

ANTICIPATING NUCLEAR PROLIFERATION

Insights from the Past

Torrey C. Froscher

Good intelligence is critical to support U.S. policy efforts to counter nuclear proliferation, but the historical record is mixed. This article reviews several past cases of nonproliferation success and failure, including the Soviet Union, China, India, Libya, Iraq, and the A. Q. Khan network. Intelligence frequently provides warning, and in some cases concrete and timely information has enabled nonproliferation successes. On the other hand, failures often result from a lack of detailed and specific information adequate to overturn erroneous assumptions or preconceptions. Improvements in intelligence are needed, but correct assessments of foreign programs cannot be guaranteed. A close and healthy relationship between intelligence analysts and policymakers is also a key factor in making the most of insights that are developed.

KEYWORDS: Nonproliferation; Intelligence; Nuclear weapons; Nuclear proliferation; Soviet Union; China; India; Pakistan; Libya; A. Q. Khan; Iraq

The need for good intelligence to aid U.S. policymakers in dealing with nuclear proliferation has been recognized since the dawn of the nuclear age. As Sherman Kent, the Yale University history professor sometimes referred to as the father of intelligence analysis, put it in 1949, "The existence of controllable atomic energy, and the dead certainty that others besides ourselves will soon possess the technical secrets, place a new and forceful emphasis upon intelligence as one of the most vital elements in our survival."¹ The immediate concern at that time was how long it would take the Soviet Union to end the U.S. nuclear monopoly. Since then, intelligence information has been a critical element in the U.S. response to nuclear developments in China, India, Pakistan, South Africa, Brazil, Argentina, Iraq, Iran, North Korea, and other countries.

So how well has the intelligence community (IC) done in meeting this challenge? Evidently, not well enough. The surprisingly swift Soviet development of nuclear weapons illustrates some shortcomings that have frequently recurred, and numerous other cases over the years illustrate the limits of intelligence. The fact of China's first nuclear test was not a surprise, but the type of fissile material used was. Other failures that have received close scrutiny include unexpected Indian nuclear tests in 1974 and 1998 and, of course, assessments of Iraq's nuclear program in 1991 and 2003. At the same time, intelligence has played a central role in many nonproliferation successes, including Libya's renunciation of its weapons of mass destruction (WMD) programs and the exposure and dismantlement of the A. Q. Khan network.

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Many of the misjudgments in estimating foreign nuclear capabilities over the years can be attributed to familiar analytic challenges, such as “mind-set,” that have been central to nearly all intelligence failures over history. Still, specific information and warnings from intelligence sources have been key to policy efforts to stem or slow nuclear proliferation, even when there have been errors or surprises in some areas. Better intelligence to enable future success will require diligent attention to the basics—expert analysts working creatively with collectors, constructive and effective collaboration among diverse players, more rigorous analytic “tradecraft,” and a healthy relationship between intelligence and policy. Nonetheless, the difficulty of the problem is growing and a realistic understanding of what is possible is also needed.

A Soviet Surprise

Estimating when the Soviet Union would join the United States as a nuclear power was the first nuclear proliferation challenge for U.S. intelligence. The Soviets went to great lengths to protect their secrets and, despite tidbits from a few defectors and analysis of letters from German expatriates in Russia, little leaked out that provided direct evidence of their progress.² Given the few specifics available, assessments of Soviet progress on the bomb were based on general estimates of the level of Soviet capabilities and judgments of what was likely based on U.S. experience.

The first official estimate, made by the newly formed Central Intelligence Group (CIG) in October 1946, put the likely date of a Soviet atomic capability sometime between 1950 and 1953.³ By July 1948, a refined estimate put the “earliest possible date” at mid-1950, while the “most probable date” was mid-1953.⁴ Despite a dearth of additional information, over time, in the words of Central Intelligence Agency (CIA) historian Donald Steury, the CIA’s “projections became more precise but less accurate.”⁵

An important factor in official government and intelligence thinking about the likely rate of Soviet progress was the monopoly of the United States on high-grade uranium ore (deposits with a uranium content of more than 50 percent). The Soviet Union had to make do with deposits containing as little as one to two percent uranium. In order to capitalize on this, the United States and United Kingdom sought to corner the market on all high-quality ore as a part of the highly secret “Murray Hill Area” project.⁶ Manhattan Project head Major General Leslie R. Groves, as well as other senior officials aware of the project, believed it would be a decade or more before the Soviets could produce their own bomb.⁷ The official timeline estimates were more realistic, but still may have been affected by the perception, or assumption, that the efforts to slow Soviet progress were succeeding at least to some degree.

At the same time as these estimates were being made, U.S. intelligence analysts and their British colleagues were developing information about Soviet plans to acquire large quantities of calcium metal of a purity needed only to refine uranium metal for nuclear applications. In 1948 and 1949 they learned that the Soviets already had obtained high purity calcium sufficient to produce hundreds of tons of uranium—enough to build plutonium production reactors with a total capacity of 500 megawatts. However, the potential implications of this finding were discounted in the estimates

because of the conviction that available ore reserves would not support the production of this much uranium.⁸ In retrospect, analysts had some key clues that could have led them to accelerate the estimated timeline for the Soviet bomb, but they failed to follow the evidence to its natural conclusion as a result of what today might be called a narrow mind-set.

Despite the overall failure to predict Soviet progress, the fact that the first Soviet nuclear test was detected at all has to be counted as a major and perhaps unexpected success. Largely on the initiative of the U.S. Army Air Forces and the newly minted Atomic Energy Commission, a committee under the auspices of Director of Central Intelligence (DCI) Roscoe H. Hillenkoetter recommended the establishment of a system to detect foreign nuclear explosions using long-range air sampling and other techniques. A directive was issued on September 16, 1947, and "interim surveillance" by the new Air Force Office of Atomic Energy (AFOAT-1) began in August 1948.⁹

Monitoring flights became routine, despite constant budget battles detailed in the recollections of AFOAT-1's technical director Doyle Northrup.¹⁰ On September 3, 1949, the first reports of elevated radioactivity levels from flights in the Pacific reached Washington. Over the next few days, additional collections and intensive analysis built confidence in the judgment that a Soviet atomic explosion had taken place, culminating in President Harry S. Truman's public announcement of the test on September 23. Ironically, during the same few weeks, an order was issued to curtail expenditures on the program severely as a result of a study panel convened to address budget concerns. The Soviet test may have come just in time to save the program—the order was reversed.

China's First Bomb

In contrast to the Soviet case, there were more specific warnings of the first Chinese nuclear test, largely due to the advent of overhead imagery and the identification of a test site in August 1964. China was not featured as a near-term prospect for development of nuclear weapons in intelligence estimates in the 1950s, largely because of the judgment that a successful Chinese program would require aid from the USSR that would not be immediately forthcoming.¹¹ By 1960, however, there was new evidence that Soviet aid had materialized, and China was thought to have almost certainly started a weapons program that would probably lead to a nuclear test between 1962 and 1964.¹² A 1962 national intelligence estimate (NIE) judged that a test was still possible the following year, but it would more likely take place as many as several years later because of economic reverses and the withdrawal of Soviet assistance after relations with China soured in 1960.¹³

By 1963, aerial photography had revealed nuclear facilities that indicated the high priority that China was giving its weapons program. A special NIE that year reported the identification of a production reactor that was judged capable of producing plutonium for a bomb sometime in 1964 or 1965. An enrichment plant was also identified, but it was not expected to produce highly enriched uranium (HEU) before 1966 at the earliest and more likely in 1968 or 1969.¹⁴ Although the anticipated test date was not far off the mark, nearly all the specific evidence advanced in support of that judgment turned out to be wrong. China's first nuclear test on October 16, 1964 used HEU rather than plutonium as

predicted. The enrichment plant had apparently progressed much faster than expected, and the "production reactor" was misidentified altogether. A key factor in the misjudgments was the apparent presumption that the Chinese would follow the United States and Soviet Union in what was seen as the technologically simpler plutonium path and a failure to give adequate consideration to alternative possibilities.¹⁵

Nonetheless, the IC was able to provide more detailed and timely warnings of China's progress than it did in the Soviet case. Together with the perceived threat posed by a nuclear-armed Red China, these assessments contributed to a robust debate about how to respond. Although many of the specific judgments about China's program and its status were in error, the overall estimate was broadly on track and enabled an effective policy debate. It probably would not have made much difference if the IC had estimated the timing of the test more accurately or had correctly projected the fissile material used. However, some of the options being considered at the time involved preemptive or other disruptive action against China's program, and the significant gaps and unknowns in the IC's knowledge of Chinese program specifics may well have had an impact on these considerations.¹⁶

Two Indian Surprises

Estimates of South Asian nuclear developments over the years show a similar pattern of generally accurate assessments of the broad outline of capabilities and likely outcomes, together with significant shortcomings and frequent tactical surprises. As early as 1957, an NIE entitled "Nuclear Weapons Production in Fourth Countries: Likelihood and Consequences" mentioned the possibility that India's opposition to nuclear weapons would decline if China developed them.¹⁷ In an estimate written shortly after China's first test in 1964, India was judged the only country likely to undertake a nuclear weapons program in the next few years.¹⁸ A special NIE written the following year noted that India had enough plutonium for a nuclear device and, although it had signed the Limited Test Ban Treaty, could test underground in a relatively short time if it decided to do so. Although Prime Minister Lal Bahadur Shastri had reaffirmed India's intention not to develop nuclear weapons, there were significant pressures to make the bomb, and the estimate concluded that, within the next few years, India would most likely detonate a nuclear device and eventually produce nuclear weapons.¹⁹

The 1965 estimate noted that it was unlikely the IC would immediately learn of an Indian decision to proceed with a weapons program, but it also judged that there probably would be advance indications of an initial test.²⁰ In reality, of course, India's first nuclear explosion on May 18, 1974 took place without U.S. foreknowledge. Perhaps the authors of the 1965 special NIE were lulled by the IC success in detecting the preparations for China's initial nuclear explosion. In any case, they underestimated the difficulty of obtaining relevant warning of actions that are relatively easy to hide. According to George Perkovich's history of the Indian nuclear program, no more than 75 scientists and engineers participated directly in the production and detonation of the device.²¹

India's 1998 tests reprised a similar story. In the intervening 24 years, the possibility and even likelihood of additional testing was widely recognized, and an important goal of

U.S. nonproliferation policy was to dissuade India from taking this step. In April 1981, the renewal of activities at India's Pokharan test site became public. The test site was regularly maintained for the next decade or more, and in mid-1995 test preparations were observed. According to Perkovich, scientists had persuaded Prime Minister Narasimha Rao to move ahead with testing to validate the performance of their device. Based on intelligence warnings of the preparations, U.S. officials quietly lobbied India not to proceed. By December the details of activities at the test site appeared in the press. The following spring test preparations were again observed, and the United States again dissuaded the Indians.²²

It is perhaps not surprising that India went to extraordinary lengths to avoid detection of its tests in 1998. Although Prime Minister Atal Bihari Vajpayee quickly made the secret decision to move forward on taking office, his party had been ambiguous on the testing question during the campaign, and Foreign Minister George Fernandes averred that India did not need to test because everyone knew India had the "the capacity and the capability."²³ Participants on the Indian side have told the story, recounting in detail their scientists' knowledge of what U.S. intelligence was looking for and the extreme measures they took to prevent any tip-offs. Indian author Raj Chengappa characterized India's success in fooling the CIA as just as much a triumph for India as the nuclear tests themselves.²⁴

Pakistan and A. Q. Khan

Public accounts have detailed the key role that U.S. intelligence played in providing information about Pakistan's nuclear program to American policymakers, including assessments related to "certifying" whether Pakistan possessed a nuclear device in the late 1980s.²⁵ As part of the efforts to track Pakistan's program, U.S. intelligence also learned a considerable amount about the role of Pakistani scientist A. Q. Khan, including details of his network of suppliers—originally put together to support uranium enrichment efforts. Former DCI George Tenet has described how U.S. intelligence put together a picture of its elements, including "subsidiaries, scientists, front companies, agents, finances, and manufacturing plants on three continents."²⁶ Khan's network was unique in providing one-stop shopping for uranium enrichment technology, enabling recipient countries to shortcut the normally protracted process of developing such capabilities indigenously. The availability of this technology outside of the direct control of governments was a new phenomenon, and the successful penetration and disruption of the network by February 2004 was a major U.S. nonproliferation success.²⁷

Libya's Renunciation of Weapons of Mass Destruction

Although the world was taken by surprise with Libya's December 19, 2003 announcement of its decision to give up its nuclear and chemical weapons programs, as well as its ballistic missile programs not in compliance with the Missile Technology Control Regime, the decision did not come out of the blue. In addition to other factors, intelligence was an important enabler of policy actions that ultimately contributed to Colonel Muammar

Qaddafi's decision. Libya had demonstrated its interest in nuclear weapons as early as the 1970s when it sought unsuccessfully to purchase nuclear arms outright from China. During the 1970s and early 1980s, it continued to seek nuclear weapons-relevant technologies from a range of countries, including Pakistan, India, the Soviet Union, Belgium, Argentina, and Brazil, but met with little success.²⁸ Partly as a result of this failure, it turned to chemical weapons and had better luck in acquiring specific technology and assistance from German firms, but this program, too, was ultimately exposed and stymied.

In the mid to late 1990s Libya renewed its nuclear efforts, taking advantage of the "full service" nuclear fuel cycle expertise offered by the A. Q. Khan network. Former DCI Tenet has recounted the story of the key role that U.S. knowledge of Libya's efforts played in closing the deal after Libya approached the United States and United Kingdom in early 2003 with an offer to renounce WMD. Libya made a voluntary decision to give up its programs, but it was not necessarily interested in acknowledging any more specifics of its efforts than was necessary. The United States insisted that Libya needed to make a complete disclosure, and actions such as the intercept of centrifuge parts bound from A. Q. Khan's Malaysia factory to Libya demonstrated that the Libyans could not expect to hide key elements of their program. It was only after the Libyans realized that the United States had penetrated their supply network and had considerable insight into the particulars of their efforts that they revealed details such as Khan's provision of a nuclear weapons design. As DCI Tenet put it, intelligence was the key that opened the door to Libya's clandestine program.²⁹

Iraq: Both Sides Now

On the opposite end of the spectrum from Libya, Iraq has become the poster child for the limitations of intelligence. U.S. intelligence underestimated Iraq's nuclear program before the first Gulf war in 1991, and it overestimated the extent to which it had taken steps to reconstitute its program after United Nations (UN) inspectors left the country in 1998. Despite the contrary misjudgments, the critical factor in each case was arguably the same: the absence of specific, concrete information adequate to dislodge strongly held preconceptions.

By 1989, a year after the end of the Iran-Iraq war and eight years after Israel's 1981 attack on the Osirak reactor at Tuwaitha, indications were growing that Baghdad was renewing efforts to develop nuclear weapons. Press accounts cited Iraqi attempts to acquire maraging steel, vacuum pumps, and other specialized machinery—all suitable for use in uranium enrichment centrifuges. According to an account in the Carnegie Endowment's annual survey of nuclear proliferation published in 1990, U.S. government sources estimated it would take Iraq five to ten years to produce a weapon, presumably because it would take that long to build a centrifuge enrichment plant. At the same time, Iraq had been caught seeking to purchase specialized capacitors used in nuclear weapons, raising the question of why it would need them so far in advance of the completion of facilities to produce fissile material.³⁰ As in the earlier case of the Soviet acquisition of high-purity calcium, this information could be seen in retrospect as a clue that all was not as it appeared. However, the dominant perception was formed by the decades that Pakistan

had taken to develop its enrichment capability, and the possible implications of what was not known about Iraq's program was not sufficient to overturn it. After the war, of course, the United States and the International Atomic Energy Agency learned that Iraq had mounted a massive effort along multiple pathways to produce fissile material and had progressed much farther than anyone had guessed.

Not much needs to be said about the more recent failure to characterize accurately the state of Iraq's nuclear program prior to the 2003 war, given the extensive postmortems and public debate. In contrast to postwar findings, the 2002 NIE judged that Iraq was reconstituting its nuclear weapons program, with the State Department's Bureau of Intelligence and Research taking a footnote to reflect its view that although Iraq was likely pursuing at least a limited effort, the evidence was inadequate to conclude that it was integrated and comprehensive. The Robb-Silberman WMD Commission and the Senate Select Committee on Intelligence (SSCI), as well as internal IC reviews, identified failings in tradecraft, sourcing, information sharing, characterization of uncertainty, and other areas—and there were serious errors and a need for continuous improvement in all of these areas.³¹ Nevertheless, there is no reason to think that even if the IC had done its job perfectly, they would have come to the correct conclusion about Saddam's WMD programs with the information available.

In 2002, the dominant perception was shaped by how wrong the IC had been in 1990 and the conviction that Saddam Hussein had effectively frustrated inspections for years, was determined to rebuild his WMD capacity after UN inspectors left in 1998, and would spare no effort to that end. The main task was seen as finding and characterizing the evidence that described how and where the activities were taking place. As Robert Jervis notes in an insightful analysis, the fundamental reason for the intelligence failure on Iraq was that the assumptions and inferences that guided analysis were much more reasonable than the alternatives. The key conclusions were driven less by the specific pieces of evidence available than by the overall perception of Saddam's political objectives and outlook—perceptions that were universally shared and did not depend on classified information.³²

Conclusion

Although this brief sampling of historical cases is cursory and necessarily incomplete, it is enough to show clearly that surprise, error, and a divergence between assessment and truth are persistent phenomena in intelligence assessments of foreign nuclear developments. This should not be news, as all intelligence is by definition a surmise based on less-than-perfect knowledge. As Clausewitz noted nearly 200 years ago: "Many intelligence reports . . . are contradictory, even more are false, and most are uncertain."³³

A common thread in the specific cases of intelligence error described above, and many others, is the influence of preconceptions or mind-set on analytic judgment. There is a substantial literature documenting the role that human cognitive limitations play in intelligence failure. Of necessity, analysts approach their work with a set of ideas or assumptions about the issue at hand. To quote Richards Heuer, "these assumptions inevitably form a mindset that influences what information the analyst sees and what information is judged reliable and relevant."³⁴ Also inevitably, flaws in these assumptions

are only apparent after the fact. At the same time, other cognitive factors such as hindsight bias and “creeping determinism” make such errors seem obvious and avoidable in retrospect.³⁵ So, our day-to-day mental processes lead to surprise when events diverge from the patterns of the past, and then they work to “recreate” the past in a way that makes those surprises seem to have been avoidable. Better understanding of these phenomena may help reduce the likelihood that we will again fall victim.

On the positive side, these cases also show that intelligence can and does provide critical information that enables key nonproliferation successes. Not surprisingly, the most important contributions occur when intelligence can provide concrete, timely, and accurate information that can serve as a basis for action, as in the cases of A. Q. Khan and Libya. Still, if specific information turns out to be wrong or misinterpreted, it can be worse than useless if action is taken that aggravates the problem, or if it provides assurance when none is warranted. And if the strategic context or intent of potential adversaries is misjudged, estimates based solely on technical indicators can be far off the mark.

What lessons can we draw about how to provide better intelligence to support policymakers in the future? There has been no shortage of postmortem studies, reform proposals, and recommendations for improvements over the years. In the last decade alone we have had the Jeremiah Report in the wake of India’s 1998 nuclear tests, the 1998 Rumsfeld Commission report inspired by a controversial 1995 NIE about the foreign ballistic missile threat, the 1999 Deutch Commission report on Combating Proliferation of WMD, and, of course, the 2004 SSCI and 2005 Robb-Silberman Commission reports. Their recommendations tend to sound a familiar cadence: the need for better coordination of effort, improved communication and sharing of information across “stovepipes,” avoiding “mind-set” or assumptions driving analysis, making better use of alternative analysis, integrating political and technical analysis more effectively, developing and tapping more expertise, using open sources more effectively, de-emphasizing current intelligence, doing more strategic analysis and capital building, rebuilding human collection, telling what you know and do not know, ensuring better training and tradecraft, and so on.

None of these shortcomings are new, and none are completely resolvable. When future failures occur—as they will—postmortem studies likely will be able to identify many of the same factors at work. Nonetheless, the IC can do much better if it has the resources and the will to persistently tackle congenital weaknesses. As a start, continued improvement is needed in collection, analysis, and methodology:

- Analysts need to work creatively with collectors to make sure they focus on and can recognize information of value
- Additional emphasis must be placed on nurturing constructive and effective collaboration across organizational and substantive boundaries
- Better methods of clarifying assumptions and systematically considering possible explanations need to be in routine use across the intelligence community.

Much good work has been and is being done on these perennial challenges, but there is no bureaucratic or organizational fix that can ensure they are satisfactorily addressed.

Individuals throughout the IC need to internalize them as a matter of day-to-day routine. Even then, the inherent difficulties suggest that best efforts may fall short.

In addition, there are clearly some newer elements in the environment within which U.S. intelligence works, most of which appear to make the challenge of successful support to policy even more difficult. For example, the number and variety of customers, with diverse and sometimes conflicting requirements, continue to increase. Policy and military consumers of long standing today need more concrete and specific information than ever before in support of demanding counterproliferation initiatives. New customers in the law enforcement and homeland security community require a different level of precise and specific intelligence about threats tailored to the needs of local conditions and response capabilities. The collection and substantive analytic challenges have increased, as relevant technology is more broadly available and adversaries adjust their approach in light of an increased awareness of intelligence methods. The stakes are higher as additional weapons states and potential linkages to terrorists increase the prospects of nuclear use. Moreover, today's heightened media scrutiny and the perceived penalty for failure is unlikely to encourage the risk-taking that critics correctly emphasize is necessary if intelligence is to succeed.

Finally, the health of the intelligence-policy relationship is itself a key factor in ensuring its success. Many observers and participants in the process have noted the cultural gap between policymakers, who must be goal oriented and inclined to action if they are to succeed, and intelligence analysts, who may feel they have the luxury of kibitzing from the sidelines.³⁶ There needs to be a better understanding among policy consumers (and the public) of what can and cannot be expected of intelligence, and intelligence analysts need to understand the realities of the policy process and the necessity to engage effectively and professionally.³⁷ A close and effective working relationship is a necessary foundation for ensuring that whatever insights U.S. intelligence can provide are effectively applied in support of U.S. nonproliferation and counterproliferation objectives.

NOTES

1. Donald Steury, ed., *Sherman Kent and the Board of National Estimates—Collected Essays* (Washington, DC: Central Intelligence Agency, 1994), p. 3.
2. Henry S. Lowenhaupt, "On the Soviet Nuclear Scent," *Studies in Intelligence* 11 (Fall 1967), pp. 13–29, <www.cia.gov/csi/kent_csi/Default.htm>.
3. Central Intelligence Group, "Soviet Capabilities for the Development and Production of Certain Types of Weapons and Equipment," ORE 3/1, Oct. 31, 1946, document available at the Central Intelligence Agency's (CIA's) Electronic Reading Room Web Site, <www.foia.cia.gov>.
4. CIA, "Status of the U.S.S.R. Atomic Energy Project," OSI/SR-10/49/1, Aug. 1949, cited in Donald P. Steury, "How the CIA Missed Stalin's Bomb," *Studies in Intelligence* 49 (2005), <www.cia.gov/csi/studies/vol49no1/html_files/stalins_bomb_3.html>.
5. Steury, "How the CIA Missed Stalin's Bomb," p. 20.

6. Charles A. Ziegler, "Intelligence Assessments of Soviet Atomic Capability, 1945–49: Myths, Monopolies, and *Maskirovka*," *Intelligence and National Security* 12 (Oct. 1997), p. 5; Steury, "How the CIA Missed Stalin's Bomb," p. 22.
7. Charles A. Ziegler and David Jacobson, *Spying Without Spies* (Westport, CT: Praeger, 1995), pp. 21–33. Ziegler and Jacobson note that most public estimates at the time—made without the benefit of secret knowledge or special expertise—were that the U.S. nuclear monopoly would be relatively short-lived.
8. Henry S. Lowenhaupt, "Chasing Bitterfeld Calcium," *Studies in Intelligence* 17 (Spring 1973), p. 24, <www.cia.gov/csi/kent_csi/Default.htm>.
9. Doyle L. Northrop and Donald H. Rock, "The Detection of Joe 1," *Studies in Intelligence* 10 (Fall 1966), p. 25–27, <www.foia.cia.gov>.
10. *Ibid.*, p.32.
11. CIA, "Development of Nuclear Capabilities by Fourth Countries: Likelihood and Consequences," National Intelligence Estimate (NIE) 100-2-58, July 1, 1958, p. 16, <www.foia.cia.gov>.
12. CIA, "Likelihood and Consequences of the Development of Nuclear Capabilities by Additional Countries," NIE 100-4-60, Sept. 20, 1960, pp. 1–2, <<http://www.foia.cia.gov>>.
13. CIA, "Chinese Communist Advanced Weapons Capabilities," NIE 13-2-62, April 25, 1962, pp. 11–12, <www.foia.cia.gov>.
14. CIA, "Communist China's Advanced Weapons Program," Special National Intelligence Estimate (SNIE) 13-2-63, July 24, 1963, p. 4–6, <www.foia.cia.gov>.
15. Willis C. Armstrong, William Leonhart, William J. McCaffrey, and Herbert C. Rothenberg, "The Hazards of Single Outcome Forecasting," in H. Bradford Westerfield, ed., *Inside CIA's Private World* (New Haven, CT: Yale University Press, 1995), pp. 244–6.
16. William Burr and Jeffrey T. Richelson, "Whether to Strangle the Baby in the Cradle: The United States and the Chinese Nuclear Weapon Program, 1960–64," *International Security* 25 (Winter 2000–2001), pp. 54–99.
17. CIA, "Nuclear Weapons Production in Fourth Countries: Likelihood and Consequences," NIE-100-6-57, June 18, 1957, p. 10, <www.foia.cia.gov>.
18. CIA, "Prospects for Proliferation of Nuclear Weapons Over the Next Decade," NIE 4-2-64, Oct. 21, 1964, p. 1, <www.foia.cia.gov>.
19. CIA, "India's Nuclear Weapons Policy," NIE 31-1-65, Oct. 21, 1965, p. 7, <www.foia.cia.gov>.
20. *Ibid.*
21. George Perkovitch, *India's Nuclear Bomb: The Impact on Global Proliferation* (Berkeley and Los Angeles, CA: University of California Press, 1999), p. 172.
22. *Ibid.*, pp. 227–8, 353–77.
23. *Ibid.*, p. 408.
24. Raj Chengappa, *Weapons of Peace: The Secret Story of India's Quest to be a Nuclear Power* (New Delhi: Harper Collins, 2000), p. 17.
25. See, for example, Jeffrey T. Richelson, *Spying on the Bomb* (New York: W.W. Norton, 2006), pp. 338–46.

26. CIA, Speeches and Testimony, "Remarks as prepared for delivery by Director of Central Intelligence George J. Tenet at Georgetown University," Feb. 5, 2004, <www.cia.gov/cia/public_affairs/speeches/2004/tenet_georgetownspeech_02052004.html>.
27. Ibid.; U.S. Senate, Select Committee on Intelligence, "The Worldwide Threat 2004: Challenges in a Changing Global Context," testimony of Director of Central Intelligence George J. Tenet, Feb. 24, 2004, CIA Web Site, <www.cia.gov/cia/public_affairs/speeches/2004/dci_speech_02142004.html>.
28. Richelson, *Spying on the Bomb*, pp. 324–7.
29. Tenet, "Remarks at Georgetown University."
30. Leonard Spector, *Nuclear Ambitions* (Boulder, CO: Westview Press, 1990), pp. 191–93.
31. U.S. Senate Select Committee on Intelligence, *Report of the Select Committee on Intelligence on the U.S. Intelligence Community's Prewar Intelligence Assessments on Iraq*, July 9, 2004, <www.gpoaccess.gov/serialset/creports/iraq.html>; Charles Duelfer, Special Advisor to the DCI on Iraq WMD, concluded after extensive postwar investigations carried out by the Iraq Survey Group that Iraq had not tried to "reconstitute a capability to produce nuclear weapons after 1991." See the nuclear section of Vol.II of the Comprehensive Report of the Special Advisor to the DCI on Iraq WMD, Sept. 30, 2004, p. 7, <www.cia.gov/cia/reports/iraq_wmd_2004/>; Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction, *Report of the Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction*, March 31, 2005, <www.wmd.gov/report/>.
32. Robert Jervis, "Reports, Politics, and Intelligence Failures: The Case of Iraq," *Journal of Strategic Studies* 29 (Feb. 2006), pp. 40–5.
33. Carl von Clausewitz, *On War* [1832] (Princeton, NJ: Princeton University Press, 1984), p. 117.
34. Richards J. Heuer, Jr. "Limits of Intelligence Analysis," *Orbis* 49 (Winter 2005), p. 76. Heuer's work, *Psychology of Intelligence Analysis* (Washington, DC: CIA Center for the Study of Intelligence, 1999) is a classic exposition of the role of psychological and cognitive factors in intelligence analysis.
35. Malcolm Gladwell, "Connecting the Dots: The Paradoxes of Intelligence Reform," *New Yorker*, March 10, 2003. Gladwell attributes the term to Baruch Fischhoff.
36. For example, see L. Keith Gardiner, "Dealing with Intelligence-Policy Disconnects," in Westerfield, *Inside CIA's Private World*, pp. 344–46.
37. Veteran CIA analyst Jack Davis provides guidance for analysts in dealing with this perennial divide in "Tensions in Analyst-Policymaker Relations: Opinions, Facts, and Evidence," *Kent Center Occasional Papers* 2 (Jan. 2003), <www.cia.gov/cia/publications/Kent_Papers/vol2no2.htm>.