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IRAN TASK FORCE

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THE SOUTH ASIA CENTER

How Reliable Is Intelligence on Iran's Nuclear Program?

The Context

For a country that has been accumulating nuclear know-how since the Eisenhower administration, Iran has hardly been sprinting toward a bomb. Indeed, repeated prognostications that Tehran was on the verge of becoming a nuclear power have a Chicken Little quality: The sky did not fall over the past decade, and it seems unlikely to do so for the next year or two or three. Still, Iran has made steady progress accumulating the elements and expertise required to make nuclear weapons, and it would be naive and irresponsible to discount what appears to be a cottage industry of piecemeal proliferation.

Collecting intelligence about the program has never been easy, and has been hurt by Iran's spotty cooperation with the International Atomic Energy Agency (IAEA) in recent years, along with Iran's long history of telling less than the whole story about its nuclear work. Iranian officials also have a tendency toward bluster that can contribute to both overestimating and underestimating the program. Solid evidence of efforts to achieve nuclear weapons capability has come from technical surveillance, human penetration, and interception of weapons-related imports, as well as Iran's continued production of ever higher grades of enriched uranium with no obvious near-term civilian use. So far, however, there has been no smoking gun when it comes to Iran's nuclear weapons intentions.

The IAEA and the UN Security Council, with the support of their member states, should continue to press for more and better access to Iran's nuclear sites and personnel. Intelligence professionals should maintain high critical standards as they evaluate new information. While seeking negotiations, the U.S. and its allies should stress targeted sanctions, stepped-up interdiction of nuclear and dual-use materials, and sabotage of nuclear-related raw materials, equipment, and computer software in order to inhibit Iran's nuclear weapons potential. The five nuclear weapons states recognized by the Non-Proliferation Treaty could create a more conducive atmosphere for a diplomatic solution by better fulfilling their own disarmament commitments, including building down their arsenals and forswearing

About the Atlantic Council's Iran Task Force

The Iran Task Force, co-chaired by Ambassador Stuart Eizenstat and Senator Chuck Hagel, seeks to perform a comprehensive analysis of Iran's internal political landscape, as well as its role in the region and globally, to answer the question of whether there are elements within the country and region that can build the basis for an improved relationship with the West and how these elements, if they exist, could be utilized by U.S. policymakers. Launched in February 2010, the Task Force has hosted eight briefings with experts addressing key issues such as "Iran's Regional Role," "Foreign Policy Choices Within Iran," "Iran's Nuclear Capabilities and Strategic Goals," and "Negotiating with Iran in an International Context."

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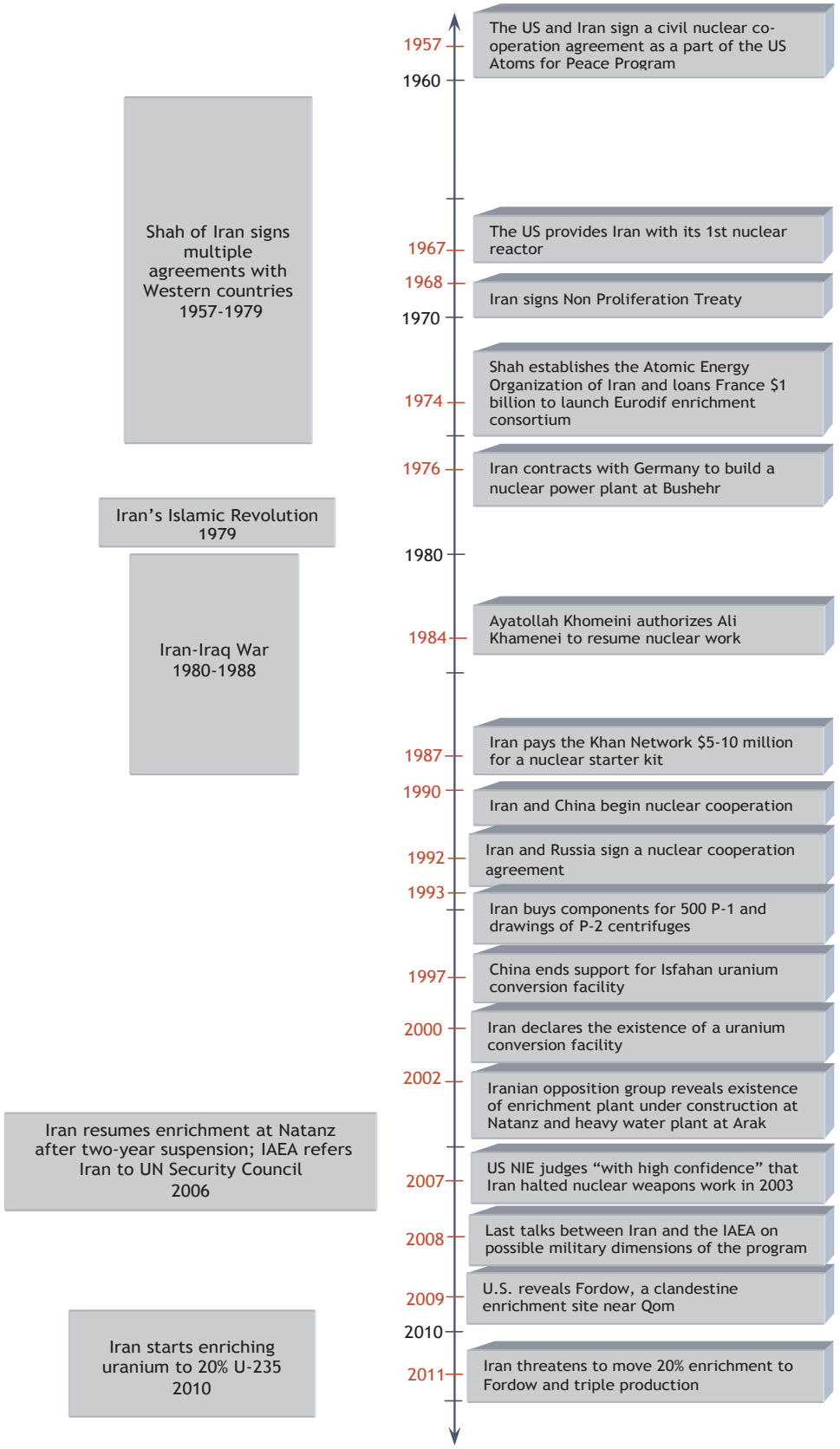
1957
The US and Iran sign a civil nuclear co-operation agreement as a part of the US Atoms for Peace Program
1960
Shah of Iran signs multiple agreements with Western countries 1957-1979
1967
The US provides Iran with its 1st nuclear reactor
1968
Iran signs Non Proliferation Treaty
1970
1974
Shah establishes the Atomic Energy Organization of Iran and loans France $1 billion to launch Eurodif enrichment consortium
1976
Iran contracts with Germany to build a nuclear power plant at Bushehr
Iran's Islamic Revolution 1979
1980
Iran-Iraq War 1980-1988
1984
Ayatollah Khomeini authorizes Ali Khamenei to resume nuclear work
1987
Iran pays the Khan Network $5-10 million for a nuclear starter kit
1990
Iran and China begin nuclear cooperation
1992
Iran and Russia sign a nuclear cooperation agreement
1993
Iran buys components for 500 P-1 and drawings of P-2 centrifuges
1997
China ends support for Isfahan uranium conversion facility
2000
Iran declares the existence of a uranium conversion facility
2002
Iranian opposition group reveals existence of enrichment plant under construction at Natanz and heavy water plant at Arak
Iran resumes enrichment at Natanz after two-year suspension; IAEA refers Iran to UN Security Council 2006
2007
US NIE judges "with high confidence" that Iran halted nuclear weapons work in 2003
2008
Last talks between Iran and the IAEA on possible military dimensions of the program
2009
U.S. reveals Fordow, a clandestine enrichment site near Qom
2010
Iran starts enriching uranium to 20% U-235 2010
2011
Iran threatens to move 20% enrichment to Fordow and triple production

nuclear weapons testing. They should also work harder to persuade North Korea, which withdrew from the NPT in 2003, and non-signatory nuclear powers Pakistan, India, and Israel to curb nuclear weapons production. Key Iranian trading partners such as China and Turkey should use their economic leverage to convince Iran to satisfy the international community's concerns.

Western nations provided the basis for Iran's nuclear program, which dates to 1957 when Shah Mohammad Reza Pahlavi's government signed a civil nuclear cooperation agreement with the United States under the "Atoms for Peace" program. The U.S. was the source of Iran's first reactor, a small facility that opened in 1967 and still produces isotopes for medical use. In the 1970s, Iran contracted with Germany to build a nuclear power plant at Bushehr on the Persian Gulf, and also bought a 10 percent share in Eurodif, a European consortium to enrich uranium, for what Iran hoped would be more than twenty power reactors. The Shah's scientists also looked into military applications despite Iran having signed the NPT in 1968.[1] Western nuclear suppliers cut off Iran after the 1979 Islamic revolution; Iranian Supreme Leader Ayatollah Ruhollah Khomeini ordered the program stopped on Islamic grounds, and was only persuaded to revive it after Iraq began using chemical weapons against Iran during the 1980–88 Iran-Iraq war. In 1984, according to an internal document of the IAEA, Khomeini authorized then Iranian president (now Supreme Leader) Ali Khamenei to resume nuclear work, to protect "the Islamic Revolution from the schemes of its enemies, especially the United States and Israel."[2]

Iran procured materials and technical information from its prerevolutionary European suppliers, especially members of a nuclear black market assembled by the father of the Pakistani bomb, A. Q. Khan. In 1987, Iran paid the Khan network between $5 and $10 million for a "starter kit," including drawings of rudimentary centrifuges known as P-1s (Iran calls them IR-1s) and two actual centrifuges.[3] Approached by the network in 1993, Iran came back for more, purchasing components for 500 P-1 centrifuges and, at a minimum, drawings of more-advanced P-2 centrifuges.[4] Iran also reached out to China and Russia. China, before ending cooperation on the project in 1997 in return for U.S. civilian nuclear assistance, provided technology that Iran used to construct a plant in Isfahan to convert raw uranium into uranium hexafluoride gas—the feeder material put into centrifuges to enrich uranium for fuel for power reactors or weapons.[5] Russia agreed in the mid-1990s to complete the civilian reactor at Bushehr that had been abandoned by the Germans and later bombed by Iraq. In addition, Russia offered to sell Iran a complete uranium enrichment plant but backed off under U.S. pressure.[6] Russian institutes and individual scientists continued to provide expertise that enabled Iran to build a heavy-water production plant at Arak and begin constructing a heavy-water research reactor that could provide an alternative path to a bomb if Iran were to master plutonium reprocessing.[7] Russian and Chinese entities also provided equipment and expertise to enrich uranium with lasers.[8]

Iranian officials assert that their program is civilian in nature and no concrete evidence of a weapon has been found to prove they are lying. However, the fact that Iran hid most of its nuclear activities for nearly twenty years and continues a pattern of subterfuge and incomplete cooperation with the IAEA undercuts Tehran's claims of purely peaceful intent. Information obtained by the IAEA and Western intelligence agencies suggests that Iran worked on warhead designs and the technology to initiate nuclear explosions for bombs from 2001 to at least 2003. A 2007 U.S. National Intelligence

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1 Barbara Slavin, *Bitter Friends, Bosom Enemies: Iran, the U.S., and the Twisted Path to Confrontation* (New York: St. Martin's Press, 2007), p. 31.

2 IAEA document quoted by David Albright, *Peddling Peril: How the Secret Nuclear Trade Arms America's Enemies* (New York: Free Press, 2010), p. 71.

3 Ibid., p. 78.

4 Ibid., p. 96.

5 "Iran's Nuclear, Chemical and Biological Capabilities: A Net Assessment," *The International Institute for Strategic Studies*, February 2011, p. 43.

6 Slavin, *Bitter Friends, Bosom Enemies*, p. 29.

7 "Iran's Nuclear, Chemical and Biological Capabilities," p. 43.

8 Iran says it dismantled a pilot laser enrichment plant at Lashkar Ab'ad in 2003; however, Ahmadinejad last year praised Iranian scientists for their "relentless efforts" to build lasers to enrich uranium. In a move that has generated proliferation concerns, General Electric has asked the U.S. government for permission to build a plant that would use lasers to mass-produce reactor fuel. (See: William J. Broad, "Laser Advances in Nuclear Fuel Stir Terror Fear," *New York Times*, August 20, 2011, **www.nytimes.com/2011/08/21/science/earth/21laser.html?_r=1&scp=1&sq=iran%20lasers%20nuclear%20aug.%2021&st=cse**).

Estimate (NIE) judged "with high confidence" that Iran had halted this explicit weapons work in the fall of 2003, and expressed "medium confidence" that the program had not resumed through mid-2007.[9] A 2011 NIE—although not made public—may be less confident.[10] The IAEA has raised questions about whether Iran has continued weapons research and has listed seven possible military dimensions in past program activities—including experiments with nuclear bomb triggers and warhead research—that have not been clarified by Iran.[11] Olli Heinonen, the former deputy director of the IAEA, said there is compelling evidence that military-related industries have continued to contribute to the nuclear program. "The question is, for what purpose? Is it to maintain the know-how and the people [or to build weapons]?" he asked.[12] Iran has also continued to produce ballistic missiles, although there are conflicting reports about its progress.[13]

Of most concern is the fact that Iran has been steadily amassing enriched uranium, which can be used for civilian or military purposes. A large plant to enrich uranium at Natanz,160 miles south of Tehran, as well as the Arak heavy-water site, were revealed in 2002 by an Iranian opposition group whose intelligence appears to have been provided by Israel.[14] Iran suspended the enrichment program (although not its work on uranium conversion) for much of the period between 2003–05 while it negotiated with Britain, France, and Germany on a broad agreement that would have provided guarantees that Iran was not developing nuclear weapons in return for civilian nuclear cooperation and other economic benefits. Those talks failed to achieve a resolution, and Iran resumed enrichment work in 2006 after the election of President Mahmoud Ahmadinejad. It has continued in defiance of six UN Security Council resolutions which call for suspension of enrichment and clarification of questions with regard to the military aspects of the program. Of about 8,000 centrifuges installed at Natanz, some 6,000 are enriching; as of the end of August 2011, Iran had produced more than 4,500 kilograms of uranium enriched to 3.5 percent U-235 (the isotope necessary for both civilian fuel and, at a higher concentration, bombs), and about 70 kilograms of uranium enriched to 20 percent, ostensibly for fuel for the Tehran Research Reactor (TRR). It had also begun operating 54 advanced centrifuges, so-called IR-2's.[15] Iranian officials have stated that they intend to triple production of 20 percent uranium, making far more than is needed for the Tehran reactor, and to move that production into an enrichment plant at Fordow under 90 yards of rock in a mountain near Qom, a location less vulnerable to attack than Natanz.[16] The latest IAEA report said that as of August 20, 2011, Iran had installed one cascade of 174 centrifuges at Fordow.[17] On August 30, 2011, Iranian vice president and Atomic Energy Organization chief Fereydoun Abbasi-Davani said that Iran would never stop producing 20 percent uranium and would not swap low enriched uranium for foreign-supplied fuel for the TRR. He also said Iran would not enrich uranium beyond 20 percent.[18]

Heinonen said Iran could have 250 kilograms of 20 percent enriched uranium by the end of next year, which could be converted together with its current stocks of low enriched uranium into 120 to 150 kilograms of 90 percent enriched uranium—sufficient for more than one nuclear weapon.[19] "What they are doing is decreasing the amount of time necessary for a breakout [diverting materials and racing toward a weapon]," said Greg Thielmann, a senior fellow at the Arms Control Association, who previously directed the Strategic, Proliferation and Military Affairs Office in the

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9 National Intelligence Estimate, *Iran: Nuclear Intentions and Capabilities*, November 2007 (**www.dni.gov/press_releases/20071203_release.pdf**).

10 Tony Capaccio, "Iran Keeps Options Open to Make Nuclear Arms, U.S. Intelligence Chief Says," Bloomberg News, February 10, 2011 (**www.bloomberg.com/news/2011-02-10/iran-keeps-options-open-to-make-nuclear-arms-u-s-intelligence-chief-says.html**).

11 IAEA Safeguards Report, Sept. 2, 2011 (**http://isis-online.org/uploads/isis-reports/documents/IAEA_Iran_2Sept2011.pdf**).

12 Heinonen interview with the author in Washington, July 14, 2011.

13 "Iranian Missile Messages: Reading between the Lines of 'Great Prophet 6,'" *Arms Control Association*, July 12, 2011 (**www.armscontrol.org/issuebriefs/Iranian-Missile-Messages**).

14 Slavin, *Bitter Friends, Bosom Enemies*, p. 25.

15 IAEA Safeguards Report, Sept. 2, 2011.

16 "New Generation of Centrifuges to be Installed at Fordo," Mehrnews.com, June 8, 2011 (**www.mehrnews.com/en/newsdetail.aspx?NewsID=1330625**).

17 IAEA Safeugards Report, Sept. 2, 2011.

18 "Abbas-Davani Interview on Iran's 20 percent Enrichment," Institute for Science and International Security, Aug. 31, 2011 (**http://www.isisnucleariran.org/brief/detail/643/**).

19 Heinonen, speaking at a symposium of the Hudson Institute, July 13, 2011. David Albright estimates a maximum of 115 kg of highly enriched uranium (HEU), and says that this is enough for five to six nuclear weapons, based on a 25 kg weapon.

Intelligence and Research Division of the State Department, and also served on the Senate Select Committee on Intelligence.[20]

The Issue

In theory, Iran should be able to resolve outstanding questions about its nuclear past and establish confidence that it is not diverting materials or personnel to weapons work. In practice, however, it has been difficult to obtain clarity from the officials of an authoritarian, factionalized state with a history of clandestine nuclear activity.

U.S. officials say they do not know whether Iran has made a decision to build weapons but that Iran is, at a minimum, keeping its options open and pursuing "various nuclear capabilities."[21] Iran has clearly made progress toward reaching the nuclear threshold despite sanctions, sabotage, defections, and assassinations of nuclear scientists.

This issue brief aims to analyze the reliability of recent intelligence about Iran. It will describe the program's diffuse nature and Iran's likely motivations in continuing nuclear work despite punishing sanctions. The report will discuss whether Iran is really aiming to make a bomb, seeking to develop the capacity to make a weapon at short notice, trying to deter potential attackers, seeking bargaining chips for negotiations, or some combination of the above. Finally, the report will suggest approaches for policymakers that might inhibit the program and convince Iran that it will benefit more by abandoning nuclear weapons ambitions than by fulfilling them.

Better and Worse Than Iraq

It is almost impossible to discuss intelligence about Iran without referring to Iraq. Critics of U.S. and other Western intelligence on Iran point to the Iraq fiasco as a reminder of how groupthink, paranoia, and political pressure can distort analysis of a hard target. The infamous 2002 U.S. NIE on Iraq, entitled "Iraq's Continuing Programs for Weapons of Mass Destruction," declared that Iraq had biological and chemical weapons and had restarted its nuclear program, even though the U.S. discovered later that Iraq had destroyed its stockpiles and dismantled its programs after the 1991 Gulf War.[22]

Much of the so-called intelligence on Iraq turned out to be single-source and the product of impostors put forward to Western intelligence by Iraqi exiles pushing for regime change—exiles who knew that the George W. Bush administration was looking for ammunition to go to war. As Tim Weiner wrote in a 2007 history of the CIA, "[T]he agency produced a ton of analysis from an ounce of intelligence. That might have worked if the ounce had been solid gold and not pure dross."[23]

Nuclear and intelligence specialists say there have been major improvements in the way U.S. intelligence is collected and analyzed since 2002, and that this sort of distortion could not take place now even if the Obama administration was eager to attack Iran, which does not appear to be the case. Post-Iraq intelligence estimates are "much more careful, much more professional and much more transparent in explaining the logic" behind the findings, according to Thielmann. Analysts are now asking tough questions, not cherry-picking intelligence to support prior conclusions, and there is vigorous pushback against thinly supported theories. Hundreds of analysts are working on Iran across the U.S. government. Thielmann said that "red-teaming"—the practice of analyzing an issue from an adversarial point of view—and other such critical tools are now rigorously used throughout this community. There is "a much more honest view of what we know and what we don't know, and confidence levels are better identified," he said.[24]

Some critics suggest that the U.S. intelligence community is underestimating the Iranian nuclear program and hewing to a lowest common denominator approach to compensate for Iraq and to make it more difficult for the U.S. to contemplate military action against Iran. Intelligence professionals bristle at this suggestion, saying they have substituted best practices for the sloppy tradecraft that prevailed in some quarters before the Iraq War. Clearly, however, there is a danger that the topic will become increasingly politicized as the United States enters a presidential election year.

Policymakers operate in a situation of imperfect knowledge. Iranian intentions about the program are opaque, and Iran

[20] Thielmann telephone interview with the author, June 28, 2011.
[21] Tony Capaccio, "Iran Keeps Options Open to Make Nuclear Arms."
[22] *Iraq's Continuing Programs for Weapons of Mass Destruction* (**www.fas.org/irp/cia/product/iraq-wmd-nie.pdf**).
[23] Tim Weiner, *Legacy of Ashes: The History of the CIA* (New York: Doubleday, 2007), p. 487.
[24] Thielmann telephone interview with the author, June 28, 2011.

has raised the level of uncertainty about its goals by failing to cooperate fully with the IAEA. Sources of information about Iran are both better and worse than they were about Iraq. With Iraq, Thielmann noted, there was "an enormous database" derived from seven years of IAEA inspections following the 1991 Gulf War, and then a vacuum from the time inspectors were kicked out in 1998 until late 2002, when they were allowed to return. By then, however, the Bush administration had already decided to go to war, and discounted the inspectors' prewar findings that the nuclear program had not been reconstituted.

Iran, which signed the Additional Protocol of the NPT in 2003 but never ratified it, has scaled back its cooperation with the IAEA since 2006; Iranian officials said this was to retaliate for being referred to the UN Security Council and subjected to sanctions. Iran has continued to allow inspectors to visit known installations, such as the major uranium enrichment facility at Natanz and the Fordow facility near Qom. As a result, the nuclear watchdog can measure the amount and type of enriched uranium produced and the efficiency of declared Iranian equipment. However, Iran has only just allowed access to the heavy-water production plant and heavy water reactor at Arak for the first time in six years as well as to a facility where research and development on advanced centrifuges is occurring.[25] It has refused entry to places suspected of military nuclear work and to make available individuals such as Mohsen Fakhrizadeh, a nuclear physicist and officer in the Revolutionary Guards, who is alleged to have directed nuclear weapons research. In addition, Iran insists that it is under no obligation to allow inspections of new nuclear facilities until they are close to beginning operation—an interpretation of its safeguards arrangements with the IAEA that is unique to Iran and which the IAEA rejects.

Experts say these obstacles are partly compensated for with better technical intelligence—from electronic signals, satellites, drones, and other surveillance tools—as well as human intelligence from defectors and others still in Iran. The latter, known as "humint," appears to have improved since the disputed 2009 Iranian presidential elections, which alienated a significant portion of Iran's intellectual elite. Foreign agents have clearly managed to penetrate Tehran, assassinating Iranian nuclear scientists and planting Trojan street signs and bricks containing radiation detectors near suspect facilities.[26]

David Albright, president of the Institute for Science and International Security, a Washington-based nongovernmental organization that tracks nuclear proliferation, said that when UN inspectors entered the Fordow facility near Qom in 2009, "they were amazed at how well they had been briefed about what to expect." Albright speculated that an informant had provided plans of the site, which Iran disclosed to the IAEA in September 2009 after it had been unmasked by Western intelligence.[27]

To the extent that it is possible to compare Iran and Iraq's nuclear program, Albright said, Iran's efforts resemble Iraq's in the 1980s. After Israel bombed the Osirak reactor in Iraq in 1981, Saddam Hussein's regime redoubled its clandestine efforts to build a nuclear weapon and would likely have succeeded by the mid-1990s had Iraq not invaded Kuwait and provoked a U.S.-led counterattack. Ironically, the Bush administration appears to have incentivized Iran by overthrowing Saddam in 2003. An assessment in early 2003 by the National Intelligence Council, an advisory board that prepares intelligence estimates for the White House, predicted that toppling Saddam—who did not yet have nuclear weapons—would likely push both North Korea and Iran to try to acquire such arms in order to deter the U.S. from attacking them.[28] North Korea has already built a nuclear device and conducted tests in 2006 and 2009.

The "Laptop of Death"

Iranian officials and some Western critics have accused the IAEA and Western nations of building a case against Iran using forged materials and hyped analyses similar to those employed to falsely incriminate Iraq. A major bone of contention is the so-called "laptop of death" containing information about bomb-related research allegedly conducted by Iran before 2003. Albright said that the information in electronic media was brought out of Iran to Turkey by the wife of an Iranian spying for Germany, and that U.S. authorities put the documents and other materials on a

[25] "IAEA Inspector Visits Iran Nuclear Sites," *Payvand Iran News*, August 24, 2011 (**www.payvand.com/news/11/aug/1228.html**).
[26] Seymour M. Hersh, "Iran and the Bomb: How Real Is the Nuclear Threat?," *The New Yorker*, June 6, 2011 (**www.newyorker.com/reporting/2011/06/06/110606fa_fact_hersh**).
[27] Albright telephone interview with the author, June 30, 2011.
[28] Slavin, *Bitter Friends, Bosom Enemies*, p. 25.

laptop to make them easier to show to the IAEA and other foreign officials.[29]

The IAEA has used the information in an effort to get Iran to come clean about its past activities. Heinonen said that, from his point of view, the authenticity of the actual documents, diagrams, and videos was less important than what he called the "veracity" of the material. "Given what you know, does the information fit in this picture?" he said. "Is it internally consistent? Does it make sense?"[30]

Heinonen, who left the IAEA in 2010, said that he personally carried information related to military studies to Iran several times, and that Iran agreed on a work plan to clarify some of the information in the summer of 2008. He said the Iranians agreed to talk about three areas: an alleged design for a missile reentry vehicle applicable to a warhead; experiments with high explosives needed to detonate a weapon; and so-called "green salt," or uranium tetrafluoride, a product that is created in the course of converting raw uranium into uranium hexafluoride for use in centrifuges—or into uranium metal to cast into a weapon. At the last minute, however, the Iranians changed their minds, Heinonen said. "This was the last time we had a meaningful discussion with them" on possible military aspects of the program, he said.[31]

Before the talks ended, Iranian officials said the documents themselves were "falsified, but at the same time, they acknowledged that some of the information was true," Heinonen said. "They acknowledged there had been high explosives studies," but claimed they had civilian or conventional military applications. The IAEA then asked to see the studies but the Iranians refused, asserting that this would compromise military secrets, Heinonen said. "There have been high explosive tests with high timing precision. The people who did it are real people. The institutes are real. The question is: What's the purpose?"[32]

Alireza Miryusefi, spokesman for the Iranian Mission to the United Nations, responded to questions about the laptop, saying that printed versions of the materials were never presented to Iran—"only some PowerPoint images by video projector without possibility of verifying their validity." As a result, he said, members of the Non-Aligned Movement, which have sometimes supported Iran in the IAEA and United Nations, also questioned the material's authenticity. Miryusefi said that based on a 2007 work program, Iran had presented "full answers and explanations to those questions posed at that time by the IAEA." Iran "never approved any part of the alleged studies," Miryusefi said, in reference to Heinonen's remark about his 2008 visits. Finally, Miryusefi criticized Heinonen for "releasing member states' classified information."[33]

Albright said, however, that the information on the laptop was so detailed and specific that it "tipped the scales for people like me"—those who were noted skeptics about Iraq's alleged nuclear program during the lead-up to war.[34] He referred in particular to three items:

- Experiments with firing systems suitable for detonating a nuclear weapon.
- A diagram for an underground testing site 400 meters deep, with a site to control the test 10 kilometers distant. Albright called this "a strange thing to be studying if you don't have a nuclear weapons program."
- A video of a mock warhead on a missile that detonated 600 meters in the air—an ideal height to cause maximum damage from a nuclear blast wave, as well as reflection off the ground.

Mark Fitzpatrick, director of the Non-Proliferation and Disarmament Program at the International Institute for Strategic Studies, and a former senior U.S. official dealing with nonproliferation, said, "I don't think anybody can be 100 percent certain that the thousands of pages of documents on the so-called 'laptop of death' were not all fabricated. But I don't know of any unbiased expert who has seen the documents who believes Iran's claims that they are fake. All the intelligence agencies that examined the documents concluded that they appear to be legitimate."[35]

The IAEA reported on September 2, 2011 that it remains concerned about military aspects of the Iranian program

[29] Albright interview with the author, July 8, 2011.
[30] Heinonen interview with the author, July 14, 2011.
[31] Ibid.
[32] Ibid.
[33] Miryusefi e-mail to the author, July 29, 2011.
[34] Albright interview with the author, July 8, 2011.
[35] Fitzpatrick e-mail to the author, July 11, 2011.

including "activities related to the development of a nuclear payload for a missile, about which the Agency continues to receive new information."[36] Heinonen said that the information the IAEA has originates from several sources and includes material about procurement, Iranian publications, meetings and visits of Iranian officials, and communications to counterparts that do not originate from the laptop.[37]

Patterns of Procurement

Over the years, Iran has turned down offers to buy massive numbers of centrifuges and other key items from the Khan network. The reasons may include keeping down costs, preserving deniability about the program, and trying to ensure that Iran was not buying inferior, damaged, or booby-trapped equipment. Insisting in the 1990s on technology-transfer agreements with Russia and China after the bitter experience of Germany abandoning Bushehr and France blocking the services of Eurodif, Iranian engineers have learned how to build most of what they need. However, there are materials and equipment that Iran has had to procure from foreign suppliers in Russia, Germany, China, and other countries in order to keep the program going, so-called choke points. These purchases—and attempted purchases thwarted by counterproliferation efforts—have provided key information about the program, as well as a means of slowing Iran's nuclear progress.

The fact that procurement continues supports the 2011 U.S. intelligence community judgment that Iran is, at a minimum, keeping its options open. In 2007, for example, German authorities arrested Mohsen Vanaki, a German-Iranian trader, on charges that he arranged that year to buy dual-use equipment for Iranian front companies in the United Arab Emirates. Among the items he purchased were high-speed cameras from a Russian manufacturer, Bifo, which has a mushroom cloud on its logo. The cameras, according to the Institute for Science and International Security, can be "used to film tests of high explosive lenses and other high-speed phenomena associated with metals driven by explosions that are key to developing implosion-type fission nuclear weapons."[38] Vanaki also allegedly tried to buy specialized radiation detectors in Germany. First acquitted—after defense lawyers cited the 2007 U.S. NIE as evidence that Iran was no longer working on nuclear weapons—Vanaki was retried and found guilty of illegal purchases on September 24, 2007.[39]

To produce large numbers of centrifuges, Iran needs hundreds of tons of high-strength aluminum, maraging steel, and carbon fiber (the latter used to make more-advanced centrifuges). It also requires so-called flow-forming machines with high precision, which make metal rotor tubes and/or bellows for centrifuges; filament-winding machines to manufacture carbon-fiber rotor tubes; and special corrosion-resistant lubricants, vacuum pumps, valves, and ring magnets.[40] UN sanctions forbid selling any of these items to Iran.

Among vulnerable pieces of equipment are frequency converters that control electrical current and the speed and stability with which centrifuges spin. The Stuxnet computer virus that attacked Iran's centrifuges at Natanz in 2010 and set back the program for some months altered the operation of converters, changing the speeds of motors they controlled for brief intervals and thus crashing the centrifuges.[41]

Iranian scientists have found ways to compensate for shortages. Sometimes they buy items of lesser quality and sophistication that are not proscribed by sanctions and use them anyway, undercutting efficiency. Recently, Iran announced that it had decided to manufacture its own carbon fiber to circumvent the UN embargo, although whether it is capable of actually producing the material is unclear.[42] While Iran most likely already has sufficient means

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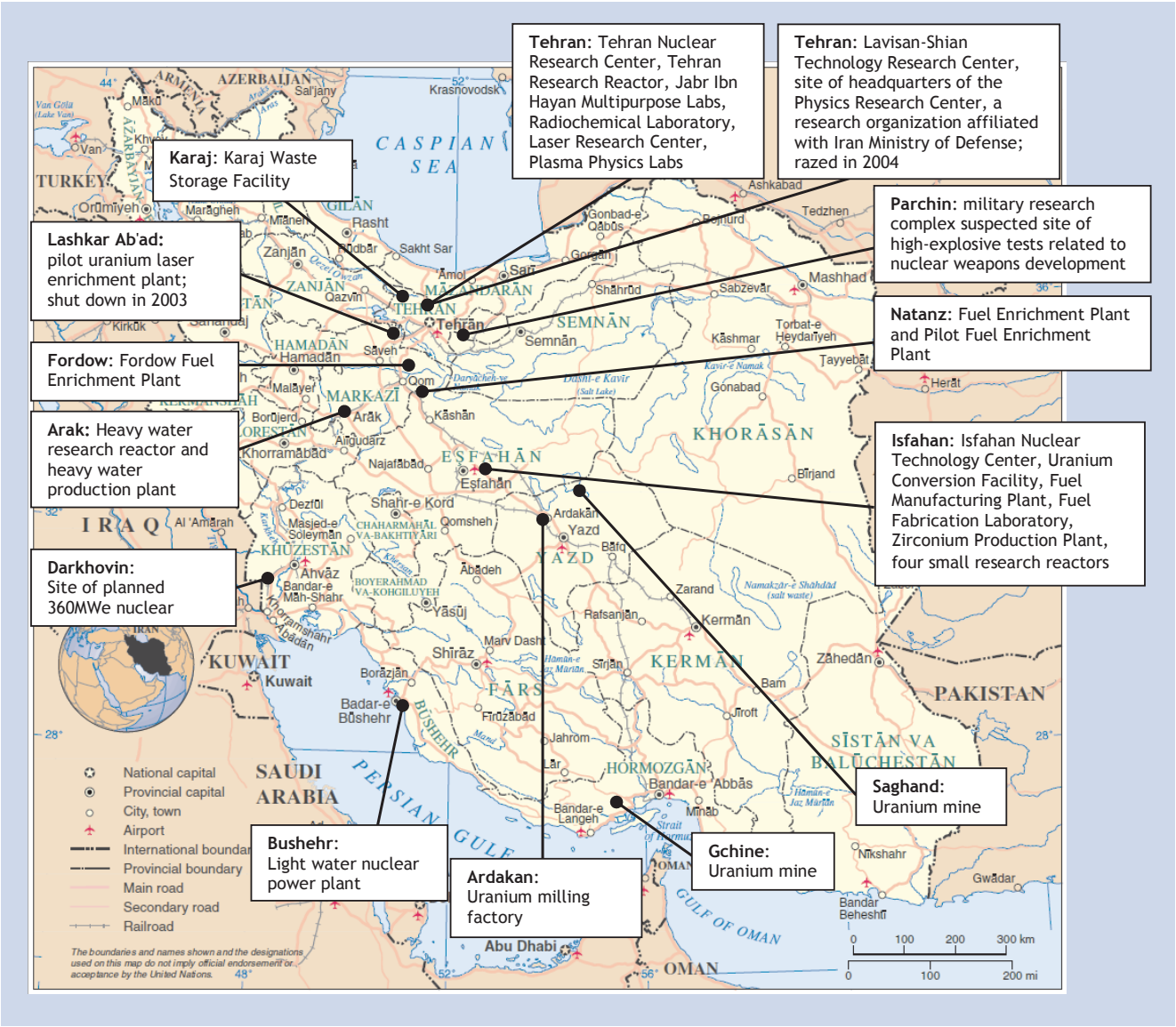
[36] IAEA Safeguards Report, Sept. 2, 2011.
[37] Heinonen e-mail to the author, July 29, 2011.
[38] David Albright and Christina Walrond, "The Trials of the German-Iranian Trader Mohsen Vanaki: The German Federal Intelligence Service Assesses that Iran Likely Has a Nuclear Weapons Program," Institute for Science and International Security, December 15, 2009 (**http://isis-online.org/isis-reports/detail/the-trials-of-the-german-iranian-trader-mohsen-vanaki-the-german-federal-in/**).
[39] Ibid.
[40] Final Report of Panel of Experts Established Pursuant to Resolution 1929 (2010) (**www.innercitypress.com/1929r051711.pdf**), p. 21.
[41] Kim Zetter, "Iran: Computer Malware Sabotaged Uranium Centrifuges," Wired.com, November 29, 2010 (**www.wired.com/threatlevel/2010/11/stuxnet-sabotage-centrifuges/**).
[42] "Iran Launches Production of Carbon Fiber Despite UN Ban over its Possible Use in Nuke Program," Associated Press, August 27, 2011 (**www.washingtonpost.com/world/middle-east/iran-launches-production-of-carbon-fiber-despite-un-ban-over-its-possible-use-in-nuke-program/2011/08/27/gIQAkgfqhJ_story.html**).



Sources:
Map: United Nations, Department of Peacekeeping Operations, 2004
Specific Site Locations: *Iran's Nuclear, Chemical and Biological Capabilities*. International Institute for Strategic Studies, 2011

and know-how to make a nuclear weapon, sanctions and interdiction are slowing it down. Iran "probably cannot produce HEU [highly enriched uranium] fast enough and in quantities large enough to make it worth the risk [of building and testing a weapon]," Fitzpatrick said. "That's why it continues to seek materials from abroad that would enable the installation of large numbers of more-advanced centrifuges able to enrich three to four times faster."[43]

Sabotage and interdiction are thus a growing focus for counterproliferation efforts. In April 2011, a multinational panel set up to monitor UN sanctions against Iran traveled to South Korea to investigate a shipment of phosphor bronze wire mesh that seemed destined for Iran's heavy-water program. According to the panel's report, the wire originated in China and was en route to Turkey when it was intercepted in Seoul in December 2010. An investigation "revealed the consignee to be an Iranian and [it was] traced to an Iranian company, Pentane Chemistry Industries."[44] While most of the items intercepted in recent years have to do with conventional arms transfers—also banned by sanctions—the

[43] Fitzpatrick e-mail to the author, July 12, 2011.
[44] Final Report of Panel of Experts Established Purusant to Resolution 1929, p. 15.

UN panel concluded that "sanctions are constraining Iran's procurement of items related to prohibited nuclear and ballistic missile activity and thus slowing development of these programs."[45]

"Walks Like a Duck and Talks Like a Duck"—But Will It Fly?

Connecting the dots in Iran's procurement and research efforts still leaves a crucial question: Is Iran actually trying to acquire nuclear weapons? Is it determined to get to a stage where it could rapidly assemble a bomb if it so chose, seeking bargaining chips for negotiations with the United States—or is it some combination of the two?

Trying to understand Iranian decision-making is a steep intellectual challenge given the fractious nature of Iranian politics. Iranian officials have different views about the nuclear program's means and goals—even as there appears to be consensus that Iran should retain facilities to enrich uranium after paying such a high cost to build them. It is also likely that Iranian objectives have changed over time as the regional and global strategic environment has changed.

The administration of former president Mohammad Khatami was willing to suspend the uranium enrichment program during negotiations with Britain, France, and Germany. It also cut back funding for Fakhrizadeh, Iran's top nuclear engineer, whose intercepted complaints about this in 2003 helped to convince the U.S. intelligence community to conclude that Iran had halted weapons work.[46] Hossein Mousavian, a top nuclear negotiator under the Khatami administration, viewed Iran-European talks as a trial run for negotiations on other issues leading to Iran's return to the fold of international respectability. "The nuclear process is the first issue where after twenty-five years, Iran is sitting at the table with Westerners discussing practical arrangements on the basis of international rules and regulations," he told this author in 2005.[47] Subsequently, Khatami's national security adviser, Hassan Rowhani, on the defensive about Iran's restraint under Khatami, claimed that Iran had outwitted the Europeans by continuing to install equipment in Isfahan to make yellowcake, the first step in processing uranium for enrichment.[48]

Since Khatami stepped down and Ahmadinejad took his place, Iranian officials have alternated denial of nuclear weapons ambitions with provocative statements that Iran's nuclear program is a train with no brakes and that Iran could make weapons if it chose to do so. Ahmadinejad declared on Iranian state television in June 2011: "If we want to make a bomb we are not afraid of anyone, and we are not afraid to announce it; no one can do a damn thing." Nonetheless, he added, "We do not want to."[49] Much attention also focused on a provocative blog post on a Revolutionary Guard website that fantasized about "the day after" Iran tests a nuclear weapon.[50] Subsequently, however, the author of the post said he wrote it off the top of his head to show his anger at sanctions.

Suspicions are also raised by the background of Abbasi-Davani, the head of Iran's Atomic Energy Organization. Wounded in an assassination attempt in December 2010 in Tehran that has been attributed to Israel, Abbasi-Davani is said to have played a major role in nuclear weapons research under Fakhrizadeh and to have directed work on measuring the yield of a nuclear weapon as well as on high-energy neutron sources.[51]

Heinonen said that connecting the known dots is sufficient to conclude that Iran likely has a program which, at a minimum, studies what is needed for a nuclear weapons option. "The same group of guys who work with high explosives worked with neutron initiators," he said. "When you take the high explosives, the neutron physics, and the missile reentry vehicle, it looks like something to do with a nuclear weapon. If

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[45] Ibid, p. 2.

[46] Erich Follath and Holger Stark, "The Birth of a Bomb: A History of Iran's Nuclear Ambitions," *Der Spiegel*, June 17, 2010 (**www.spiegel.de/international/world/0,1518,701109-6,00.html**).

[47] Slavin, *Bitter Friends, Bosom Enemies*, p. 36.

[48] Philip Sherwell, "Iranian Says Tehran Tricked EU on Nukes," *London Sunday Telegraph*, March 5, 2006. Similar comments available online at **www.armscontrolwonk.com/file_download/99/Rowhani_Interview.pdf**.

[49] Farhad Pouladi, "Ahmadinejad Insists Iran Not Seeking Nuclear Bomb," Agence France Presse, June 23, 2011. (**www.google.com/hostednews/afp/article/ALeqM5hH8mB4iW9MJ6ElbozG5o8-QlZDqA?docId=CNG.34a096065d43eb06d18ea86500b8f1a9.01**).

[50] Julian Borger, "The Day after Iran's First Nuclear Test Is a Normal Day," *The Guardian*, June 8, 2011 (**www.guardian.co.uk/world/julian-borger-global-security-blog/2011/jun/08/iran-blogging**).

[51] David Albright, Paul Brannan, and Andrea Stricker, "Will Fereydoun Abbasi-Davani Lead Iran to Nuclear Weapons?," Institute for Science and International Security, June 24, 2011 (**http://isis-online.org/isis-reports/detail/will-fereydoun-abbasi-davani-lead-iran-to-nuclear-weapons/**).

it walks like a duck and talks like a duck and has feet like a duck, it most likely is a duck."[52]

Heinonen also noted that Iranian officials appear to have concealed their true intentions about nuclear facilities such as the Fordow site near Qom. "When it was revealed in 2009, they said it was for 3.5 percent uranium, nothing else," he said. "A year ago, they said it was also an R&D facility for more-advanced centrifuges. Now they say they want to move production from 3.5 percent to 20 percent, triple the production, and use more-advanced centrifuges. So maybe from the very beginning, [most] likely it was planned for high enriched uranium."[53] A similar experience occurred in 2000 when Iran first declared the existence of its uranium-conversion facility in Isfahan to the IAEA. At the time, it said the UF6 produced would be sent abroad for enrichment. This was, of course, before Iran had completed an enrichment plant at Natanz where the UF6 was ultimately used.[54]

Some analysts believe that Iran will go as far as possible toward nuclear weapons capability without crossing the line and building and testing a device. "I think it is very possible, even likely, that Iran will stop short of actually building a nuclear weapon, while striving to achieve the capability to do so in a short time," Fitzpatrick said. "I say this because Iran surely knows that if it starts to build a weapon and this leaks, Israel and probably the U.S. too will launch a preemptive military attack . . . For the time being, until Iran has sufficient enriched uranium to make breakout worth the risk, there is little practical difference between striving for a capability and striving for a bomb."[55] Heinonen added that stopping short of a weapon would mean Iran would not jeopardize its current support from members of the Non-Aligned Movement, which Iran highly values.[56]

Albright said it was possible that Iran would build and test a crude device before attempting the more difficult feat of producing a nuclear warhead. "It's about getting across the threshold like Pakistan, South Africa, North Korea, and India," he said. "You worry about the deliverability [of the weapon] later."[57]

Russian specialists discount Iran's ability to make a nuclear weapon that can be placed on a missile—something North Korea has apparently had difficulty doing. "Maybe they want to have nuclear weapons, but the distance between a device and a bomb is a very long distance," said retired lieutenant general Evgeny Buzhinskiy, former head of the International Treaties Department of the Russian Ministry of Defense.[58]

Heinonen speaks of a "nuclear ladder" with three steps: producing sufficient fissile material for a weapon; making a nuclear device; and finally, developing the means to deliver it. It is still possible, he believes, to stop Iran on the first rung. "The genie is out of the bottle but it is not yet wandering around," he said.[59] In other words, it may be a duck, but it's not certain that it will ever fly.

Iranian Motives

Understanding why Iran continues its nuclear program in the face of international condemnation and sanctions is crucial if one is to devise an approach to dissuade Tehran.

While Iran has defended the program on the grounds that it will provide energy independence for the country, sanctions are hampering Iranian exploitation of its oil, and particularly its large gas reserves which could easily satisfy Iran's domestic-energy needs and export-revenue requirements for many years to come.

Nationalism and prestige are bigger factors for a country whose leaders have always had a sense of entitlement about Iran's stature and regional importance. Iranian officials deeply resent the fact that Israel, India, and Pakistan have been able to develop nuclear arsenals without paying a high price; indeed, they have been rewarded. Ali Larijani, Iran's top nuclear negotiator for much of Ahmadinejad's first term, was particularly bitter about India, which the Bush administration rehabilitated from nuclear-pariah status. "If Americans are really over concerned about the NPT," he said in 2006, "why are they working with India, [a country] that has already manufactured the weapons?"[60]

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[52] Heinonen interview with the author, July 14, 2011.
[53] Ibid.
[54] "Iran's Nuclear, Chemical and Biological Capabilities," p. 16.
[55] Fitzpatrick e-mail to the author, July 11, 2011.
[56] Heinonen e-mail to the author, July 29, 2011.
[57] Albright interview with the author, July 8, 2011.
[58] Buzhinskiy speaking at the Center for the National Interest, U.S.-Russia Dialogue, July 25, 2011.
[59] Heinonen, speaking at the Hudson Institute, July 13, 2011.
[60] Slavin, *Bitter Friends, Bosom Enemies*, p. 34.

Beyond prestige, there is the question of where nuclear weapons fit in Iran's strategic calculus. Some Iranians see acquiring such weapons as detrimental and likely to provoke an arms race with wealthier Arabs—a race that Iran could not win. Others say it will give the Iranian regime more confidence to pursue an asymmetric foreign policy. Iran seeks to extend its influence primarily through ties to groups that oppose the United States, Israel, and conservative Arab regimes, such as Hezbollah, Hamas, and assorted Shiite militias in Iraq. Acquiring nuclear weapons, or even the perception that it has nuclear weapons capability, could embolden the Iranian regime to increase support for such groups.

On the other hand, Iran's rising profile has already caused neighboring Sunni-led Arab regimes to close ranks against it and seek to prevent Shiite empowerment in vulnerable nations such as Bahrain. A recent poll shows that Arab opinion of Iran's regional role has plummeted, and that most Arabs do not want Iran to obtain nuclear weapons.[61] Meanwhile, Israel and the United States have not given up the option of attacking Iran, even though there is little prospect that they could destroy the entire Iranian program, and the economic, political, and military consequences of military action could be dire.

Despite concerns that Iranian regional influence is rising in the wake of the Arab Spring, Iran remains in many ways a strategically lonely nation that is not a member of any significant defense alliance.[62] In pursuing nuclear weapons capability, Iran may be seeking deterrence and leverage—what Thomas Schelling described in his book, *Arms and Influence*, as "the bargaining power that comes from the capacity to hurt."[63]

Kayhan, a hard-line Iranian publication, stated recently that Iran was not making nuclear weapons, but suggested it was a good thing Western countries thought Iran intended to do so. "The West's main concern is that an Iran with nuclear capabilities [but not necessarily nuclear weapons] will have an impenetrable deterrence, and the military option against it will disappear. They also worry that a nuclear Iran with high self-esteem will be bolder and more motivated in pursuing its plan in the region. This will make Iran a stronger rival of the U.S."[64] One wild card is the fate of the Assad regime in Syria. If this longtime Iranian ally falls and is replaced by a regime hostile to Iran, it will make Iran feel much more vulnerable, and could be a further incentive to develop a nuclear deterrent. The fall of Libyan leader Moammar Gadhafi—who gave up a nuclear weapons program to ingratiate himself with the West—is another cautionary tale for Tehran's nuclear proponents.

Domestic politics is also a factor. Iranian leaders have milked the nuclear program for years to bolster their prestige among a population beset by economic difficulties and frustrated by Iran's pariah status. To achieve the mastery of the nuclear fuel cycle is a sign that Iran has become an advanced, technically proficient nation despite thirty years of sanctions and isolation. As Ayatollah Khamenei said in 2006, "This is a historic investment. It represents our political independence and national self-confidence. It is due to the bravery of our people . . . and we should not sell out this precious resource because of the enemies' threats, and we should not be fooled by enemy bribes."[65]

Khamenei, who lacks the religious credentials and charisma of his predecessor, has been much more supportive of the nuclear program than Khomeini.[66] The current Supreme Leader's statements suggest that Iran will never bargain away its nuclear prowess. It is unlikely that any Iranian government will concede what Iran views as its "legitimate right" to enrich uranium under the terms of the NPT. However, it may be possible to craft a compromise under which Iran retains that right in return for greater transparency, limits on enrichment, sanctions relief, and safer and more-efficient civilian nuclear equipment.

How to Keep Iran From Building a Bomb

In the end, it may not be possible to stop this "duck" from taking wing. But there are a number of steps that might keep it grounded for a long time.

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[61] Barbara Slavin, "Iran's Image Plummets in Arab World, Poll Finds," Inter Press Service, July 27, 2011 (**http://ipsnews.net/news.asp?idnews=56656**).

[62] Barbara Slavin, " 'Strategically Lonely' Iran Exploits Opportunities for Regional Influence," The Atlantic Council, June 2011 (**www.acus.org/publication/strategically-lonely-iran-exploits-opportunities-regional-influence**).

[63] Schelling as quoted by Stephen L. Carter, "Lost in Afghanistan," *Newsweek*, June 26, 2011 (**www.newsweek.com/2011/06/26/are-we-winning-in-afghanistan.html**).

[64] *Kayhan* editorial, June 22, 2011, Mideastmirror translation.

[65] "Iran Must Not Give In to 'Threats and Bribes': Supreme Leader," Agence France Press, June 4, 2006 (**www.taipeitimes.com/News/world/archives/2006/06/05/2003311820**).

[66] "Iran's Nuclear, Chemical and Biological Capabilities," p. 12.

Stepped-up efforts to stop Iran from acquiring more sensitive goods for its nuclear program should be the major focus for counterproliferation and sanctions. There are not many manufacturers of maraging steel and high-quality carbon fiber needed to produce advanced centrifuges. Sanctions, trade controls, greater government and industry cooperation, and interdictions slow the program down, and that in itself is an important achievement.

The intelligence community has also shown that it can sabotage the Iranian program through computer viruses such as Stuxnet. Technical means uncovered the clandestine enrichment site at Fordow; U.S. surveillance systems are constantly searching for other suspect sites. Iran's unsettled domestic politics and economic woes provide fertile ground for recruiting more scientists to reveal Iranian nuclear secrets.

Diplomacy is also essential, despite the frustration of dealing with a government riven by internal divisions and whose officials sometimes seem to regard negotiations as a zero-sum game. While the nominal chief nuclear negotiator, Saeed Jalili, appears constrained in his ability to make compromises, the U.S. and its partners should take advantage of the fact that Iran's foreign minister, Ali Salehi, is a U.S.-educated physicist who previously headed the Iranian Atomic Energy Organization and represented Iran at the IAEA. Recently, Salehi has assumed a bigger role, representing Iran in discussions with Russia on a plan that would gradually lift international sanctions in return for Iranian concessions, a so-called "step-by-step" approach.[67]

Iran will not concede what it regards as its right to possess the nuclear fuel cycle, but it might be willing to accept more-stringent international monitoring and enrichment caps in return for sanctions relief and provision of new and safer civilian nuclear technology. Heinonen, for example, has proposed offering Iran a new Tehran Research Reactor, one that is far more advanced than the 1960s technology of Iran's current facility. Multilateral offers to Iran in 2006 and 2008 remain on the table and offer Iran more modern power reactors than the hodgepodge of German-Russian technology that comprises Bushehr.[68]

At a minimum, before any sanctions relief, Iran should be expected to ratify and implement the Additional Protocol of the NPT and agree to permit inspections anyplace, anytime, to verify that it is not diverting nuclear material and know-how to weapons production. Nuclear negotiations should also be combined with talks on other issues of concern to Iran, including the future status of Iraq and Afghanistan. China, Iran's top trading partner, and Turkey, another major economic partner, should be encouraged to use their leverage with Tehran.[69]

To produce an atmosphere more conducive to a diplomatic solution, the United States and other NPT-recognized nuclear powers must keep their own commitments to ban nuclear testing and accelerate nuclear disarmament. They should also try harder to convince India, Pakistan, North Korea, and Israel to curb their programs—although Israel, which does not acknowledge its arsenal, should not be expected to do so until Iran takes the suggested steps to prevent it from developing nuclear weapons. While the United States and Russia have made progress on further reductions in their strategic nuclear weapons, it is unfortunate that the Obama administration—like the Bush administration before it—appears more interested in selling India nuclear reactors than in pressing India and Pakistan to reach arms control agreements.[70]

It is not too late for Iran to climb down the nuclear ladder. It is always possible for Iran to answer the IAEA's questions and to start again with a clean slate. South Africa did so and so, the world belatedly learned, did Iraq. The uncertainties surrounding intelligence about Iran's nuclear program are a reason for caution, not defeatism or despair.

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[67] "Iran's Foreign Minister Says Tehran Ready to Resume Talks on Its Nuclear Program," Associated Press, August 16, 2011 (**www.washingtonpost.com/world/middle-east/iran-russian-proposal-can-be-basis-to-start-negotiations-on-nuclear-program/2011/08/16/gIQANJEJJJ_story.html**). (Note: U.S. officials say the approach has promise, but that the Russian plan offers too much sanctions relief up front in return for insufficient Iranian steps.)

[68] More than three decades after its construction began, Bushehr finally went on line in September, according to the Iranian government. **http://www.nytimes.com/2011/09/05/world/middleeast/05iran.html?_r=1&ref=world**

[69] China has cut back on energy investment in Iran but has increased purchases of Iranian oil. **http://ca.reuters.com/article/topNews/idCATRE78112K20110902?sp=true**.

[70] "Clinton Calls on India to Amend Atomic Trade Law," National Journal Group (**http://gsn.nti.org/gsn/nw_20110719_9256.php**).

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