

Nuclear weapons are explosive devices that derive their power from the splitting (fission) or combining (fusion) of atoms of fissile material (uranium or plutonium). The result is an explosion that produces immense destructive effects through blast, heat, and radiation.[24]

FOUR GENERATIONS

Nuclear weapons are often categorized by generation:

- **First generation weapons** include fission devices, using gun-type or implosion assemblies, as well as boosted fission devices that produce significant increases in yield. The arsenals of Israel, India, Pakistan, and North Korea are believed to consist largely of fission or boosted fission devices.
- **Second generation weapons** are fusion (thermonuclear) devices that use a fission primary to trigger a fusion secondary, creating massive increases in yield. Nearly all if not all devices currently in the arsenals of the original five nuclear weapons states (U.S., Russia, Britain, France, and China) are thermonuclear weapons.
- **Third generation weapons** are specialized devices designed to produce specific effects, such as neutron weapons that rely on intense radiation to kill personnel but not destroy equipment or infrastructure, or electromagnetic pulse (EMP) weapons designed mainly to disable equipment and critical infrastructure.
- **Fourth generation weapons** may in the future include small, clean, low-yield fusion devices that could lower the threshold for use because they will not produce radioactive fallout—thereby blurring the boundary between conventional and nuclear arms. Only the most technologically advanced states, however, are likely to acquire them.[25]

STRATEGIC OR TACTICAL

Nuclear devices can be further categorized as strategic or tactical (non-strategic) weapons, depending on their intended use. Strategic weapons are usually larger in size and yield, and target the enemy's homeland—to destroy its ability to mobilize the human and material resources needed to wage war. Tactical nuclear weapons are usually smaller in size and yield, and are meant to be delivered over shorter ranges against battlefield targets. They are intended to disrupt the enemy's ability to conduct military operations.

MINIATURIZATION AND LARGER YIELDS

The development of smaller, more efficient weapon designs allows for more diverse delivery options, including cruise missiles, torpedoes, artillery rounds, and even man-portable demolition munitions or "suitcase bombs" (see figure 2). At the same time, more efficient designs allow for larger yields by boosting or fusion. There are also, however, boosted fission and fusion devices built for battlefield use that produce very small yields as well as variable yields (so-called dial-a-yield weapons).

Fission, Boosted, and Fusion Weapons Yields (Upper Limits)

WEAPON	YIELD
Fission devices	Hundreds of tons → tens of kilotons*
Boosted fission devices	Tens of kilotons → hundreds of kilotons
Fusion (thermonuclear) devices	Hundreds of kilotons → megatons

THREE NUCLEAR AGES

The nuclear era is often divided into three "ages." The first nuclear age dates to the U.S. decision in the closing days of World War II to drop the atomic bomb on Japan. It largely coincided with the Cold War, in which nuclear weapons played a central role in the U.S.-Soviet standoff, leading to an arms race wherein both sides built tens of thousands of nuclear weapons before eventually agreeing to freeze their arsenals.

The second nuclear age followed the end of the Cold War and the subsequent collapse of the Soviet Union (1991). It was a period characterized by U.S. nuclear and conventional military primacy in which nuclear weapons were peripheral, and the main threats came from rogue states, terrorists, and other transnational actors. During this period, the United States and Russia agreed to dramatically reduce their nuclear arsenals.

The world is now entering a third nuclear age marked by renewed great power competition, the emergence of a multipolar international system, the emergence of new nuclear powers (perhaps including Iran), the expansion or modernization of nuclear arsenals by Russia, China, and North Korea, and the proliferation of nonnuclear strategic weapons (including drones, hypersonic glide vehicles, anti-satellite systems, cyber weapons, and artificial intelligence–enabled information operations). Arms control agreements will likely prove elusive, while conflict and instability will increase.[26]

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*One kiloton carries an explosive force equivalent to a thousand tons of TNT (trinitrotoluene)—a high explosive used as the standard unit of measurement for conventional and nuclear explosions; a megaton carries an explosive force equal to a million tons of TNT.

Figure 2. World Nuclear Arsenals

	NUCLEAR WEAPONS (TOTAL)	Nuclear weapons (fission)	Nuclear weapons (boosted fission)	Nuclear weapons (fusion/thermonuclear)	Ballistic missiles (land-based)	Submarine-launched ballistic missiles	Air-/ground-/sub-launched cruise missiles	Aerial bombs/air-to-surface missiles	Aerial drones	Anti-ballistic missiles	Surface-to-air missiles	Air-to-air rockets/missiles	Tactical rockets	Artillery rounds	Antiship cruise missiles	Naval mines	Torpedoes	Depth bombs (anti-submarine warfare)	Naval drones	Man-portable nukes/demolition munitions
United States	**3,708**	X	X	**X**	**X**	**X**	**X**	**X**		X	X	X	X	X			X	X		X
Russia/USSR	**4,380**	X	**X(?)**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	X	X	X	**X**	**X**	**X**	**X**	**X**	**X(?)**
Britain	**225**	X	X	**X**	X	**X**		X					X	X				X		X
France	**290**	X	X	**X**	X	**X**		**X**												
China	**500+**	X	**X(?)**	**X**	**X**	**X**		**X(?)**								**?**				
Israel	**90+**	**X**	**X**	**?**	**X**		**X**	**X**												
South Africa	6 (dismantled)	X						X												
India	**160**	**X**	**X**	**?**	**X**	**X**		**X**												
Pakistan	**170**	**X**	**X**		**X**		**X**	**X**												
North Korea	**35–65**	**X**	**X**	**?**	**X**	**X**	**X**									**?**			**X**	
Iran																				
Go small	5–20	X			X			X												
Midsize	20–100	X	X		X		X	X	X							X			X	
Go big	100+	X	X	?	X		X	X	X							X	X		X	X

Sources: Bulletin of the Atomic Scientists, "Nuclear Notebook," https://thebulletin.org/nuclear-notebook/; Nuclear Threat Initiative, "Countries and Areas," https://www.nti.org/countries/; Natural Resources Defense Council, "Nuclear Weapons Databook," Vols. 1, 4, and 5; and media reports.

Notes: A bolded **X** indicates that a capability is currently part of a country's nuclear arsenal. A bolded **X(?)** indicates uncertainty over whether a capability remains in service. An unbolded X indicates that a capability has been retired or, in the case of Iran, may be a future option. A bolded **?** indicates that a capability may exist. And an unbolded ? indicates uncertainty about a possible future capability. Regarding Iran, all entries are unbolded since it has not yet acquired nuclear weapons—as can best be determined at this time. The light blue shaded cells are the five nuclear weapons states under the Nuclear Nonproliferation Treaty (signed 1968). The light green shaded cells provide alternative force structure futures for Iran under three possible scenarios: "Go small," "Midsize," and "Go big."

AN EMP WEAPON?

For years, analysts have speculated that in a crisis or war Iran might detonate a nuclear device at high altitude to create an electromagnetic pulse (EMP) that could cause massive disruption over a very wide area.[27] The attempted use of a nuclear device as an EMP weapon would involve tremendous uncertainties, given the limited data available regarding the use of nuclear weapons in such a role.[28] Nonetheless, because of the sensational claims made for EMP weapons, the idea might appeal to Tehran—which has often toyed with technologies and concepts that others have dismissed as impractical (see below). Moreover, employing a nuclear device as an EMP weapon would add yet another rung to Tehran's escalation ladder in a crisis or war. And an EMP weapon, if it worked as intended, could enable Iran to use nuclear weapons to cause mass disruption without necessarily causing mass destruction—although such an attack could still produce mass casualties by disrupting electricity production and food supply chains. Yet any use of nuclear weapons could prompt an in-kind response. It is therefore not clear that the unproven benefits of using a nuclear device as an EMP weapon would outweigh the potential risks of doing so.

Weapons Delivery Options

Historically, most proliferators developed nuclear weapons before they developed dedicated delivery systems for them. Thus, while the United States first tested and used nuclear weapons in 1945, the first U.S. strategic bomber designed to deliver nuclear weapons, the B-36 Peacemaker, became operational in 1948, and the first intercontinental ballistic missile (ICBM) designed to deliver nuclear weapons, the SM-65 Atlas D, entered service in 1959. By contrast, the IRGC's Aerospace Force now possesses more than three thousand conventionally armed missiles of various types—all of which can reach targets in the Gulf and many of which can reach Israel.[29] Many are also capable of delivering nuclear weapons.

Iran's missiles are deployed in hardened silos,[30] sprawling underground missile cities built into mountains,[31] and road-mobile launchers in underground mountainside tunnels—enabling Iran to play a shell game by moving them around. These measures could protect the missile force from a disarming first strike and ensure a secure second-strike capability.

Iran undoubtedly intends to convert some of its conventional missiles for nuclear delivery if it gets the bomb, and its nuclear forces will benefit from a more mature, robust infrastructure than did most other states when they crossed the nuclear threshold. In addition, Iran has one or more hardened underground air bases built into the sides of mountains, indicating that elements of the country's air forces—including crewed aircraft and drones belonging to the IRGC and possibly the Artesh (regular military)—could have a nuclear strike role.[32]

NUCLEAR WEAPONS AND IRAN'S DETERRENCE/WARFIGHTING TRIAD

Iran aspires to acquire many of the conventional military capabilities possessed by the great powers—for reasons of power and prestige—and likely aspires to do so in the nuclear domain as well.[33] If Iran eventually creates more than a small arsenal of missile- and aircraft-delivered devices, it may consider producing nuclear weapons for use by all three legs of its deterrence/warfighting triad. This triad consists of:

- **Long-range strike systems.** Missiles, drones, and strike aircraft capable of hitting targets throughout the Middle East.
- **Maritime antiaccess/area-denial and power projection forces.** Small boats, naval mines, fast-attack craft, submarines, frigates, expeditionary sea bases and drone carrier vessels, and shore-based antiship cruise and ballistic missiles. These assets can disrupt shipping through maritime chokepoints like the Strait of Hormuz and Bab al-Mandab Strait, deny enemies use of the maritime arena to stage attacks on Iran, and launch strikes from offshore locations.
- **Unconventional warfare forces.** Particularly the IRGC's Qods Force and proxies like Lebanese Hezbollah, which are capable of waging unconventional warfare and conducting terrorist attacks in the region and beyond.

Tehran, however, will have to balance any aspirations it may have for a large and diverse nuclear arsenal against the need for reasonably assured delivery. This militates against delivery systems that are vulnerable to attack prior to use or that are more likely to be captured, diverted, or intercepted en route to their targets.

TRADEOFFS, TIMELINES, AND ORGANIZATIONAL CONSIDERATIONS

The need for secure and reliable delivery systems that can penetrate enemy defenses translates into a nuclear force based largely on ballistic missiles. This is why nearly every nuclear-armed state has relied on land- or submarine-based ballistic missiles as its primary nuclear delivery system. Ensconced in hardened underground bases and capable of movement on mobile launchers, Iran's missiles can be readied for use in hours and reach targets throughout the region in minutes. They therefore constitute Iran's most survivable, flexible, and responsive weapons system. Iran might also consider placing nuclear-armed missiles on maritime platforms during a crisis or war, although that is a more risky basing option. And it might rely on elements of its air force based in hardened, underground facilities to conduct nuclear strikes with bombs, air-to-ground missiles, or one-way attack (suicide) drones.

Weapons design choices have always been shaped by limitations imposed by available delivery systems and operational considerations.[34] The device that Iran was working on as part of the Amad Plan was fairly compact (560 mm diameter), sized to fit in the conical RV atop the Shahab-3 missile, and was also small enough to fit in the triconic ("baby bottle") RVs atop Iran's Ghadr and Emad missiles.[35] Smaller weapons designs would be required for the Fateh-110 family of solid-fuel missiles, as well as for other potential delivery systems such as cruise missiles, aerial and naval drones, and torpedoes. Iran might also aspire to develop man-portable munitions for use as terror weapons.

Iran's initial weapon of choice would probably be a refined version of the device it was working on more than twenty years ago as part of the Amad Plan. According to published Israeli estimates, Iran might need eighteen to twenty-four months to develop, test, and integrate the components needed for such a device.[36] If Iran has received secret assistance or engaged in secret R&D work or were willing to take shortcuts with regard to reliability and performance, that timeline could probably be shortened.

If Iran felt an urgent need to acquire a bomb, it could probably develop a larger, less complex device for delivery by dhow or aircraft within six months.[37] Dhows and small boats of all types regularly ply the waters of the Persian Gulf and Gulf of Oman, commingling with U.S. naval vessels and visiting ports throughout the region to transfer cargo. Such a device would not have to be designed to withstand the stresses of missile flight. But a nuclear device delivered by boat would be more vulnerable to capture or destruction prior to employment than one delivered by missile or aircraft based at a secure inland facility.

Iran is also likely to explore the use of naval expeditionary sea bases or civilian cargo vessels to transport nuclear-armed ballistic or cruise missiles in deck-mounted container erector launchers. It could use these against enemies located beyond the range of its land-based missile force, and to permit attacks from unexpected directions. Several countries have developed such systems, including Russia (Club-K), China (YJ-18), and Israel (LORA), and Iran demonstrated such a capability in February 2024 when it test-launched two Fateh-110 class solid-fuel ballistic missiles from a container erector launcher on the deck of the *Shahid Mahdavi*, one of several expeditionary sea base–type vessels in Iranian service.[38] However, to the extent that this container erector launcher was developed for use with Fateh-110 class ballistic missiles, Iran would have to develop a smaller device than that called for under the Amad Plan.[39]

A nuclear-armed Iran would likely spend several years refining its initial nuclear weapons design, followed by the accelerated deployment of a range of variants as it acquires experience and expertise. (This is more or less the pattern that followed the deployment of Iran's Shahab-3 and Fateh-100 ballistic missiles as well as its IR-1 gas centrifuge; in each case, a decade or so of work on the basic model was followed by the production, in quick succession, of a series of variants or derivatives.) This process of diversifying and building out its nuclear arsenal could take an additional decade or more—assuming the regime lasts that long—just as it took North Korea roughly two decades after producing its first nuclear device to produce a miniaturized warhead for its nascent ICBM force.[40] Foreign assistance might speed up this process, although given past and presumably ongoing problems with sabotage, Tehran might be unwilling to rely on foreign weapons designs or bomb components.[41]

Because its missiles have sometimes experienced high failure rates and challenges in penetrating enemy missile defenses, Iran would likely consider several alternative means for delivering nuclear weapons, including a mix of traditional and nontraditional delivery means—aligning with its penchant for nontraditional approaches to warfighting. These could include:

- Aerial bombs, air-to-ground missiles, and suicide drones
- Antiship and coastal-defense cruise missiles, naval torpedoes, command-detonated naval mines, and surface and underwater attack drones[42]
- Man-portable nuclear devices for use by the IRGC's Qods Force[43]

The desire to build out and diversify its arsenal might also require Tehran to grapple with longstanding institutional tensions and rivalries between the IRGC and Artesh. While Iran's past nuclear weapons R&D efforts fell under the administrative purview of the Ministry of Defense and Armed Forces Logistics (MODAFL), it was overseen by a senior IRGC officer, Brig. Gen. Mohsen Fakhrizadeh, until he was killed in an Israeli covert operation in 2020. Many of his subordinates were IRGC officers as well. The IRGC therefore would likely have operational control over the nuclear arsenal, which at least initially would consist mainly, if not exclusively, of nuclear-armed missiles. Yet if Iran were to eventually build a more diversified nuclear arsenal, it might need to involve the Artesh, recognizing that it possesses aerial and naval platforms better suited to delivering nuclear weapons at long range.

For instance, the Su-22 is the only fighter-bomber in the IRGC Aerospace Force, while the Artesh Air Force (IRIAF) has more capable F-4, F-14, and Su-24 fighters, some of which are based at hardened underground facilities. Both forces also operate aerial drones—some of which are also based at hardened, underground facilities—that could play a nuclear strike role. Likewise, while the IRGC Navy has a large number of small boats and fast-attack craft that operate exclusively in the Persian Gulf, the Artesh Navy (IRIN) has larger warships—submarines and frigates—that operate in the Gulf of Oman, Arabian Sea, and beyond, areas where the U.S. Navy would most likely operate during a crisis or war.[44] Iran, moreover, would presumably prefer to use nuclear weapons as far as possible from its own shores. If the IRGC refuses to share aspects of the nuclear mission with the Artesh, Iran's nuclear options will be somewhat circumscribed unless the IRGC eventually grows the necessary capabilities itself.

Nuclear Command and Control

Nuclear use authority is likely to be tightly held at the highest levels of the Islamic Republic. Supreme Leader Ali Khamenei is the regime's paramount decision-maker, which is why his nuclear fatwa ostensibly banning the development, stockpiling, and use of nuclear weapons is often cited by Iranian officials as the regime's definitive policy statement on the matter. Key national security decisions are usually made by the Supreme National Security Council in accordance with guidance provided by the Supreme Leader. Yet with more than twenty members, the council is unwieldy. As a result, smaller informal groups answering to the Supreme Leader are generally relied on for sensitive decisions.[45]

Thus, according to Iranian nuclear archive documents, a Supreme Council for Advanced Technologies was founded in 1998 and charged with oversight of the Amad Plan. Regularly reporting to the Supreme Leader,[46] the body is said to have included the president, secretary of the Supreme National Security Council, defense minister, head of the Atomic Energy Organization of Iran, and possibly the foreign minister. A decision to use nuclear weapons during a crisis or war would likewise probably be made by a small group of senior decisionmakers gathered for that purpose.

Moving further down the prospective nuclear chain of command, the IRGC is likely to have operational control over most, if not all, of Iran's nuclear weapons, with the IRGC Aerospace Force controlling Iran's nuclear missile arsenal. The Artesh Air Force, the Artesh and IRGC Navies, and the IRGC Qods Force may eventually be assigned operational control over nuclear weapons developed for use by their forces.

Within each of these organizations, individuals sharing bonds of trust to politicians or senior officers atop the chain of command—in some cases, family or close personal ties—are likely be selected to ensure the security of the weapons and to prevent their unauthorized use.[47] And while commanders are often granted significant latitude to accomplish their missions,[48] the Islamic Republic's persistent problem with sabotage and penetration by foreign intelligence services makes pre-delegation of nuclear use authority—even during a crisis or war—highly unlikely, except in the most extreme of circumstances.

Stockpile Security and Weapons Safeguards

Concerns about the security of its nuclear weapons might lead Iran to develop safeguards to prevent their unauthorized use. Such measures might include:

- Removable cores stored separately and inserted into the bomb assembly just prior to use
- Command disable features that destroy critical warhead components on order
- Environmental sensors that arm the device only when various parameters—acceleration/deceleration, barometric pressure, air temperature—indicate it is being employed properly
- Release codes used to activate permissive action links (PALs)—which prevent the use of nuclear weapons by individuals who lack the codes[49]

But in a country lacking an institutionalized safety culture and plagued by frequent industrial accidents, it would not be surprising if Iran failed to prioritize such measures.[50] If so, it would hardly be unique; through the 1990s, British nuclear bombs reportedly lacked any integral safeguards, while at least through the 2000s Pakistani nuclear weapons likewise lacked any kinds of safeguards, such as PALs.[51]

MISSILES: THE ISLAMIC REPUBLIC'S PRIMARY NUCLEAR DELIVERY SYSTEM

Iran's crash nuclear weapons program in the late 1990s and early 2000s, known as the Amad Plan, envisioned using the Shahab-3 missile and perhaps derivatives such as the Ghadr-1 as the primary delivery system for the Islamic Republic's first nuclear weapon.[52] Ballistic missiles would likely be the primary delivery system for a future Iranian nuclear arsenal, since no other option offers the same combination of survivability, responsiveness, and ability to penetrate enemy defenses. This is why nearly every nuclear-armed state has relied on ballistic missiles as its primary nuclear delivery system. But unlike nearly every other nuclear-armed state, Iran would cross the nuclear threshold with a robust and mature missile infrastructure (see figures 3–9).

Iran has more than three thousand ballistic missiles, many of which are nuclear capable. This force relies on three main basing modes: (1) mobile launchers hidden in mountainside tunnels, (2) large underground missile cities, and (3) hardened silos:

- **Mobile launchers** enable Iran to play a shell game by moving missiles around to create uncertainty about their location and thus thwart a disarming first strike. Transporter erector launchers (TELs) are often fitted with rail-mounted curtains that make them look like civilian semi-trailers from afar, while support vehicles are configured and painted to resemble civilian vehicles.[53]

- **Underground missile cities** consist of large missile launch halls built under mountains and connected by long tunnels, with underground munitions storage and maintenance areas. Launchpads located in each launch hall can be rapidly reloaded and reused, in some cases using rail-mounted ready magazines that can accommodate five liquid-fuel missiles. This allows for rapid reuse and relatively high sustained rates of fire.[54]

- **Silos** shown in published photos lack fuel and oxidizer lines and scaffolding required for maintenance work. Because missiles cannot be fueled in situ, they would likely be fueled before being hoisted by cranes into the silos. But newer liquid-fuel missiles like the Khoramshahr use storable fuels and oxidizers whose shelf life is reportedly three years, while fueling is not an issue for solid-fuel missiles like the Sejjil.[55]

These diverse basing arrangements may protect Iran's missile force from a disarming first strike and ensure a secure second-strike capability. In addition, Iran has one or more hardened underground air bases built into the sides of mountains, indicating that elements of the country's air forces—including crewed aircraft and drones belonging to the Artesh and IRGC air forces—could in the future have a nuclear strike role.

If it gets the bomb, Iran would likely convert some of its conventional ballistic missiles into nuclear-armed missiles. Its nuclear missile force might initially consist of a mix of liquid-fuel Shahab and solid-fuel Fateh-110 variants. Iran, moreover, will work to ensure that these missiles can penetrate enemy missile defenses. The triconic RVs fitted on some of its missiles (Qiam-1, Ghadr-1, Emad-1, Khoramshahr-2/3, and Sejjil) offer improved aerodynamic shape, which results in greater terminal velocities, making them harder to intercept.[56] The airframes of the Qiam-1 and Khoramshahr lack tail fins—possibly to reduce their radar cross-section and make them more difficult to detect in flight.[57] And the Emad-1, Khoramshahr-2/4, and Fattah-2 missiles have been fitted with maneuverable reentry vehicles (MARVs) to enable them to evade interceptors and achieve greater accuracy.[58] Finally, in its April 13 and October 1 missile strikes on Israel, Iran used saturation tactics in order to overwhelm Israeli defenses.

In the future, it might employ other missile defense countermeasures, such as decoys, chaff, and jamming, and it may try to develop hypersonic glide vehicles whose high terminal velocities and ability to maneuver may help them defeat enemy missile defenses.[59] These would probably be much more realistic options than attempting to develop multiple independently targetable reentry vehicles (MIRVs) for its missile force—a capability that only a few countries have mastered.

Figure 3. Ghadr-1 missile TELs and crews in mountainside tunnel. (Fars News Agency)

Figure 4. Ghadr-1 missiles launched from camouflaged TELs. (Mehr News Agency)

Figure 5. Sejjil missiles readied for launch from TELs. (Fars News Agency)

Figure 6. Qiam missile in underground launch hall. (Islamic Republic of Iran Broadcasting)

Figure 7. Emad missiles mounted on rapid reload magazines. (IMA Media)

Figure 8. Shahab-3 missile in hardened silo. (Islamic Republic of Iran Broadcasting)

Figure 9. Not just missiles: an IRIAF F-4 Phantom taxis in a hardened, underground air base—a possible indication that the air force may eventually have a nuclear strike role. (Reuters)

Notes

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his brief exile in France; and Anis al-Naqqash, a Lebanese Sunni Muslim who led a squad that previously attempted to kill Bakhtiar in Paris, in 1980, was a close friend of Khomeini's son Ahmad. Individuals involved in Iranian overseas technology procurement networks have also shared family ties. See, e.g., U.S. Department of the Treasury, "Treasury Designates Multi-Million Dollar Procurement Network for Directly Supporting Iran's Missile Program," press release, February 1, 2011, https://home.treasury.gov/news/press-releases/tg1044.

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3

Force Structure and Posture

Tehran's decisions regarding its nascent nuclear force structure and posture will be influenced by a variety of considerations, including: (1) its ability to manufacture nuclear weapons, which likely will be outstripped initially by its production of fissile material—as Iran's known weapons production facilities were dismantled two decades ago and will need to be rebuilt; (2) Iran's proliferation strategy—whether this entails building a large arsenal from the start, or creating a handful of weapons while retaining a large fissile material stockpile to enable small "bump-ups" or an eventual larger nuclear "breakout" (i.e., expansion of its nuclear arsenal);[1] (3) its assessment of the domestic or external threat environment, which will determine whether Iran decides to:

- Keep its weapons in an unassembled, "non-weaponized" state, separate from associated delivery systems, so that they can be more effectively secured against sabotage, diversion, or unauthorized use. Such a force posture might also be seen as less provocative, and a way of reducing the potential for miscalculation in a crisis or war.

- Create a hybrid force of both unassembled and assembled weapons in order to strike a balance between security and military readiness. Thus, some weapons might be unassembled, others might be assembled but kept separate from delivery systems, and still others might be kept in a state of high readiness.

These choices will, in turn, be affected by the context surrounding an attempted Iranian breakout—whether in response to a perceived opportunity, or in the aftermath of a military strike against its nuclear infrastructure that may limit its options even as it strengthens its desire to proliferate.

Iran has a large and growing stockpile of fissile material—at present, about fifteen bombs' worth of uranium enriched to 5, 20, and 60 percent.[2] If this trend continues, in another year or two, Iran may have sufficient fissile material for scores of weapons. Iran's ability to create a nuclear arsenal, therefore, will depend on its ability to enrich to weapons grade and then to weaponize—a process that could initially take as little as several months, or as much as a year or two—creating a window of vulnerability during which the effort, if discovered, could be disrupted by military action.

Whether Tehran opts to crawl or dash to the bomb, having a large stockpile of fissile material will be advantageous. If Iran is attacked, having more fissile material on hand raises the odds that more will survive a strike, enabling it to jump-start its program thereafter. And the more it has, the faster it can advance should it restart its crash weapons program. In either case, the main constraint will be its weapons production capability.

A Sneak-Out, a Creep-Out...

Iran's preferred path to the bomb—one consistent with the cautious, incremental approach it has taken for most of the past forty years—would likely be via a stealthy sneak-out. In this scenario, clandestine weapons work would remain limited in scope and advance slowly in order to avoid signatures that could be detected by foreign intelligence services. Such a slow, deliberate approach may also be required in the event that a military strike destroys much of its HEU stockpile and enrichment capabilities. In the aftermath of such a strike, Iran might move forward slowly and carefully to avoid provoking follow-on strikes. And by keeping any renewed nuclear activities secret, the regime would facilitate post-strike diplomacy intended to portray itself as the victim of aggression.

Alternatively, Iran might attempt an incremental, overt slow-motion creep-out, engaging in both declared enrichment activities and clandestine weapons work.

This could culminate in an announcement that Iran had secretly demonstrated the ability to produce all the components needed for a bomb, but that it would not actually build a bomb, enabling it to claim it had not violated the Nuclear Nonproliferation Treaty (NPT) ban on the manufacture of nuclear weapons. It might then gradually adopt a non-weaponized deterrent posture as did India and Pakistan in the 1980s.[3] In doing so, Iran could claim that it remained compliant with the Supreme Leader's "nuclear fatwa" as well as the spirit of the NPT—which does not define precisely what the ban means.[4] Furthermore, it could threaten to abandon this posture, assemble the weapons, and weaponize its HEU stockpile if threatened or attacked. This would enable Iran to combine elements of both latent and weaponized deterrence, using its weapons and HEU stockpiles synergistically to gain leverage over its adversaries. This non-weaponized nuclear posture could eventually serve as a stepping stone to a more robust, overt posture involving the deployment of assembled weapons.[5]

...Or a Dash to the Bomb?

Should Tehran face a crisis or war that threatened the regime's vital interests, it might mount a crash program to rapidly build a bomb, much as Iraq did in 1990 following its invasion of Kuwait. In this scenario, Iran might also want to conduct a hasty demonstration test, so building a large, functioning device might be more important than building a small, deliverable weapon. With time being of the essence, it might also cut corners to produce the maximum number of devices in the shortest time possible. Thus, it might manufacture a few large, ready-to-use devices that could be delivered by remotely controlled dhows, large naval or aerial drones, or crewed aircraft.

Go Small or Go Big?

In considering potential nuclear force structures, Iranian military planners will need to manage tensions between security, readiness, and operational effectiveness (see figure 10).[6] Thus, Iran may need only a handful of low-yield nuclear devices to achieve its minimal nuclear program objectives: to threaten and intimidate Israel and the Gulf states as well as to hold at risk U.S. carrier strike groups and major U.S. military bases in and around the Gulf. This would equate to an inventory not much larger than that initially envisioned under the Amad Plan.[7] And Iran might prefer such a small stockpile, which could be more easily secured against sabotage or diversion. At the same time, a small stockpile might not be militarily credible; it could be vulnerable to a disarming first strike, or attrition due to sabotage, malfunctions, or enemy air defenses—raising questions as to whether any would get through.

Alternatively, a nuclear-armed Iran might go big, believing only a large arsenal could ensure that at least some survive a first strike, or attrition due to sabotage, malfunctions, and enemy action. And it might decide that a large arsenal is a necessity for reasons of national honor and pride: a great nation seeking to transform the regional and global order requires a nuclear arsenal commensurate with its grandiose ambitions. Indeed, Iran's past efforts to build a large fissile missile-production capability that could generate twenty-five to thirty devices a year might indicate an interest in such an option.[8]

To sum up, a small, clandestine nuclear arsenal kept in a low state of readiness might enhance regime security and regional stability, but may lack credibility for deterrence—and warfighting. Conversely, a large arsenal maintained at high readiness might enhance military credibility and effectiveness, but may undermine regime security and regional stability. How Iran manages these tensions, or prioritizes one set of considerations over the other, will have a major impact on the evolution of its nuclear force structure.

STOCKPILE SECURITY

The Iranian regime has failed to protect its most senior nuclear scientists from Israeli hit teams, its most important nuclear facilities from foreign saboteurs, and its nuclear archives from theft by Israeli intelligence. Moreover, the Islamic Republic has experienced repeated bouts of popular unrest that could pose a threat to the security of a nuclear arsenal.

The risks posed by sabotage become much more serious once a state acquires nuclear arms. During a crisis or war, foreign intelligence services could cause nuclear-armed missiles or other delivery systems to be misdirected as a result of cyber manipulation, GPS spoofing, or the entry of incorrect target data so that they hit sites in Iran.[9]

Tehran therefore has to consider the wisdom of building nuclear weapons at all. And should it get the bomb, it must determine whether it should build fewer devices, which would be easier to secure, or a larger number, which could make the arsenal more vulnerable to diversion by disaffected individuals or terrorists in the event of widespread unrest. It also

Figure 10. Iran's Nuclear Options: Weapons, Force Posture, Strategy

	POLICY LOGIC	FORCE STRUCTURE	FORCE POSTURE	STRATEGY	DECLARATORY POLICY
GO SMALL	Minimum force required for deterrence and coercion. Relies on a small stockpile that is more easily hidden—to minimize the risk of a disarming first strike; and more easily secured—to reduce the potential for sabotage and diversion. Manages risk through secrecy, ambiguity, and perhaps initially a non-weaponized force—consisting of unassembled devices that would ostensibly be less threatening to its enemies.	Amad Plan "Plus," consisting of 5–20 fission devices (missile warheads and perhaps some aerial bombs). Augmented by a large stockpile of fissile material that would allow Tehran to threaten further incremental nuclear "bump-ups" or a larger "breakout." This will provide leverage over potential adversaries, who will tread lightly lest Iran move to further expand its arsenal.	Unassembled, "non-weaponized" devices kept separate from delivery systems, allowing Tehran to claim it has not violated the NPT should the existence of the force be disclosed. ▼ Hybrid force of both unassembled and assembled weapons, with the latter kept near their associated delivery systems, in order to balance security and readiness. ▼ Weapons and delivery systems kept at a relatively high state of readiness.	A "sword," a "shield," and a "wedge" to support Iran's regional proxy strategy. Assured retaliation for enemy use of nuclear weapons with an emphasis on military and economic targets, though enemy population centers may be hit in response to attacks on Iranian population centers. Could morph into a first-use policy if regime survival is threatened.	Continued denial of intent to acquire nuclear weapons. Undeclared possession could eventually morph into a policy of nuclear ambiguity. ▼ Nuclear ambiguity could morph into a policy of acknowledged possession of nuclear weapons without clearly defined nuclear red lines or doctrine. ▼ Declared possession of nuclear weapons with clearly defined nuclear red lines and use doctrine.
MIDSIZE	***A midsize force of several dozen weapons of various types could enable Iran to strike a balance between security, survivability, and credibility: small enough to be relatively secure, large enough to survive a disarming first strike and to enable multiple delivery options—ensuring a militarily credible force. A small force could morph into a midsize force through incremental "bump-ups" or a larger "breakout."***				
GO BIG	The largest force deemed prudent in order to maximize deterrent and coercive effects. Manages risk by creating a force large enough to ensure that a substantial residual capability would survive a first strike, or attrition due to sabotage, malfunctions, and enemy missile defenses. Accepts the heightened risk of sabotage and diversion associated with a large arsenal in order to create a more survivable and therefore more credible force.	100-plus fission and boosted fission devices delivered by a wide variety of means. Weapons are eventually developed for deployment with all three legs of Iran's deterrent/warfighting triad. Scope and pace of weapons buildup limited by fissile missile and weapons production capacity—although initially the former will likely outstrip the latter, limiting the pace of the buildup. May eventually pursue thermonuclear weapons for power and status.	Hybrid force of both unassembled and assembled weapons, with the latter kept near their associated delivery systems, in order to balance security and readiness. ▼ Weapons and delivery systems kept at a relatively high state of readiness.	A "sword," a "shield," and a "wedge" to support Iran's regional proxy strategy. Assured retaliation for enemy use of nuclear weapons with an emphasis on military and economic targets, though enemy population centers may be hit in response to attacks on Iranian population centers. Could morph into a first-use policy if regime survival is threatened.	Declared possession of nuclear weapons with clearly defined nuclear red lines and use doctrine.

needs to consider possible unauthorized use of nuclear weapons against Israel or U.S. targets by hardline IRGC zealots, especially if Iran fails to implement effective safeguards to prevent unauthorized use.

Indeed, during the short-lived Wagner Group rebellion against Russian president Vladimir Putin in June 2023, some of the rebels may have tried to obtain nuclear weapons from a storage depot.[10] And Syria's ongoing civil war stoked fears over a decade ago that the Bashar al-Assad regime's chemical weapons could fall into the hands of rebels or terrorists. The Islamic Republic could face similar challenges in the event of heightened unrest. Demonstrating an awareness of the need to address all these security challenges, the IRGC in 2022 created a Nuclear Protection and Security Corps, headed by Brig. Gen. Ahmad Haghtalab.[11]

STOCKPILE SIZE, RELIABILITY, AND MILITARY CREDIBILITY

The widespread deployment of air and missile defense systems in the Middle East will make it very difficult for Iran to reliably deliver nuclear weapons against all of its enemies. The scale of this challenge was highlighted by Operation True Promise, the name for the April 13, 2024, drone and missile attack by Iran and its proxies in retaliation for a lethal Israeli attack on Damascus that killed three Qods Force generals. Iran targeted the Nevatim and Ramon Air Bases and the Israeli intelligence facility on Mount Hermon, which it claimed were involved in the attack.

The strike involved more than 450 munitions launched by Iran, Iraqi proxies, the Yemen-based Houthis, and Hezbollah in Lebanon. Of this total, Iran launched 110–135 ballistic missiles, 6 cruise missiles, and 185 suicide drones. Iraqi militias launched 30 drones, the Houthis launched 3 drones, and Hezbollah launched about 100 rockets at the Golan Heights. U.S. forces destroyed seven Houthi drones and a ballistic missile being readied for launch.[12]

Every one of the drones and cruise missiles was downed en route to Israel by either U.S., Israeli, British, or Jordanian aircraft. About half of the ballistic missiles failed after launch or while en route to their targets, while nearly all of the remainder were downed by Israeli and U.S. missile defenses. Between seven and nine missiles got through Israeli defenses, but none caused significant damage. Thus, Israeli and coalition air and missile defenses downed 100 percent of the drones and cruise missiles and some 80–85 percent of the missiles launched at Israel. This success was attributable to ample warning, advanced planning, concerted action by a U.S.-led military coalition, and a phased attack that aided the defense—circumstances that may not be repeated in the future.[13]

Indeed, when Iran struck again, on October 1, 2024, to avenge the killing of Hezbollah secretary-general Hassan Nasrallah, Hamas political leader Ismail Haniyeh, and IRGC-QF Brig. Gen. Abbas Nilforoushan, more than 39 of the 180 missiles that made it to Israel (out of 200 launched) appeared to get through Israeli defenses—although Israel may have let some through to conserve munitions.[14] Israel did not suffer any casualties.

Iran's missile forces have often experienced significant failure rates, perhaps due to design flaws, quality-control issues, or sabotage. Thus, only 4 of 7 missiles that Iran launched against Islamic State targets in northeast Syria in June 2017 reached their targets; 12 of 16 missiles that Iran launched to avenge the killing of IRGC-QF commander Qasem Soleimani in January 2020 reached their targets in Iraq; about half of the 120 or so missiles launched in April 2024 to avenge the killing of three IRGC-QF generals in Damascus reached Israel; and 180 of 200 missiles launched on October 2024 to avenge the killing of Nasrallah et al. did so.[15] (The reason for these failures is not clear, nor is it clear whether this is something that can be rectified.[16]) While a 10–50 percent failure rate may not be a reliable proxy for the performance of other sensitive and complex systems produced by the Islamic Republic's military industries, these failures raise questions about the potential reliability of a future nuclear arsenal.

This could push Tehran to deploy a very large number of nuclear weapons to ensure that in a crisis or war at least some would get through enemy defenses. But it may also mean that the more nuclear-armed missiles Iran deploys, the more likely some might land inside its own borders. So as long as Iran cannot resolve problems relating to quality control and sabotage, it might defer the deployment of large numbers of nuclear-armed missiles. Much will depend on whether Iranian policymakers conclude that on balance the risks of a large nuclear arsenal are outweighed by the benefits.

CRISIS INSTABILITY AND MISCALCULATION

Iran's deployment of nuclear-armed ballistic missiles would create additional risks and dilemmas for the Islamic Republic. These include short flight times (twelve minutes to Israel) and a lack of direct communication with the Jewish state, which might cause the latter to adopt a launch-on-warning nuclear

posture and to pre-delegate use authority to military commanders.[17] This could increase the risks of miscalculation and nuclear weapons use during a crisis or war. Iran's fielding of nuclear-armed missiles would thus add a destabilizing element to the Iran-Israel deterrence equation.

Matters would be even worse if certain missile units were dual use—tasked with delivering both conventional and nuclear payloads—or if dedicated conventional and nuclear units or delivery systems were co-located during a crisis or war.[18] Signals would more likely be misunderstood, and in the event of an attack, Israel might not be able to discern whether incoming Iranian missiles were conventionally armed or nuclear. It would then be confronted with the choice of riding out what might be a devastating nuclear first strike, even if only a small percentage of the missiles penetrate its defenses, or launching a nuclear "counterstrike" in response to what might turn out to be a conventional attack.[19]

Israel's upper-tier missile defenses exist in part to deal with such a scenario. Their purpose in the event of a nuclear attack would be to preserve Israel's ability to launch a devastating nuclear second strike with land- and sea-based missiles and combat aircraft.[20] Because some Iranian missiles might get through these defenses, Israel could be expected to keep its nuclear forces on hair-trigger alert during a crisis or war. Reckless Iranian rhetoric, moreover, including ritual calls for Israel's destruction, might incline Israeli decisionmakers to interpret Iranian actions in the darkest possible light—further increasing the potential for miscalculation.[21] The possibility that a massive conventional missile strike might be mistaken by Israel for a nuclear strike and prompt a massive nuclear "counterstrike" could complicate Iran's military calculus. Paradoxically then, the deployment of nuclear-armed missiles might undermine the utility of Iran's large conventional missile force, which has played such an important role in the regime's ability to deter its enemies and project influence across the region.[22]

A less prudent and more risk-acceptant Iranian leadership, however, might dismiss the potential for miscalculation, convinced that Israel would never dare respond to a conventional attack with nuclear weapons. While they might be right, the menacing atmosphere created by Iranian propaganda and the use of eliminationist language vis-à-vis Israel could increase the odds of just such a response. Thus, a dual-capable missile force in Iran could create a form of nuclear ambiguity and conventional-nuclear "entanglement" that could increase the potential for miscalculation in a crisis or war.[23]

Avoiding a Nuclear Proliferation Cascade

An Iranian bomb would almost certainly prompt a regional proliferation cascade that could jeopardize the country's security. For this reason, a small clandestine nuclear arsenal would probably be the best way to manage the tension between Iran's nuclear aspirations and its security concerns. Senior Iranian officials, however, have only rarely evinced anxiety on this matter, perhaps because they do not believe other countries in the region would or could develop nuclear weapons—or acquire them abroad. (Longstanding rumors, however, suggest that if Iran got the bomb, Saudi Arabia might obtain nuclear weapons from Pakistan.[24]) Alternatively, Tehran may harbor such concerns, and its hedging strategy may be driven in part by a desire to avoid a nuclear cascade. Yet several regional states have already established civilian nuclear energy programs—at least in part to hedge against Iran's nuclear program.[25] If Iran gets the bomb, others will almost certainly follow.[26] Such a proliferation cascade could make it much harder for Iran to maintain a small nuclear stockpile—if that is its goal—and might eventually push it to expand its arsenal to keep ahead of its neighbors, sparking a regional nuclear arms race.

To Test, or Not to Test?

Iran's Amad Plan called for the production of five nuclear missile warheads, including one for testing. It is not clear, however, whether this was an order from the national leadership to "be prepared" to test a weapon, or to test immediately upon delivery. There are reasons for doubt, for if Iran had succeeded in building a small, clandestine arsenal—as South Africa did in the 1980s (before later dismantling it)—it likely would not have wanted to squander a significant part of its initial stockpile in a test unless a crisis or war compelled it to do so. Given Tehran's current balance of interests, it is only likely to conduct a weapons test in case of military necessity. A more risk-acceptant leadership, however, might welcome the political and military benefits conferred by a weapons test, as Iran now has sufficient fissile material both on hand and in the pipeline to test without compromising military readiness. And while North Korea is the only state that has conducted nuclear weapons tests in the twenty-first century, a decision by Russia or China to resume testing could provide Iran with political cover for doing so as well.[27]

Notes

1. The term *breakout* generally refers to the production of sufficient weapons-grade fissile material to build a nuclear weapon. Here, it refers to a decision by a country with a small nuclear arsenal to build a much larger, more capable arsenal. See, e.g., Robert S. Litvak, *Preventing North Korea's Nuclear Breakout* (Wilson Center, 2018), https://www.wilsoncenter.org/book/2018-update-preventing-north-koreas-nuclear-breakout.
2. David Albright, Spencer Faragasso, and Andrea Stricker, "Analysis of IAEA Iran Verification and Monitoring Report—August 2024," Institute for Science and International Security, September 9, 2024, https://isis-online.org/isis-reports/detail/analysis-of-iaea-iran-verification-and-monitoring-report-august-2024.
3. For many years, both India and Pakistan maintained a non-weaponized deterrent posture with nuclear weapons kept unassembled and separate from their associated delivery systems. Only in recent years has India reportedly adopted a hybrid posture, with most of its weapons unassembled but others kept in a higher state of readiness—assembled but not necessarily mated with their delivery systems. Ashley Tellis, *Striking Asymmetries: Nuclear Transitions in Southern Asia* (Carnegie Endowment for International Peace, 2022), 125–31, 182–85, https://carnegieendowment.org/2022/07/18/striking-asymmetries-nuclear-transitions-in-southern-asia-pub-87394. For more on "non-weaponized deterrence," see George Perkovich, "A Nuclear Third Way in South Asia," *Foreign Policy*, no. 91 (Summer 1993), 85–104.
4. Some legal scholars have argued that a state that has manufactured nuclear weapons components but not assembled them into a bomb has not violated its NPT obligations. David S. Jonas, "Ambiguity Defines the NPT: What Does 'Manufacture' Mean?" *Loyola of Los Angeles International Comparative Law Review* 36, no. 2 (2014): 263–80, https://digitalcommons.lmu.edu/ilr/vol36/iss2/3/. For more on gaps, loopholes, and areas of ambiguity in the NPT, see Leonard Weiss, "The Nuclear Nonproliferation Treaty: Strengths and Gaps," in *Fighting Proliferation: New Concerns for the Nineties*, ed. Henry Sokolski (Air University Press, 1996), 31–55.
5. Zia Siddiqui, "Ready Deterrence vs Recessed Deterrence," *The News* (Pakistan), July 8, 2014, http://www.thenews.com.pk/Todays-News-13-23971-Ready-deterrence-vs-Recessed-deterrence.
6. For an excellent treatment of how the nuclear force structures and postures of regional powers are affected by their nuclear strategies, see Vipin Narang, *Nuclear Strategy in the Modern Era: Regional Powers and International Conflict* (Princeton University Press, 2014).
7. Likewise, South Africa apparently considered a half dozen nuclear devices sufficient for its needs in the 1980s. See David Albright, "South Africa and the Affordable Bomb," *Bulletin of the Atomic Scientists* 50, no. 4 (July/August 1994): 37–47.
8. David Albright and Corey Hinderstein, "Iran, Player or Rogue?" *Bulletin of the Atomic Scientists* (September/October 2003): 52–58.
9. For more on the risk that cyberattacks could pose to the safety, security, and reliability of nuclear weapons, as well as to nuclear stability, see Beyza Unal and Patricia Lewis, *Cybersecurity of Nuclear Weapons Systems: Threats, Vulnerabilities and Consequences* (Chatham House: Royal Institute of International Affairs, 2018), https://www.chathamhouse.org/sites/default/files/publications/research/2018-01-11-cybersecurity-nuclear-weapons-unal-lewis-final.pdf; Page Stoutland and Samantha Pitts-Kiefer, *Nuclear Weapons in the New Cyber Age: Report of the Cyber-Nuclear Weapons Study Group* (Nuclear Threat Initiative, 2018), https://www.nti.org/analysis/articles/nuclear-weapons-cyber-age/.
10. Mari Saito et al., "Wagner Fighters Neared Russian Nuclear Base During Revolt," Reuters, July 11, 2023, https://www.reuters.com/world/europe/wagner-fighters-neared-russian-nuclear-base-during-revolt-2023-07-10/.
11. Islamic Republic News Agency, "IRGC Forms Nuclear Command Center," March 14, 2022, https://en.irna.ir/news/84684334/IRGC-forms-nuclear-command-center.
12. Uzi Rubin, *Operation "True Promise": Iran's Missile Attack on Israel*, BESA Center Perspectives Paper 2281 (Begin-Sadat Center for Strategic Studies, 2024), https://besacenter.org/wp-content/uploads/2024/06/2281-Rubin-Operation-true-promise-Irans-revenge.pdf.
13. Rubin, *Operation "True Promise*," https://besacenter.org/wp-content/uploads/2024/06/2281-Rubin-Operation-true-promise-Irans-revenge.pdf.
14. Michael Knights and Elizabeth Dent, "Israel's Missile Defense Performance: Views from the Gulf," PolicyWatch 3944, Washington Institute for Near East Policy, October 11, 2024, https://www.washingtoninstitute.org/policy-analysis/israels-missile-defense-performance-views-gulf.
15. Farzin Nadimi, "Iran Missile Strikes Reveal Potential Military Weaknesses," PolicyWatch 2823, Washington Institute for Near East Policy, June 22, 2017, https://www.washingtoninstitute.org/policy-analysis/iran-missile-strikes-reveal-potential-military-weaknesses; Michael Knights, "Iran's Cross-Border Strikes: A Pattern in Search of a Policy," PolicyWatch 3592, Washington Institute for Near East Policy, March 15, 2022, https://www.washingtoninstitute.org/policy-analysis/irans-cross-border-strikes-pattern-search-policy; David Martin and Mary Walsh, "Who Would Live and Who Would Die: The Inside Story of the Iranian Attack on Al Asad Airbase," *60 Minutes*, CBS News, August 8, 2021, https://www.cbsnews.com/news/iranian-attack-al-asad-air-base-60-minutes-2021-08-08/; Rubin, *Operation "True Promise*," https://besacenter.org/wp-content/uploads/2024/06/2281-Rubin-Operation-true-promise-Irans-revenge.pdf; Adam Taylor and Meg Kelly, "Iran's Missile Attack on Israel Raises Questions About Limits of Arsenal," *Washington Post*, October 5, 2024, https://www.washingtonpost.com/world/2024/10/05/iran-missiles-attack-israel-deterrence/.
16. By comparison, America's early ICBM program in the late 1950s and early 1960s, which relied on Atlas and Titan II boosters, experienced a 50 percent failure rate. This problem was eventually rectified with the passage of time. E. D. Harris and J. R. Brom, "Apollo Launch-Vehicle Man-Rating: Some Considerations and an Alternative Contingency

Plan," Memorandum RM-4489-NASA, RAND, May 1965, available at https://en.wikipedia.org/wiki/Intercontinental_ballistic_missile#/media/File:USAF_ICBM_and_NASA_Launch_Vehicle_Flight_Test_Successes_and_Failures_(highlighted).png.

17. Colin H. Kahl, Raj Pattani, and Jacob Stokes, *If All Else Fails: The Challenges of Containing a Nuclear Iran* (Center for a New American Security, 2013), 20–21, 50, 52, https://s3.amazonaws.com/files.cnas.org/documents/CNAS_IfAllElseFails.pdf.
18. For an examination of this problem in a great power context, see James M. Acton, *Is It a Nuke? Pre-Launch Ambiguity and Inadvertent Escalation* (Carnegie Endowment for International Peace, 2020), https://carnegieendowment.org/2020/04/09/is-it-nuke-pre-launch-ambiguity-and-inadvertent-escalation-pub-81446.
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20. Uzi Rubin, "Missile Defense and Israel's Deterrence Against a Nuclear Iran," in *Israel and a Nuclear Iran: Implications for Arms Control, Deterrence, and Defense*, ed. Ephraim Kam, Memorandum 94 (Institute for National Security Studies, 2008), https://www.inss.org.il/publication/missile-defense-israels-deterrence-nuclear-iran/.
21. Iran, moreover, has shown no interest in confidence- and security-building measures that could reduce the potential for misunderstandings or miscalculation. This is because it believes that uncertainty enhances its leverage, while stability would help consolidate an unfavorable status quo. See, e.g., Jay Solomon and Julian E. Barnes, "U.S. Weighs a Direct Line to Iran," *Wall Street Journal*, September 19, 2011, http://www.wsj.com/articles/SB10001424053111903374004576578990787792046; "Address by Admiral Mike Mullen," transcript, Carnegie Endowment for International Peace, September 21, 2011, http://carnegieendowment.org/files/92011_transcript_Mullen.pdf; Fars News Agency, "Iran Rejects U.S. Hotline Request," November 11, 2012, http://english2.farsnews.com/newstext.php?nn=9107118530.
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4

Strategy: How Would Iran Use the Bomb?

Any attempt to use Iran's "conventional" past to assess its "nuclear" future will need to consider the degree to which the past is relevant, given the vastly greater destructive potential of nuclear weapons. While Iran's past conduct is the only analytical baseline to work from, Israel's recent successes against Iran's "axis of resistance," the moral and psychological boost provided by the acquisition of nuclear weapons, and potential changes wrought by a post-Khamenei succession could produce significant changes in the regime's "personality," risk tolerance, and strategy.

Continuity and Change in Iran's Strategic Approach

In the past two decades, Iran has transformed itself from a country fearing encirclement to a country encircling its regional adversaries (Israel, Saudi Arabia, the United Arab Emirates) with proxy armies; from a strategically lonely power to the leader of the region's most cohesive political-military bloc—the so-called axis of resistance; and from a struggling nuclear rogue state to a nuclear threshold state. It has done so through a strategy that has relied on incrementalism, indirection, and patient perseverance.

Yet since Hamas attacked Israel on October 7, 2023, Tehran's regional strategy has suffered major setbacks with Israel's near-total destruction of Hamas and its infliction of severe blows on Hezbollah. At the same time, Iran has shown a greater willingness to attack Israel directly—an approach that entails significant long-term risks—as shown by Israel's airstrikes against air defenses and missile production facilities near Tehran and other locations on October 26. That said, Tehran's responses to these reversals will likely be characterized by significant continuity, as inertia and constraints imposed by its current force structure limit its options, precluding dramatic departures from its current approach.

Extrapolating from Tehran's past use of its conventional forces and lessons it may have learned by observing other nuclear-armed states, Iran will most likely use nuclear weapons to deter, compel, and intimidate its enemies, and facilitate a more assertive overall policy. It will probably do so largely in accordance with the principles that have guided its regional and nuclear strategies for nearly forty years now.[1] These principles include:

- Ambiguity, incrementalism, and patient perseverance to avoid provoking its enemies, while blurring or circumventing their red lines and lulling them into inaction
- The use of proxies, whenever possible, to avoid becoming decisively engaged with its adversaries, and to offload risks and costs onto others
- The calibrated use of force on the basis of reciprocity—responding in kind and proportionally to enemy actions, thereby conveying its desire to avoid escalation

This approach has enabled Iran to advance its anti–status quo agenda while managing risk, preventing escalation, and avoiding a major conventional war. The ongoing conflict with Israel will, however, test the limits of this approach.

Iran's conventional missile force has played a central role in Iran's national security strategy by providing it with "overmatch" vis-à-vis its enemies.[2] Thus, missiles have figured prominently in Iranian threats to deliver a "crushing response" to attacks Iran, and it has often conducted mass missile launches during military exercises to back up these threats.[3] Moreover, no military parade in Tehran would be complete without ballistic missiles festooned with banners calling for "Death to America" or "Death to Israel"—to demonstrate Iran's military might and intimidate its enemies

(see figures 11 and 12 for murals depicting Iranian threats to Israel).[4] Unsurprisingly, then, missiles have figured prominently in Iranian (and proxy) attacks against its enemies, including the Islamic State in eastern Syria, Saudi Arabia and the UAE,[5] Pakistan-based separatist groups,[6] American troops in Iraq, and Israel.[7] Tehran has likewise threatened to attack U.S. and Arab military assets in the region in response to an Israeli attack on Iran, with the goal of driving a wedge between Israel and its American ally and Gulf partners.[8]

Despite Iran's preference for proxy or covert unilateral action, it has engaged in overt unilateral military action when it has deemed such action desirable or necessary. Thus, the Islamic Republic surged forces into Syria in 2015 at the height of its civil war to save the regime after concluding that neither Israel nor the United States would respond if it did so. Likewise, it retaliated openly for the killings of senior Iranian military officers (e.g., Qasem Soleimani) and proxy leaders (e.g., Hassan Nasrallah) because it believed its honor and interests required doing so.

Figure 11. Tehran Mural Threatening Israel's Destruction

The Hebrew text reads: "Shelter? Prepare Your Coffins...," implying that neither bomb shelters nor the state of Israel can any longer protect the Jews of Israel from their enemies.

Yet these cases demonstrate that even when departing from its traditional playbook, Iran assigns great importance to the management of risks and costs. Thus, several months after surging forces into Syria in September 2015, Iran quickly drew down its presence to limit mounting casualties, relying thereafter on several hundred IRGC officers to advise its "Shia foreign legion" doing most of the fighting there.[9] And after launching sixteen missiles at al-Asad Air Base in Iraq in January 2020 in retaliation for the Soleimani killing—having publicly telegraphed its intention to retaliate—it announced that it considered the account closed in order to avoid further escalation.[10] (Even so, Tehran quietly continues to plot against U.S. officials involved in the killing of Soleimani almost five years later.[11]) Similarly, after launching two hundred missiles at Israel in October 2024, it announced that the attack was over—unless Israel decided to strike again, in which case its response would be "stronger" and "more powerful."[12]

Tehran's consistent emphasis on the management of risk through the use of proxies and calibrated force argues for more continuity than change should Iran acquire nuclear weapons, although this could yield a more assertive regional gray zone strategy and a greater willingness to act overtly when proxy options are lacking. Of course, Iran might vacillate between these two approaches—which is how it has often managed tensions and contradictions in its policies.

A MORE ASSERTIVE APPROACH

No matter how Iran gets the bomb, the regime will see the event as a triumph over enemies that have labored for decades to prevent such an outcome. The achievement is likely to embolden the regime, and in a pattern observed with other new nuclear-armed states, Iran could test the limits of influence conferred by its nascent nuclear arsenal. This will likely engender a heightened propensity for risk-taking—at least initially.[13] Thus, North Korea's 2006 nuclear test was followed by increasingly aggressive behavior, continuing to this day; India and Pakistan's nuclear weapons tests in 1998 led to bilateral military crises in 1999 (over Kashmir) and 2001 (following an attack by Pakistan-based terrorists on India's parliament); and Iraq's burgeoning chemical and biological weapons arsenals and rapidly maturing nuclear program may have emboldened President Saddam Hussein to invade Kuwait in 1990.

Indeed, this dynamic may explain the famous December 2001 Friday prayer sermon in which Akbar Hashemi Rafsanjani—the Expediency Council chairman and former Iranian president—suggested:

> If one day the Islamic world is also equipped with weapons like those that Israel possesses now, then the imperialists' strategy will reach a standstill because the use of even one nuclear bomb inside Israel will destroy everything. However, it will only harm the Islamic world. It is not irrational to contemplate such an eventuality.[14]

The late Rafsanjani was a central regime figure who almost certainly knew about the country's secret crash nuclear weapons program, which at that time was expected to yield its first device within about a year. And while his sermon lends itself to multiple interpretations, it raises the disquieting possibility that some Iranians, including even relatively pragmatic conservatives in his mold, may see nuclear weapons as a means of pursuing an eliminationist solution to the conflict with Israel. Although such a nuclear threat has never been repeated, senior Iranian officials have regularly stated for about a decade that Israel will no longer exist in twenty-five years—if not sooner. The impending demise of Israel is now a common regime talking point.[15]

As the nuclear program advances, Iranian policymakers could gain confidence, strengthening a longstanding propensity for occasionally risky behavior. Examples include several past proxy operations, such as the 1983 Marine barracks bombing, the 1996 Khobar Towers bombing, the 2011 plot to kill the Saudi ambassador to the United States in Washington DC, and several plots to kill former U.S. officials linked to the 2020 killing of Qasem Soleimani. This tendency may increase after Supreme Leader Ali Khamenei becomes incapacitated or dies and key players in the system—including hardline IRGC commanders—are no longer restrained by his cautious, if sometimes erratic, hand.[16]

A "SWORD," A "SHIELD," AND A "WEDGE"

A nuclear arsenal would serve as a sword, a shield, and a wedge for Iran as it seeks to encircle its regional adversaries and end the U.S. presence in the region. As part of its encirclement strategy, the Islamic Republic has created "rings of fire" around Israel, Saudi Arabia, and the UAE, arming its Lebanese, Iraqi, Palestinian, and Yemeni proxies and partners with rockets, drones, and missiles. In particular, Iran has sought to enmesh Israel in a series of wearying wars that will make life there intolerable, while undermining its economy—encouraging those Jews with options to emigrate. At the same time—at least prior to the recent Israeli wars on Hamas in Gaza and Hezbollah in Lebanon—Iran armed the Palestinians in Gaza and the West Bank to enable them, along with Lebanese Hezbollah, to seize and hold Israeli terrain in future wars.[17] Meanwhile, Iran has armed the Houthis of Yemen, enabling them to rain down missiles and drones on Riyadh and Abu Dhabi, to cause Saudi Arabia and the UAE to end their military intervention in Yemen. Thus, while waging proxy warfare against its regional enemies, Iran's nuclear arsenal would be poised like a Sword of Damocles over Israel and America's Arab partners.

Nuclear weapons would further facilitate this strategy by acting as a shield to deter Israeli and American counterattacks as Iran weakens the Jewish state by incessant warfare, and wears down Washington by a constant trickle of proxy attacks on U.S. troops in the region. Moreover, nuclear weapons would cast a pall over Israel's future by holding out the implied threat of nuclear annihilation—playing on Jewish existential fears and historical traumas.[18] Although the recent losses inflicted by Israel on Hamas in Gaza and on Hezbollah in Lebanon were major setbacks for Iran, Hezbollah still retains significant military potential, and Iran may compensate by intensifying efforts to arm West Bank Palestinians and further building up its Iraqi proxies. One should not assume, however, that Tehran would extend a nuclear umbrella to its proxies; they exist to serve Iran and not vice versa. The Islamic Republic will not put itself at risk to protect them. Finally, Iran would use its nuclear forces as a wedge to reinforce doubts about Washington's willingness to defend its Arab partners, further incentivizing Arab states like Saudi Arabia to acquire their own nuclear deterrent. For all these reasons, countering Tehran's gray zone regional strategy, which has proven challenging enough for Washington, will become an even tougher task once nuclear weapons are added to the mix.[19]

Proxy warfare waged under a nuclear shadow entails risks for Iran as well. On at least two occasions, Iran's proxies or partners have initiated conflicts with Israel that threatened a broader war: Hezbollah in 2006 and Hamas in 2023. Hezbollah leader Hassan Nasrallah subsequently stated that he regretted starting the 2006 war,[20] while the Hamas-Israel war created conditions that have so far led Israel to strike Iran on two occasions—raising the prospect of further escalation. As for the Houthis of Yemen, they have shown themselves to be a risk-acceptant, independent-minded proxy that is willing to challenge U.S. interests and directly attack U.S. allies like Israel, Saudi Arabia, and the UAE.[21] This raises the question of whether one of Iran's proxies or partners might someday initiate a conventional conflict that drags a nuclear Iran into a confrontation with another nuclear power—whether Israel, the United States, or another regional state.

Figure 12. Tehran Mural Predicting Israel's Impending Demise

The text quotes from a famous speech by the late Lebanese Hezbollah leader Hassan Nasrallah, stating that "Israel is more fragile than a spider's web."

Nuclear Warfighting?

There is no evidence that Supreme Leader Ali Khamenei believes nuclear weapons have a role in warfighting. His "nuclear fatwa" rhetoric indicates that he does not see conventional and nuclear weapons as part of a continuum in which nuclear weapons are just bigger bombs; rather, he sees them as qualitatively different.[22] Likewise, four decades of experience offer no evidence, at least thus far, that Iran is led by a "messianic apocalyptic cult" (as Israeli prime minister Binyamin Netanyahu once put it)[23] for which mutual assured destruction is "not a constraint" but "an inducement" (as the late historian Bernard Lewis once wrote)[24]—although this could someday come to pass. Iran's largely risk-averse behavior in its conventional conflicts with the United States and Israel to date suggests that the regime would use nuclear weapons only in extremis: if the survival of the Islamic Republic were threatened by revolution, invasion, a long bloody war, or a nuclear strike.

Tehran's use of force is generally guided by the principle of reciprocity—it hits back proportionally and in kind. Khamenei has frequently stated, with respect to Iran's enemies, that "we will attack them on the same level that they attack us."[25] Thus, during the Iran-Iraq War, Iran unleashed numerous air and missile strikes on what it claimed were military and economic targets in Iraqi cities, retaliating in kind for Iraqi strikes during the "war of the cities" between 1984 and 1988. It often provided advance warning for attacks in accordance with Islamic law—and perhaps also to demoralize the enemy; to avoid harm to members of Iraq's Shia majority, which Tehran hoped would rise up against the Baathist regime; and so as not to cede the moral high ground, as Iraq had often given notice prior to attacks.

In a 2008 interview, Hassan Rouhani, who would later serve as Iran's president, shed light on the debate that led up to this decision:

> The debate began in the year 1363 [1984] in order to address Iraqi air attacks on our cities. Iraq was hitting our cities, but we did not retaliate because we had problems from a religious/legal (shari') perspective. The question was, what do we do for deterrence?

> When Iraq invaded our cities and weakened our home front, we had obstacles in preventing them. We realized that we required a response and answer. Mr. Hashemi Rafsanjani researched this issue and raised it with the Imam (Khomeini). The Imam said that you can do so (retaliate) on the condition that you announce/declare it on the radio and tell at what time you will attack, so the people do not suffer in the city. And so it was done through the means of Arabic radio, and announced that tomorrow that in retaliation for Iraq's attack on a particular city, Kirkuk or Mosul or Basra will be attacked.[26]

In these broadcast warnings, Iran often took pains to clarify that it intended to hit only military and economic sites in the targeted cities and that residents should evacuate.[27] These air and missile strikes were not very accurate, and they often caused significant collateral damage. Indeed, a comprehensive survey of official announcements during the war showed that Iran launched roughly 120 Scud B missiles and 320 Oghab rockets against targets in Iraqi cities and towns, killing or wounding more than a thousand civilians.[28] This figure does not include the hundreds if not thousands more killed or wounded in Iranian airstrikes. Ultimately, military necessity overshadowed all other concerns when Iran launched retaliatory strikes.

Some thirty years later, Iran responded to the U.S. "maximum pressure" policy with a carefully planned series of nonlethal attacks on oil transport and infrastructure in the Persian Gulf region, followed by escalating and ultimately lethal rocket attacks against American troops in Iraq and later Syria. By contrast, in response to the killing of Maj. Gen. Qasem Soleimani in January 2020, Iran responded with a missile attack on a base housing U.S. troops in Iraq, while in response to the killing of Brig. Gen. Mohammad Reza Zahedi in April 2024 and Hassan Nasrallah in September, Iran launched massive missile attacks on military and intelligence targets in Israel that went beyond Tehran's traditional tit-for-tat approach to retaliation. Moreover, in avenging the deaths of Soleimani and Zahedi, Tehran telegraphed its intention to respond militarily—perhaps for dramatic effect, perhaps to demonstrate its determination to act despite counterthreats. Following the death of Nasrallah, however, Tehran initially indicated that Hezbollah would take the lead in responding, but it eventually acted on its own without advance warning.[29] No U.S. or Israeli military personnel were killed in any of these attacks, although a Palestinian residing in the West Bank was killed in the strike to avenge Nasrallah's death.

The more advanced capabilities Iran has acquired since the war with Iraq—particularly long-range strike systems such as drones, cruise missiles, and ballistic missiles—have enabled it to employ force with greater precision, and thus with less risk of harm to civilians.[30] It is not clear, however, whether this is due to a sense of moral propriety, or to lingering memories among Khamenei's generation of how missile strikes during the final chapter of the war of the cities forced the evacuation of one-quarter of the capital's residents—further demoralizing Iran's war-weary public and, ultimately, contributing to the decision to end the war.[31] That is an experience Iran's leadership never wants to repeat, and it has been careful to avoid giving enemies reason to do so.

This may also explain why Tehran relies on its proxies and partners to attack enemy civilians—though the Islamic Republic has shown no compunction about killing thousands of Iranian dissidents at home and abroad.[32] Since the early 1980s, Hezbollah has attacked U.S. and Israeli embassies as well as Jewish and Israeli civilian targets on several continents, killing hundreds. Hamas and Palestinian Islamic Jihad (PIJ) likewise unleashed deadly bombing campaigns in Israel in the 1990s and 2000s that killed hundreds of civilians. And most recently, in its October 7, 2023, attack on Israel, Hamas killed some 1,200 Israelis and foreigners (more than 800 of them civilians) and kidnapped 250 more (most of them civilians). Hezbollah, Hamas, and PIJ all benefit from extensive Iranian funding, training, and arms.[33] Iran thus encourages its proxies and partners to play by rules it could not itself play by without incurring great risk.

While Tehran's approach to the use of force may have its own idiom, syntax, and grammar, the leaders of the Islamic Republic are quite fluent in the universal language of deterrence. Thus, shortly after the first test launch of a Shahab-3 missile in July 1998, then defense minister Ali Shamkhani, who until recently served as secretary of the Supreme National Security Council, explained that to bolster Iran's deterrent capability, "we have prepared ourselves to absorb the first strike so that it inflicts the least damage on us. We have, however, prepared a second strike which can decisively avenge the first one while preventing a third strike against us."[34]

Shamkhani's comment, issued just as Iran was embarking upon its crash nuclear program, describes a scenario lifted straight from the academic literature on nuclear deterrence. And it captures Tehran's general approach to deterrence, with its emphasis on reciprocity, although here one can discern a threat beyond mere proportionality—perhaps the kind of "crushing response" that senior Iranian officials have

often threatened but rarely delivered on. An attempt at such a response was finally delivered on April 13, 2024, with the launch of 450 rockets, drones, and missiles against Israel following the killing of the three Qods Force generals in Damascus. While Iran undoubtedly expected many of these munitions to be intercepted, it probably believed that more would get through than the seven to nine that landed near targets in Israel. This strike, however unsuccessful, also demonstrated Iran's growing assertiveness, as it was linked to the annunciation of a new deterrence strategy, described by IRGC commander Maj. Gen. Hossein Salami as an attempt to create "a new equation" with Israel, which held that "any attack" on the "people, property, or interests" of Iran would prompt "a reciprocal [direct] response from…the Islamic Republic."[35]

In sum, past conduct suggests that if Iran were to employ nuclear weapons, it would likely prioritize the targeting of enemy bases, forces, and economic infrastructure, while avoiding attacks on civilian population centers. But because it has always emphasized reciprocity in its responses to enemy actions, Tehran could be expected to respond in kind to a nuclear attack on cities and towns, as the regime's reading of Islamic law permits the use of all means and methods available to ensure the survival of the Islamic Republic and to triumph over its enemies.[36] As for the possibility that Tehran might someday task a trusted proxy to attack an enemy city with nuclear weapons, this would be an extremely risky move, but in light of its growing risk acceptance in recent months, now might finally be the time to consider such an eventuality.

Yet in the event of a nuclear exchange with Israel—even if Iran were to strike only military and economic targets—many Jewish civilians as well as many Palestinian Arabs in Israel, Gaza, and the West Bank would die due to Israel's small size and densely populated center. The death of Israeli Jews might be justified by Tehran in light of the insidious qualities attributed to Jews as enemies of Islam in the regime's worldview,[37] the vilification of Jews and Zionism in its propaganda,[38] and its frequent threats to destroy the Jewish state.[39] The potential death of numerous Muslim Arabs would likely not affect the regime's calculus either.[40] After all, Tehran has never shied away from sacrificing Arab lives to advance its own interests, as demonstrated by its support for proxies that have killed many tens of thousands of other Muslims in Gaza, Lebanon, Syria, Iraq, and Yemen.

There is little doubt, however, that Israel's ability to inflict mass destruction on Iran with its own nuclear arsenal—estimated at some 90 devices—*would* greatly affect Tehran's nuclear calculus.[41] And since Iran has no missile defenses, nearly all the nuclear-armed missiles launched by Israel would get through. For this reason, Iranian policymakers sharing Supreme Leader Khamenei's value orientation would almost certainly countenance the use of nuclear weapons only as a last resort, although that might change after his passing.

Finally, one other "black swan" (low-probability/high-impact) event needs to be considered: the possibility that regime-inspired religious propaganda might eventually stimulate the kind of apocalyptic thinking that could induce some Iranian decision-makers to adopt a more permissive approach toward use of the bomb.

Nuclear Weapons and the Shia Apocalypse

A central tenet of Shia Islam is the longing for the return of the Hidden Imam—a descendant of the Prophet Muhammad through his cousin and son-in-law Ali—who went into hiding in the tenth century CE and will reappear at a time of rampant injustice and oppression. According to tradition, after reappearing and waging a climactic war against the forces of evil, Imam Mahdi will establish and lead a single world government, founded on justice and guided by sharia law, which will inspire all of humanity to acknowledge the truth of Shia Islam.[42]

Since the creation of the Islamic Republic in 1979, its leaders have generally tried—despite the progressive alienation of large swaths of the population from official religion—to promote an atmosphere of hopeful "waiting" for the return of the Hidden Imam, without encouraging unbridled messianic speculation.[43] Despite efforts to manage expectations, one can discern the growth of millenarian sentiment in the Islamic Republic among some of the believing public, whether in the form of "political Mahdism," which reflects official regime narratives; "populist Mahdism," which some politicians have used to challenge the authority of Supreme Leader Khamenei and the politicized clerical establishment; or "popular Mahdism," a grassroots movement reflecting the hopes and aspirations of the masses.[44]

Iran is not the only country whose society and politics are being shaped by messianic or apocalyptic expectations.[45] Recent decades have seen a proliferation of millenarian movements and apocalyptic cults around the world—but particularly in the Middle East.[46] While some of these groups are quietist and

seek to disengage from society and politics, others have engaged in instrumentalist or nihilistic political violence to advance their salvific mission.[47] They include:

- Gush Emunim and its diverse ideological heirs, which emerged in Israel after the 1967 war and became the main proponents of settlement in the West Bank. Extreme elements within the movement have engaged in terrorism, and the worldview it spawned influenced the assassin of Prime Minister Yitzhak Rabin (1995).[48] It remains a force close to the center of power in the current Israeli government.[49]

- Juhayman al-Otaibi and his followers—who believed that a member of their movement was the Sunni Mahdi—seized the Grand Mosque in Mecca, Saudi Arabia, in 1979 in an effort to overthrow the monarchy. They were subsequently captured by government forces and executed. As a result of this episode, Saudi Arabia allowed extreme elements within its society to proselytize outside the kingdom with the government's blessing. These activities have since been reined in.[50]

- The Mahdi Army (Jaish al-Mahdi) militia and the Soldiers of Heaven (Jund al-Sama) and Supporters of the Mahdi (Ansar al-Mahdi) armed cults, which emerged in Iraq following the 2003 U.S. invasion, fought to expel foreign forces amid rumors that the United States invaded to prevent the return of the Hidden Imam.[51]

- The Islamic State—which seized large swaths of Iraq and Syria in 2014 and inspired terrorist attacks by supporters around the world—sought to restore the historic caliphate and defeat the forces of apostasy and unbelief, as foretold in some Sunni apocalyptic traditions. Its "caliphate" was finally destroyed by a U.S.-led military coalition in 2019, although affiliates remain active in Africa, the Middle East, South Asia, and elsewhere.[52]

Historically, adherents of Twelver Shia Islam, the predominant branch in Iran, embraced quietism and avoided politics, which they generally associated with injustice and oppression. This view arose from the exclusion of the Prophet's family—who Shia Muslims believe should have rightly succeeded him—from the leadership of the nascent Muslim community.[53] Moreover, Twelver Shia clerics have traditionally been quick to condemn and crack down on messianic speculation and any attempt to hasten the return of the Hidden Imam, lest dashed expectations shake the faith of believers.[54] For these reasons, the 1979 revolution—which produced an Islamic republic headed by Ayatollah Ruhollah Khomeini, based on the principle of clerical rule (*velayat-e faqih*)—marked a revolution in Twelver Shia doctrine.[55]

The Islamic Revolution was from the start endowed with messianic overtones, as Khomeini was often referred to as the vice regent (*naib*) to the Hidden Iman. But a decade of revolutionary turmoil and bloodletting led the nation to turn to more practical concerns.[56] Then, a new wave of messianic expectation swept Iran following the U.S. invasion of Iraq in 2003, which some saw as a fulfillment of prophecy regarding the Hidden Imam's reappearance.[57] President Mahmoud Ahmadinejad (2005–13) attempted to ride this wave by promoting his own brand of populist Mahdism—claiming that he was in contact with Imam Mahdi—in order to challenge the authority of Supreme Leader Khamenei. The latter's supporters responded by smearing Ahmadinejad and his faction, claiming they represented a heretical "deviant current."[58]

In light of such challenges, Khamenei has stated that the proper mode of "waiting" for the Hidden Imam's return is through spiritual self-perfection and the Islamization of Iranian society.[59] In recent years, however, it seems that he has tried to coopt the Mahdist current as part of a broader effort to imbue a new generation with the ideals of the revolution as it enters its "second phase."[60] To this end, the regime has promoted cultural products like the 2022 music video by Abuzar Rouhi "Peace Be Upon You, Commander," which seeks to instill among its young listeners absolute loyalty to the Hidden Imam, along with Supreme Leader Ali Khamenei, Qasem Soleimani's legacy, and the regime's cult of martyrdom.[61]

Mahdism, then, is a core element of the regime's ideology that is sometimes used to justify policies and actions. According to an internal IAEA report, when in 1984 then president Ali Khamenei notified a meeting of senior officials that Ayatollah Khomeini had decided to restart Iran's nuclear program, he rationalized it by claiming that it was the only way to deter Iran's enemies, secure the Islamic Revolution from these enemies' schemes, and prepare for the reappearance of Imam Mahdi.[62] While such expressions of hope for the return of the Hidden Imam may be nothing more than rote, obligatory declarations of faith, they may also reflect deeply held beliefs that are shaping policy.

Thus, in their study of Mahdism and the IRGC, Kasra Aarabi and Saeid Golkar note that: political Mahdism is, at least ostensibly, central to the IRGC's official worldview; adherents of this worldview

believe that the IRGC and particularly its Qods Force are among the tools for facilitating the reappearance of Imam Mahdi; and Israel is the "greatest barrier" to his return.[63] Indeed, reports that Supreme Leader Khamenei was persuaded by regime hardliners to ignore his instincts favoring restraint and respond to recent Israeli attacks against Iranian interests with massive missile strikes may indicate that a new generation of radical IRGC officers is already shaping Tehran's military policies—and that the post-Khamenei era has, in effect, arrived. Time will tell whether these hardliners also influence Iran's nuclear proliferation calculus, and what role political Mahdism may play in their belief system.[64]

The Islamic Republic will face formidable challenges in the coming years, including a political legitimacy deficit, a bleak economic outlook, and hardships related to climate change.[65] These are likely to increase the public's susceptibility to apocalyptic narratives that historically have had great appeal in times of great stress and disruptive social change.[66] U.S. policymakers must therefore be aware that some Iranian decisionmakers may see nuclear weapons as a means of dealing with enemies that are obstructing redemptive processes—creating unconventional deterrence challenges and underscoring the need for further research regarding this poorly understood topic.

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5

Policy Recommendations

A nuclear-armed Iran would further destabilize the Middle East—a region at the nexus of three continents, crisscrossed by critical sea, air, and land lines of communication, with two-thirds of the world's proven oil reserves. It would also empower Iran—a state committed to destroying Israel, expelling the United States from the Middle East, and overturning the U.S.-led international order.

To avert such an outcome, Washington needs to convince Tehran that an attempted nuclear breakout would be caught and could prompt a devastating military strike by Israel and perhaps the United States—one that might not be limited to its nuclear program. It likewise needs to persuade the Islamic Republic that nuclear weapons are a two-edged sword that could threaten the regime in the event of sabotage, diversion, unauthorized use, or a regional proliferation cascade.[1] Tehran's apparent ambivalence over whether to continue hedging or to attempt a nuclear breakout—given the potential risks, costs, and uncertain benefits of proliferation—suggest it is not too late to dissuade the Islamic Republic from acquiring nuclear weapons. Time, however, may be short.

If Iran gets the bomb, its assessment of potential risks, costs, and benefits will likewise drive its decisions regarding weapons, force structure and posture, and strategy. More than any other factor, U.S. words and actions will shape these decisions. American policymakers will therefore need to reacquire the deterrence and competitive strategy skills acquired by their Cold War–era predecessors through a series of nuclear crises—and near disasters.[2] And they will need to embrace a holistic approach that combines all the instruments of national power to shape Tehran's nuclear decision calculus in order to bolster deterrence and stability.

Washington and its partners will need to leverage their strengths and continuously seek new forms of advantage, while exploiting Iranian vulnerabilities, to compel Tehran to make difficult budgetary and military choices to the detriment of its nuclear weapons program. Tehran has long faced a dilemma in balancing social welfare investments with military spending—each of which affects different aspects of regime security. As revolutionaries, Iran's leaders fear nothing more than a counterrevolution, and they seek to prevent economic conditions from becoming so dire for most Iranians that they foment widespread unrest. And as revolutionaries, they hope to reshape the Middle East in their own image. Thus, social welfare expenditures and investment in the broader economy will continue to compete with defense spending.[3] And while stiff sanctions by the United States and its partners could cause Iran to shift resources from guns to butter to avoid a revolution, other steps will be required to cause Iran to divert resources from offensive to defensive capabilities, and from nuclear to conventional arms—as the United States did, to some extent, with the Soviet Union during the Cold War.[4]

For instance, the U.S. deployment of penetrating bombers in the 1950s and 1960s led the Soviet Union to invest massive resources in air defenses, while the subsequent American deployment of cruise missiles and stealth bombers in the 1980s and 1990s neutralized this massive investment.[5] Likewise, the U.S. deployment of submarine-launched ballistic missiles in the early 1960s caused the Soviet Union to invest heavily in constructing a range of warship types (attack submarines, cruisers, helicopter carriers, destroyers, and frigates) designed to counter the threat from ballistic missile submarines.[6] And the U.S. decision in 1979 to deploy the Pershing II medium-range ballistic missile and the BGM-109G ground-launched cruise missile to counter the Soviet deployment three years earlier of the SS-20 intermediate-range ballistic missile eventually led to the removal and destruction of these systems in accordance with the 1987 Intermediate-Range Nuclear Forces Treaty.[7]

Although U.S. sanctions in the 1980s hurt the Soviet economy and hindered access to foreign technology,[8] and U.S. military force structure and posture decisions

during the Cold War forced the Soviets to divert enormous resources to bolstering their defenses, the Soviet Union still built a massive nuclear arsenal comprising more than 40,000 weapons. This was because military spending remained substantial and the USSR was able to produce weapons cheaply due to low labor and material costs.[9]

By contrast, harsh sanctions have in the past forced Iran to make significant cuts in defense spending (more than 20 percent in response to the Trump administration's maximum pressure policy), and they should therefore be part of any future effort to force hard choices regarding military outlays.[10] But sanctions alone will not suffice, as nuclear weapons are relatively inexpensive compared to conventional arms.[11] Military force structure and posture decisions along with other actions by the United States and its partners that cause Tehran to divert resources from its nuclear program will be necessary. In the context of a long-term competition with Iran, even marginal gains in this regard can be important.

To accomplish this, the United States and its partners should seek synergies between economic sanctions (to limit Tehran's resources) and military and other measures (to force difficult choices and tradeoffs in the allocation of resources), with the goals of inducing Iran to: spend less on guns and more on butter; allocate more of its resources to conventional defense; and adopt a less threatening and destabilizing nuclear force posture.

To this end, the United States and its partners should:

- Demonstrate a persistent ability to penetrate Tehran's nuclear program by cyber and other means to highlight its vulnerability, and to thereby discourage the production of weapons in large numbers and their deployment in a high state of readiness.
- Further strengthen regional air and missile defenses while providing maritime forces with the means to detect and interdict nuclear-armed naval drones, cargo vessels, or warships—including perhaps a regional network of seaborne radiation monitors.[12]
- Deploy conventional hypersonic weapons that can strike Iran's leaders to deter the use of nuclear weapons and cause Tehran to divert resources to defend against this threat.[13] Israel's recent decapitation of the leadership of both Hamas and Hezbollah showed what can be done when accurate and timely intelligence is available.
- Revive the Cold War–era policy of deploying non-strategic nuclear weapons on warships to cause Tehran to divert resources to defend against them, deter nuclear weapons use, and help counter a more assertive China, Russia, and North Korea.[14]
- Integrate B-2 stealth bombers more fully into regional military exercises and operations to demonstrate a readiness to use this system to launch a disarming first strike against a nascent arsenal.
- Feed Tehran's paranoia about foreign "soft warfare" plots to destabilize the Islamic Republic so that it devotes more resources to building up its internal security forces and to ensuring nuclear stockpile security, and less to building up its nuclear forces.

In sum, should Iran get the bomb, shaping its choices regarding weapons, force structure and posture, and strategy will be key to bolstering deterrence and stability in a nuclearized Middle East. Figuring out how to do so will be a major challenge for U.S. policy.

Notes

1. For details, see Michael Eisenstadt, *Iran's Nuclear Hedging Strategy: Shaping the Islamic Republic's Proliferation Calculus*, Policy Focus 178 (Washington Institute, 2022), https://www.washingtoninstitute.org/policy-analysis/irans-nuclear-hedging-strategy-shaping-islamic-republics-proliferation-calculus; see also Michael Eisenstadt, "America's Failing Iran Nuclear Policy: Time for a Course Adjustment," War on the Rocks, October 20, 2023, https://warontherocks.com/2023/10/americas-failing-iran-nuclear-policy-time-for-a-course-adjustment/.
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12. A regional network of seaborne and airborne radiation monitors could help detect Iran's attempted covert seaborne delivery of nuclear devices during a crisis or war. The network might consist of unattended floating sensors camouflaged as refuse clandestinely emplaced at the mouth of Iranian harbors; sensors aboard naval drones operated by U.S. Naval Forces Central Command's Task Force 59; yachts or other civilian craft plying the Persian Gulf; and aerial drones patrolling the Persian Gulf. During the Cold War, the U.S. Navy ran a clandestine program in which yachts and pleasure craft were fitted with sensors that could detect radiation emitted by nuclear weapons aboard Soviet warships transiting the Bosporus in Turkey. The boats, manned by foreign crews in civilian clothes, would draw alongside the Soviet warships as they passed through the strait to allow a reading. See Jeffrey T. Richelson, "Task Force 157: The U.S. Navy's Secret Intelligence Service, 1966–77," *Intelligence and National Security* 11, no. 1 (January 1996): 116–19. However, given the relatively short distances at which penetrating radiation from a nuclear device or weapon may be detected—tens of meters for gamma radiation, scores of meters for neutron radiation emanating from an unshielded device or weapon—early detection will pose formidable challenges. And a nuclear device can be shielded to limit the escape of penetrating radiation. For more on the challenges of detecting nuclear devices or weapons, see Steve Fetter et al., "Detecting Nuclear Warheads," *Science & Global Security* 1 (1990): 225–302; Steve Fetter and Frank von Hippel, "The Black Sea Experiment: Measurements of Radiation from a Soviet Warhead,"

Science & Global Security 1 (1990): 323–27; and S. T. Belyaev et al. "The Use of Helicopter-Borne Neutron Detectors to Detect 254 Nuclear Warheads in the USSR-U.S. Black Sea Experiment," *Science & Global Security* 1 (1990): 328–33.

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Appendix A

Profusion of Pathways: Iran's Approach to the Development of Weapons and Technology

Iran's military R&D establishments often pursue multiple, parallel paths when developing weapons systems and strategic technologies, as demonstrated by the following items produced by the Islamic Republic:

- **Liquid-fuel ballistic missiles.** Shahab family (Shahab-1/2/3, Qiam-1, Ghadr-H/-1/-F/-S, and Emad-1), and Khoramshahr family (Khoramshahr-1/2/3/4).
- **Solid-fuel ballistic missiles.** Fateh-110 family (Fateh-110A/B/C/F, Khalij-e Fars, Hormuz-1/2, Fateh-313, Zolfaqar, Fateh Mobin, Dezful, Raad-500, Haj Qasem, Kheibar Shekan, and Fatah-1/2) as well as the larger Sejjil.
- **Cruise missiles.** Soumar, Ya-Ali, Hoveizeh, Paveh.
- **Long-range suicide drones.** Kian, Arash, Shahed-131/-136/-138.
- **Space launch vehicles.** Safir-1A/B, Simorgh, Qased, Zoljanah, Qaem-100.
- **Gas centrifuges for uranium enrichment.** IR-1, IR-2, IR-2M, IR-3, IR-4, IR-5, IR-6, IR-6M, IR-6sm, IR-6s, IR-7, IR-7B, IR-8, IR-8B, IR-8s (not all have been deployed).[1]

Iran's military-industrial DNA seems to be characterized by the iterative refinement of designs, the establishment of parallel R&D efforts, and the sequential production of follow-on models—although manpower limitations, operational security considerations, and limited availability of fissile material might initially preclude such an approach when it comes to developing nuclear weapons. If Iran is able to operate free of such constraints after refining a fission device and producing several variants for delivery by missiles and perhaps aircraft—a process that might take a decade or more—it might develop smaller, boosted fission devices and explore various other weapons designs, configurations, and delivery options.

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Appendix B

Foreign Assistance and Homegrown Innovation

Many nuclear programs have benefited from foreign assistance of some sort—witting or not. Thus, the Soviets' first nuclear device, RDS-1, was based on the American Fat Man bomb, details of which were obtained through espionage.[1] China's first nuclear weapon benefited from Soviet assistance.[2] Pakistan's first device was based on a Chinese design.[3] And Pakistan's A. Q. Khan aided the nuclear programs of North Korea, Libya, and Iran, and is believed to have provided nuclear weapons design information to Libya and Iran.[4]

Likewise, Iran's weapons design choices have been and will continue to be influenced by whatever assistance it can obtain from foreign sources. Past assistance to Iran's nuclear weapons program includes:

- A Chinese weapons design that Iran may have received from the A. Q. Khan network in the 1980s—reportedly a smaller, more advanced design than that provided to Libya[5]
- Apparent design help on the initiation and conventional explosives package for a nuclear weapon from the Russian scientist Vyacheslav Danilenko in the late 1990s and early 2000s[6]
- Mathematical formulas and codes for theoretical design work that North Korea may have provided in 2010–11[7]

In light of this history, it would be prudent to assume that Iran's future weapons design efforts will benefit, to some extent, from foreign assistance despite efforts by the United States and others to prevent it.

Iran can, moreover, be expected to put its own creative imprint on its weapons designs, having cultivated a long tradition of reverse engineering, copying, or adapting foreign designs in accordance with its own operational requirements. Iran's gas centrifuge program uses a modified Pakistani centrifuge—which was based on a design from the European fuel consortium Urenco.[8] Iran's defense industries have likewise produced clones or modified versions of the:

- British Vosper Thornycroft Alvand-class frigate (the basis for IRIN's Mowj-class warship)
- American Northrop F-5 fighter (the basis for IRIAF's Azarakhsh and Saegheh fighters)
- North Korean Nodong ballistic missile (the basis for IRGC Aerospace Force's Shahab-3 missile and its derivatives)
- American Northrop Grumman RQ-180 stealth drone (the inspiration for the Aerospace Force's Shahed-171 Simorgh and Shahed-191 Saegheh drones)

Furthermore, Iran has shown a penchant for adapting unconventional designs or concepts often considered impractical by others. Thus, Iran has employed rocket-propelled grenade teams on Jet Skis, placed multiple rocket launchers and naval mines on speedboats, used ground-effect vehicles for maritime reconnaissance missions, built naval fast-attack craft with unconventional catamaran-type hulls, and developed high-capacity missile reload magazines for use in its underground missile cities. Iran also has attempted to enrich uranium using lasers—relying on a technology widely considered impractical.[9]

Finally, Iran and its proxies have employed a variety of unconventional and in some cases innovative tactics and techniques, including:

- Vehicle-borne improvised explosive devices,[10] fiberglass rock IEDs,[11] and explosively formed penetrator IEDs[12]
- Conventional rockets, drones, and missiles as strategic bombardment systems[13]
- Small-boat swarm tactics, employed by the IRGC Navy in the Persian Gulf[14]
- Extensive tunnel complexes, built by Hezbollah in Lebanon and Hamas in Gaza as well as by Iran's air and strategic missile forces[15]

Accordingly, Iran should be expected to develop nontraditional methods for the delivery and employment of nuclear weapons.

Notes

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8. David Albright and Christina Walrond, "Iran's Advanced Centrifuges," Institute for Science and International Security, October 18, 2011, http://isis-online.org/isis-reports/detail/irans-advanced-centrifuges.

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