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## Is There Time to Prevent an Iranian Nuclear Weapon?

By Greg Thielmann, Senior Fellow

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The Obama administration has identified September as a time for reassessing its approach to negotiating with Tehran over Iran's nuclear program. It is imperative that this reassessment be based on a realistic appraisal of Iran's weaponization capabilities and limitations and not fall prey to politically motivated hyperbole. Iran's nuclear program is undeniably bringing that country closer to an ability to construct nuclear weapons—bad news for the region, the United States, and the world. Yet, a nuclear-armed Iran is years, not months, away, which is ample time for negotiating an outcome that prevents Iran from becoming a nuclear-weapon state while strengthening the nuclear Nonproliferation Treaty regime.

### Highlights

- Iran is making steady progress in satisfying two of the three requirements for building deployable nuclear weapons: development of delivery vehicles in the form of ballistic missiles and attainment of a full-scale uranium-enrichment capability.
- The U.S. intelligence community is nonetheless sticking with its 2007 assessment that Iran halted the weaponization portion of its nuclear program in the fall of 2003.
- Discussions of Iran's nuclear program are now replete with talk of "redlines being crossed" and "time running out." Yet, informed projections of the earliest possible arrival of an Iranian nuclear threat to the United States are actually being extended outward.
- Iran now has a sufficient amount of low-enriched uranium to produce at least one nuclear weapon, if enriched to bomb-grade levels. Such enrichment at declared facilities, however, would be detected by International Atomic Energy Agency monitors, sending an unambiguous signal of weapons intent long before use of the weapon could be credibly threatened.
- U.S. intelligence concluded in 2007 that Iran would probably be technically capable of producing enough highly enriched uranium for a bomb between 2010 and 2015 but that such enrichment would probably be done covertly, which could take years.
- In previous assessments, U.S. intelligence seriously overestimated how fast Iran would be able to develop and deploy long-range ballistic missiles. According to the latest testimony by intelligence officials, Iran is focusing on medium-range missiles and would not be able to deploy ICBMs prior to 2015 at the earliest.
- Even as Iran masters the nuclear fuel cycle and expands its ballistic missile forces, it must still develop a reliable weapons package and integrate it into a delivery vehicle. There is no evidence that Iran has done this work yet and little reason to believe it could do so quickly.
- Estimating that proliferants could have a nuclear weapon within several months of acquiring sufficient fissile material is a common predictive formula. But the real-world technical challenges of designing a reliable nuclear warhead for placement in a ballistic missile argue for a longer timeline.
- Finding a mutually acceptable outcome through negotiations will be neither quick nor easy. The pace of progress should not be forced in a way that strengthens hard-liners in Iran or leads to counterproductive military actions by U.S. friends in the region. Realistic timelines suggest a space for opportunities to dissuade Iran from building nuclear weapons.

The Islamic Republic of Iran confronts U.S. policymakers with a number of interconnected security challenges. Foremost among them are understanding Tehran’s nuclear program and curbing its potential to morph into a nuclear weapons program. The “first responder” in this regard is the U.S. intelligence community, which monitors and counters nuclear proliferation as a top priority. It must try to answer policymakers’ questions about Iran’s nuclear program: What does Tehran want? What is it doing? How long would it take to get a nuclear weapon?

### The Official Intelligence Community Position

In December 2007, the U.S. government released a redacted summary of a National Intelligence Estimate (NIE) that shocked Washington and the world. This controversial NIE judged with “high confidence” that Tehran had halted a covert nuclear weapons program in the fall of 2003; with “moderate confidence,” the NIE assessed that as of mid-2007, the program had not been restarted. It further assessed with “moderate confidence” that Iran would probably be technically capable of producing enough highly enriched uranium (HEU) for a weapon sometime during 2010-2015.<sup>1</sup>

This National Intelligence Council (NIC) product represented a comprehensive review of all-source evidence lasting many months and included examination of new information prompting analysts to take a second look at previous assumptions.<sup>2</sup> The NIE represented conspicuous progress in addressing the tradecraft deficiencies of the fatally flawed 2002 NIE on Iraq’s weapons of mass destruction (WMD) programs. (Those deficiencies were documented and analyzed in a comprehensive retrospective by the Senate Select Committee on Intelligence, published in July 2004.)<sup>3</sup> Yet, the political implications of the conclusions from the latest NIE on Iran’s nuclear program provoked an immediate firestorm of criticism from many who had not had access to the full classified text.

Instead of resolutely endorsing his NIC product, then-Director of National Intelligence Adm. Michael McConnell expressed regret for the misimpressions left by the wording in the redacted portion. In what amounted to *ex post facto* editing—he would have presumably signed off on the redacted summary as well as the final classified text—McConnell raised suspicions that he was responding to political pressure generated by reactions to the NIE’s conclusions. In the following days and weeks,



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Iranian President Mahmoud Ahmadinejad (C), flanked by Iran’s nuclear negotiator Saeed Jalili (L) and then-head of Iran’s Atomic Energy Organization Gholam Reza Aghazadeh (R), poses with officials outside the Isfahan Fuel Manufacturing Plant in April 2009. Used for the manufacture of nuclear fuel for civilian reactors, the facility could also be used for fashioning the fissionable core of nuclear weapons.

President George W. Bush seemed reluctant to accept the NIE's findings. One of his most conspicuous departures from the NIE was his March 2008 mischaracterization of Iran's stated position on nuclear weapons: "Iran declared it wants to be a nuclear power with a weapon to 'destroy people,' including others in the Middle East."<sup>4</sup>

McConnell reminded Congress and the public that Iran was continuing to make steady progress on two of the three prerequisites for nuclear weapons development: the ability to produce fissile material and development of ballistic missiles. Not surprisingly, the Iranians and many other governments chose to focus exclusively on the "no nuclear weapons program" headline rather than on the NIE's damning confirmation that Iran had hidden a prohibited nuclear weapons program for years from the International Atomic Energy Agency (IAEA). Israeli officials were particularly critical of the NIE, implying that they had intelligence leading to a contrary conclusion with regard to the alleged program halt. Israeli Defense Minister Ehud Barak immediately expressed skepticism about the NIE's key judgment, suggesting that Iran had "probably since revived" its weapons efforts.<sup>5</sup>

### Spinning Away

Over time, an alternative narrative to that in the NIE has emerged, or re-emerged, among some members of Congress, executive branch officials, and the press, advancing a very different assessment about the Iranian nuclear program. Its starting point arises from the conventional wisdom that fissile material production is the biggest technological obstacle, the so-called long pole in the tent, in any proliferant's quest to develop nuclear weapons.

The narrative then departs from the intelligence community's reluctance to pronounce a definitive conclusion on whether Tehran has decided to build a bomb. In this version, Iran has made that decision and is proceeding toward nuclear weapons development and production as fast as it can without being detected. Any negotiations are simply a tactic for delaying punitive action by the international community until a nuclear weapons capability has been irrevocably achieved.

The narrative suggests that weaponization, pursued for years in secret before its alleged halt in 2003, may still be underway. After sufficient HEU is available—existing low-enriched uranium (LEU) stocks are adequate for enriching enough fissile material for a single bomb within weeks—this HEU could be fashioned into a warhead within a few months. Because Iran has now acquired the knowledge and facilities necessary to produce HEU, the actualization of Iran's nuclear threat could therefore be less than a year away.<sup>6</sup> This rapid breakout capability poses an imminent existential danger to Israel, unnerves regional neighbors in the Persian Gulf, and represents a serious midterm threat to European NATO members.

This alarming scenario is highly speculative, inconsistent with what we know, and fails to take real-world considerations into account. Accepting it at face value would lead us into a dangerous policy cul-de-sac.

### Iran's Uranium-Enrichment Program

Iran has indeed passed important technological milestones in its nuclear and ballistic missile programs during the nearly two years since the information cutoff of the 2007 NIE. According to the most recent report of the IAEA,<sup>7</sup> Iran now has 8,308 installed centrifuges at the Natanz Fuel Enrichment Plant, 4,592 of which are enriching uranium. Iran has produced and stockpiled 1,508 kilograms of LEU. As pointed out in one outside analysis of the IAEA data, Iran's daily rate of LEU production has remained steady from the previous period.<sup>8</sup> Iran operates a fuel fabrication laboratory at Isfahan, capable of producing small amounts of fuel pellets,<sup>9</sup> and continues to construct a heavy-water reactor at Arak, which could be used later in plutonium production. Iran's first civilian nuclear power reactor at Bushehr, built and supplied with fuel by the Russians, is scheduled to go online in October or November of this year.

Notwithstanding these advances, senior U.S. intelligence officials in 2009 testimony to Congress continued to repeat the key conclusions of the 2007 NIE. The unclassified NIE summary did not predict when Iran could have a nuclear weapon but did project 2010-2015 as the time when Iran would be technically capable of producing enough HEU for a nuclear weapon if it chose to do so. The Department of State's Bureau of Intelligence and Research (INR) disputed the lower end of this timeline, arguing instead that Iran would be "unlikely to achieve this capability before 2013, because of foreseeable technical and programmatic problems."<sup>10</sup> Interestingly, the expansion of Iran's uranium-enrichment capabilities and LEU stockpiles since 2007 did not alter INR's opinion on the timeline, which Director of National Intelligence Dennis Blair updated in April 2009 in a response to a question from a February 2009 hearing of the Senate Intelligence Committee.<sup>11</sup>

The IAEA, privy to confidential information from its own inspectors on the ground in Iran as well as intelligence information from various members, has identified a number of "outstanding issues which give rise to concerns, and which need to be clarified to exclude the existence of possible military dimensions to Iran's nuclear programme."<sup>12</sup> The concerns divulged by the IAEA in its reports regarding the "possible military dimensions" appear to be consistent with the evidence to which the U.S. intelligence community alluded and seem to apply more to suspicions of past activities than to ongoing actions.

### Iran's Ballistic Missile Programs

Iran continues to make progress in the development of medium-range ballistic missiles (MRBMs), demonstrating in 2009 relevant technology in the successful space launch of a satellite by the two-stage Safir liquid-fuel rocket on February 2 and the first apparently successful flight test of the 2,000-kilometer-range, two-stage solid-fuel Sajjil-2 medium-range ballistic missile on May 20. Yet, at a missile defense conference in Huntsville, Alabama, last month, Lt. Gen. James Cartwright, vice



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**Iran's Sajjil-2 medium-range ballistic missile was first successfully test-fired on May 20, 2009.**

chairman of the Joint Chiefs of Staff, remarked that the U.S. government had assumed the Iranian and North Korean ICBM threat “would come much faster than it did.”<sup>13</sup> This frank acknowledgment is consistent with retrospective looks at missile program developments of the proliferant states during the years following issuance of the notoriously inaccurate predictions in the 1998 Rumsfeld Commission Report on Foreign Ballistic Missile Threats and the slightly less-inflated projections in the 1999 NIE, “Foreign Missile Developments and the Ballistic Missile Threat to the United States Through 2015.”<sup>14</sup> It also tracks with the U.S. intelligence community’s technology acquisition report to Congress, covering 2008, which judges that “Iran currently is focusing on producing more capable MRBMs,” not longer-range missiles.<sup>15</sup> One decade ago, only one of the 15 U.S. intelligence agencies, the State Department’s INR, thought it unlikely Iran would have an ICBM before 2015. Today, INR’s earlier projection appears to be the consensus view within the intelligence community. Some nongovernmental experts predict Iran would need at least 10-15 years to develop such systems.<sup>16</sup>

## Weaponization? Not So Fast

The quickly constructed 2002 NIE on Iraqi weapons of mass destruction used an off-the-shelf formula “within several months to a year”<sup>17</sup> for projecting the minimum time required for Iraq to build a bomb after it had acquired sufficient fissile material for the weapons package. The former head of Israel’s military intelligence from 2001 to 2006 offered a similar formula with regard to Iran in commenting on the 2007 NIE: “Once (the Iranians) have enough enriched uranium, they will be 3-6 months away from building a nuclear bomb if they decide to do so.”<sup>18</sup>

Ironically, then-Director of Central Intelligence George Tenet provided reluctant witness against this formula in his February 5, 2004, Georgetown University apology for the 2002 Iraq WMD NIE. Tenet cited an influential report from a sensitive source “who had direct access to Saddam and his inner circle,” subsequently identified by NBC News and others as then-Iraqi Foreign Minister Najib Sabri Al-Hadithi.<sup>19</sup> According to Tenet’s source, in the face of Saddam Hussein’s ire that Iraq did not yet have a weapon, his nuclear weapons committee assured him that “once fissile material was in hand, a bomb could be ready in 18 to 24 months.”<sup>20</sup> Tenet said he could not have “ignored or dismissed” this sensitive source in the fall of 2002. (Tenet has never explained why he then approved an NIE using the same old formula, i.e., Iraq might be able to build a bomb *several months* after getting fissile material.)

Producing and integrating a reliable weapon for the front end of a ballistic missile presents another nontrivial engineering challenge for a nascent nuclear power, a challenge often overlooked in the stock formulas frequently used in public discussions. It requires obtaining or developing specialized detonators; a high-explosive system, including a sophisticated lens system; and neutron initiator components. It requires learning fissile core fabrication and nonfissile component fabrication, performance testing of firing sets, and a host of other discrete steps, large and small. The guesstimate of “several months” seems to flow from U.S. experts who have already acquired the know-how rather than from empirical studies of how long it has actually taken those who are building a nuclear weapon for the first time.

In their book *The Nuclear Express*, Thomas Reed and Danny Stillman make graphic the differences between assembling a simple nuclear device and building a reliable and militarily significant nuclear weapon when they assert that “[a]ny...nuclear-aspiring state can get kiloton-size yields, using World War II technology, from a contraption the size and weight of an automobile.”<sup>21</sup> Yet, such a “contraption” is not the weapon assumed in most discussions of the threat Iran might pose to the region or eventually to the United States. To satisfy the space and weight restrictions of a Shahab-3 or Sajjil-2 MRBM warhead compartment or that of a future ICBM, the Iranians would almost certainly require more than a few months to build and possibly test their first deliverable nuclear weapon.

The EastWest Institute concluded in a 2009 study that

Iran might need one to three years to make a simple nuclear device after its decision to do so and perhaps five years to develop a nuclear warhead capable of being fitted onto existing and future Iranian ballistic missiles.<sup>22</sup> These calculations by U.S. and Russian experts assume multiple nuclear explosive tests. With the possible exception of Israel and South Africa—there is still no consensus explanation of the South Atlantic event on September 22, 1979<sup>23</sup>—every state that has developed and deployed nuclear weapons has needed or at least chosen to conduct nuclear testing of its warheads prior to deployment. Testing would be particularly necessary for the implosion weapon design most suitable for the tight confines of the

## Implications for Negotiations

There is time to test whether a negotiated resolution to the crisis is possible, but only if a serious, sustained, and comprehensive initiative is pursued by the United States and other UN Security Council members.

The Iranian government's handling of the June 12 presidential election and its turbulent domestic aftermath has encumbered near-term efforts to enter into U.S.-Iranian negotiations on the nuclear issue. Given the lack of an Iranian response to the "open hand" he extended, President Barack Obama set the September 24-25 meeting of the Group of 20 as a time for reassessing U.S. policy toward Tehran. Iranian Foreign Minister Manouchehr Mottaki

## **In spite of ubiquitous rhetoric about "time running out" and "redlines being crossed," an actualized Iranian nuclear threat is years, not months, away.**

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front ends of either MRBM type available to Iran.

One should not assume that longer-range ballistic missiles can be quickly developed from shorter-range systems or that the first successful flight test of a long-range ballistic missile constitutes the beginning of a threat. Israeli missile expert Uzi Rubin told a U.S. missile defense conference in August that Iran had achieved "a technological and strategic breakthrough" with its successful May 2009 test of the Sajjil-2 MRBM. He predicted that Iran could double the range within three to four years "if they pushed it."<sup>24</sup>

In order to deploy the Sajjil-2 missile, however, Iran would need to establish a production line with strict performance criteria to make solid-fuel rocket motors, according to an analysis by the International Institute for Strategic Studies (IISS). This would require many static test firings and test launches over the next three to five years.<sup>25</sup> (This figure is based on a review of historic development timelines for more than 25 solid-fuel ballistic missile programs of multiple countries. It takes into consideration that Iran's Shahab-3 liquid-fuel MRBM was actually deployed four to five years after its initial flight test.)<sup>26</sup> In order to utilize solid fuel in longer-range missiles posing a threat to U.S. territory, Iran would have to acquire or develop sophisticated navigation, guidance, and control systems, as well as the thermal shielding needed to protect the warhead during re-entry into the atmosphere, the IISS commentary noted. (Positing substantially greater time requirements for developing longer-range solid-fuel missiles stems from a review of the experience of France, China, India, and Israel, which each required six to 12 years to move to next-generation systems.)<sup>27</sup>

presented a new proposal on September 9 to representatives of the five permanent members of the UN Security Council and Germany (P5+1), Tehran's diplomatic interlocutors on nuclear issues. Considering President Ahmadinejad's statement two days earlier that Iran would not suspend uranium enrichment, it is unclear whether Tehran's newly declared willingness to resume negotiations and the cooperative gestures it recently made to the IAEA—granting access to the heavy-water facility at Arak and allowing the agency to expand surveillance of the fuel enrichment plant at Natanz—are merely tactical concessions to prevent a strengthening of sanctions or whether they signal a greater Iranian willingness to reach agreement on nuclear issues with the five permanent members of the UN Security Council and Germany.

In spite of ubiquitous rhetoric about "time running out" and "redlines being crossed," an actualized Iranian nuclear threat is years, not months, away. Constructing realistic timelines for Iran's potential development of nuclear warheads and the ballistic missiles to deliver them sets the stage for a patient and prudent pursuit of U.S. nonproliferation objectives. Washington need not, therefore, try to force the pace of progress in a way that strengthens hard-liners in Iran or prompts friends in the region to undertake counterproductive military actions.

The U.S. government should encourage concerted multilateral efforts to make nuclear proliferation more difficult everywhere by strengthening the Missile Technology Control Regime and the Nuclear Suppliers Group and by implementing the nonproliferation resolutions of the UN Security Council. It should proceed with clearly defined and realistic policy goals that respect Iranian

sovereignty, reinforce Iran's membership in the nuclear Nonproliferation Treaty (NPT), and secure fulfillment of Iran's IAEA safeguards obligations.

A realistic threat assessment does not justify complacency in response to proliferation concerns about Iran's nuclear program. It should instead enhance the effectiveness of nonproliferation efforts by making optimal use of the leverage available. This approach argues for abandoning counterproductive attempts to roll back uranium enrichment or shut down Iran's civilian nuclear power program. Instead, the United States should participate in a multilateral effort to insist on sufficient transparency in Iran's nuclear program so that the international community can have confidence that Tehran is not seeking to break out of the NPT.<sup>28</sup>

## ENDNOTES

1. National Intelligence Council (NIC), "National Intelligence Estimate: Iran: Nuclear Intentions and Capabilities," November 2007, [www.dni.gov/press\\_releases/20071203\\_release.pdf](http://www.dni.gov/press_releases/20071203_release.pdf) (hereinafter 2007 Iran NIE).
2. Tom Gjelten, "Iran NIE Reopens Intelligence Debate," National Public Radio, January 17, 2008, <http://www.npr.org/templates/story/story.php?storyId=18177103>
3. Senate Select Committee on Intelligence, "The U.S. Intelligence Community's Prewar Intelligence Assessments on Iraq," 108th Cong., 2d sess., 2004, S. Rep. 108-301, <http://intelligence.senate.gov/108301.pdf>.
4. Robin Wright, "Iran a Nuclear Threat, Bush Asserts," *The Washington Post*, March 21, 2008, [www.washingtonpost.com/wp-dyn/content/article/2008/03/20/AR2008032002284.html](http://www.washingtonpost.com/wp-dyn/content/article/2008/03/20/AR2008032002284.html).
5. Juan Cole, "International Reaction to the NIE: OSC," *Informed Comment*, December 5, 2007, [www.juancole.com/2007/12/usg-open-source-center-surveys-iranian.html](http://www.juancole.com/2007/12/usg-open-source-center-surveys-iranian.html).
6. For example, the Institute for Science and International Security (ISIS) characterized a "nuclear weapons 'breakout capability'" as "a scenario that involves enriching LEU up to weapon[s]-grade uranium. This could be accomplished within 3-6 months at either the Natanz facility or in a clandestine gas centrifuge facility." ISIS, "ISIS Report on Iran," August 28, 2009, [www.isisnucleariran.org/assets/pdf/Analysis\\_IAEA\\_Report.pdf](http://www.isisnucleariran.org/assets/pdf/Analysis_IAEA_Report.pdf).
7. IAEA Board of Governors, "Implementation of the NPT Safeguards Agreement and Relevant Provisions of Security Council Resolutions 1737 (2006), 1747 (2007), 1803 (2008), and 1835 (2008) in the Islamic Republic of Iran: Report by the Director General," GOV/2009/55, August 28, 2009.
8. David Albright, Paul Brannan and Jacqueline Shire, "Natanz Enrichment Plant: How to Measure Progress," *ISIS Report*, Rev. 1, September 1, 2009, p. 2, [www.isisnucleariran.org/assets/pdf/Natanz\\_Centrifuge\\_Progress\\_1Sept2009.pdf](http://www.isisnucleariran.org/assets/pdf/Natanz_Centrifuge_Progress_1Sept2009.pdf).
9. The Institute for Science and International Security, "ISIS Nuclear Iran" website, <http://www.isisnucleariran.org/sites/esfahan/>.
10. 2007 Iran NIE.
11. Dennis Blair, responses to questions from the Senate Select Committee on Intelligence, February 12, 2009, [www.fas.org/irp/congress/2009\\_hr/threat-qfr.pdf](http://www.fas.org/irp/congress/2009_hr/threat-qfr.pdf).
12. Ibid.
13. "Boeing Proposes Deploying Mobile Missile Interceptor in Europe," Global Security Newswire, August 20, 2009, [http://gsn.nti.org/gsn/nw\\_20090820\\_2005.php](http://gsn.nti.org/gsn/nw_20090820_2005.php).
14. See Greg Thielmann, "Rumsfeld Reprise? The Missile Report That Foretold the Iraq Intelligence Controversy," *Arms Control Today*, July/August 2003, [www.armscontrol.org/act/2003\\_07-08/thielmann\\_julaug03](http://www.armscontrol.org/act/2003_07-08/thielmann_julaug03).
15. Office of the Director of National Intelligence, "Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, Covering 1 January to 31 December 2008," [www.dni.gov/reports/Unclassified%20Report%20to%20Congress%20WMD%20Covering%201January%20to%2031December%202008.pdf](http://www.dni.gov/reports/Unclassified%20Report%20to%20Congress%20WMD%20Covering%201January%20to%2031December%202008.pdf) (also known as the Section 721 report).
16. EastWest Institute, "Iran's Nuclear and Missile Potential: A Joint Threat Assessment by U.S. and Russian Technical Experts," May 2009, p. 5, <http://docs.ewi.info/JTA.pdf>.
17. NIC, "National Intelligence Estimate: Iraq's Continuing Programs for Weapons of Mass Destruction," NIE 2002-16HC, October 2002, [www.fas.org/irp/cia/product/iraq-wmd.html](http://www.fas.org/irp/cia/product/iraq-wmd.html).
18. Maj.-Gen. Aharon Ze'evi Farkash, "Iran Now Free to Achieve Its Military Nuclear Ambitions: An Israeli Perspective on the U.S. National Intelligence Estimate," *Jerusalem Issue Brief*, Vol. 7, No. 28 (January 9, 2008), [www.jcpa.org/JCPA/Templates/ShowPage.asp?DBID=1&LNGID=1&TMID=111&FID=283&PID=1846&IID=2009](http://www.jcpa.org/JCPA/Templates/ShowPage.asp?DBID=1&LNGID=1&TMID=111&FID=283&PID=1846&IID=2009).
19. Aram Roston, Lisa Myers, and the NBC Investigative Unit, "Iraqi Diplomat Gave U.S. Prewar WMD Details," MSNBC.com, March 20, 2006, [www.msnbc.msn.com/id/11927856/](http://www.msnbc.msn.com/id/11927856/).
20. Center for American Progress, "Speech of CIA Director George Tenet," February 5, 2004, [www.americanprogress.org/issues/kfiles/b27744.html](http://www.americanprogress.org/issues/kfiles/b27744.html) (speech given at Georgetown University).
21. Thomas C. Reed and Danny B. Stillman, *The Nuclear Express: A Political History of the Bomb and Its Proliferation* (Minneapolis: Zenith Press, 2009), p. 343.
22. EastWest Institute, "Iran's Nuclear and Missile Potential."
23. An event in the South Atlantic, detected by U.S. Vela satellites and U.S. Navy acoustic sensors on September 22, 1977, is believed by many members of the nuclear and defense scientific communities to have been the test of an Israeli nuclear device, facilitated by the South Africans. A U.S. government panel, however, concluded in 1980 that the signal detected was probably not from a nuclear explosion.
24. Jim Wolf, "Iran Missile Said to Pose Europe Threat in 3-4 Years," Reuters, August 20, 2009.
25. International Institute for Strategic Studies, "Iran's Missile Development: Further Tests Needed to Cement Recent Advances," *IISS Strategic Comments*, Vol. 15, No. 1 (February 2009).
26. Michael Elleman, conversations with author, September 2009.
27. Ibid.
28. See Greg Thielmann, "To Curtail the Iranian Nuclear Threat, Change Tehran's Threat Perceptions," *ACA Threat Assessment Brief*, April 14, 2009, [www.armscontrol.org/system/files/TAB\\_Iranian-NuclearThreat.pdf](http://www.armscontrol.org/system/files/TAB_Iranian-NuclearThreat.pdf).