

# The Rise and Fall of the South African Bomb

Peter Liberman

South Africa built six nuclear weapons in the 1970s and 1980s and then scrapped them in 1990–91.<sup>1</sup> As one of the few states to produce nuclear weapons and the only one to dismantle an indigenous arsenal, the South African case presents a rare opportunity to study the causes of nuclear acquisition and disarmament. This article examines the political history of the South African bomb and the light it sheds on three general sources of nuclear weapons policy: security incentives, organizational politics, and international pressure along with state sensitivity to such pressure. It is based on published research as well as dozens of interviews with South African nuclear policymakers.

Official South African accounts and some scholarly studies stress the changing security threat to South Africa as the mainspring behind the nuclear weapons program's development and ultimate demise.<sup>2</sup> Although the militarization and dismantlement of the program did coincide with the vicissitudes of threats

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1. Interview-based studies following the March 1993 disclosure of the program include David Albright, "South Africa and the Affordable Bomb," *Bulletin of the Atomic Scientists*, Vol. 50, No. 4 (July–August 1994), pp. 37–47; Mark Hibbs, "South Africa's Secret Nuclear Program: From a PNE to Deterrent," *Nuclear Fuel*, May 10, 1993, pp. 3–6; Mark Hibbs, "South Africa's Secret Nuclear Program: The Dismantling," *Nuclear Fuel*, May 24, 1993, pp. 9–13; Frank V. Pabian, "South Africa's Nuclear Weapon Program: Lessons for Nonproliferation Policy," *Nonproliferation Review*, Vol. 3, No. 1 (Fall 1995), pp. 1–19; Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities* (Washington, D.C.: Woodrow Wilson Center Press, 1995), pp. 7–44; and an article by a South African nuclear energy official who reviewed the documents, Waldo Stumpf, "South Africa's Nuclear Weapons Program: From Deterrence to Dismantlement," *Arms Control Today*, Vol. 25, No. 10 (December–January 1995/96), pp. 3–8.

2. William J. Long and Suzette R. Grillot, "Ideas, Beliefs, and Nuclear Policies: The Cases of South Africa and Ukraine," *Nonproliferation Review*, Vol. 7, No. 1 (Spring 2000), pp. 24–40; T.V. Paul, *Power versus Prudence: Why Nations Forgo Nuclear Weapons* (Montreal: McGill-Queen's University Press, 2000), pp. 113–117; and Bradley A. Thayer, "The Causes of Nuclear Proliferation and the Utility of the Nuclear Nonproliferation Regime," *Security Studies*, Vol. 4, No. 3 (Spring 1995), pp. 494–495.

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to South Africa, the state did not face the kind of nuclear coercion or conventional invasion threats commonly thought to trigger nuclear weapons programs.<sup>3</sup> International ostracism of South Africa because of its policy of apartheid certainly exacerbated its insecurity, and isolated states are often prime candidates for nuclear acquisition.<sup>4</sup> But South Africa remained militarily predominant in southern Africa, and Soviet or Soviet-backed aggression was a remote possibility. Moreover, nuclear weapons would have provided only a limited remedy to this threat, even had it materialized.<sup>5</sup>

These weaknesses of the security explanation have led some observers to conclude that domestic politics drove South African nuclear weapons policies. One general domestic explanation for nuclear proliferation, derived from organizational politics theory, is that influential science, energy, and armament complexes spur nuclear acquisition.<sup>6</sup> Heads of state are likely to dominate decisionmaking on policies with such dramatic diplomatic, security, and budgetary ramifications. But scientists' rarefied expertise, particularly when combined with internal secrecy over nuclear policies, gives them extraordinary informational advantages in political debates.<sup>7</sup>

The South African nuclear science agency did have a vested interest in a nuclear explosives research program, as did the armaments agency—but not the

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3. Benjamin Frankel, "The Brooding Shadow: Systemic Incentives and Nuclear Weapons Proliferation," *Security Studies*, Vol. 2, Nos. 3/4 (Spring/Summer 1993), pp. 37–78; and Thayer, "Causes of Nuclear Proliferation."

4. Richard K. Betts, "Paranoids, Pygmies, Pariahs, and Nonproliferation Revisited," *Security Studies*, Vol. 2, Nos. 3/4 (Spring/Summer 1993), pp. 100–124; Steve Chan, "Incentives for Nuclear Proliferation: The Case of International Pariahs," *Journal of Strategic Studies*, Vol. 3, No. 1 (May 1980), pp. 26–43; and Robert E. Harkavy, "Pariah States and Nuclear Proliferation," *International Organization*, Vol. 35, No. 1 (Winter 1981), pp. 135–163.

5. The insecurity explanation for nuclear acquisition is derived from balance-of-power theory, which also predicts that states will adopt more-or-less rational strategies within their resource and informational constraints. See Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany between the World Wars* (Ithaca, N.Y.: Cornell University Press, 1984), pp. 59–79.

6. Steven Flank, "Exploding the Black Box: The Historical Sociology of Nuclear Proliferation," *Security Studies*, Vol. 3, No. 2 (Winter 1993/94), pp. 259–294; and Peter R. Lavoy, "Nuclear Myths and the Causes of Nuclear Proliferation," *Security Studies*, Vol. 2, Nos. 3/4 (Spring/Summer 1993), pp. 192–212. For theoretical underpinnings, see Morton H. Halperin, *Bureaucratic Politics and Foreign Policy* (Washington, D.C.: Brookings, 1974).

7. Nuclear secrecy (or "opacity") has many possible origins: fear of precipitating arms races or preventive attack, prior bureaucratic turf struggles, and international nonproliferation pressures. Whatever the reason, keeping potential bureaucratic opponents—such as foreign or finance ministries—in the dark about nuclear issues makes it harder, in some cases impossible, for them to mobilize opposition. See Avner Cohen and Benjamin Frankel, "Opaque Nuclear Proliferation," *Journal of Strategic Studies*, Vol. 13, No. 3 (September 1990), pp. 13–43; and Thayer, "Causes of Nuclear Proliferation," pp. 508–517.

military—in weaponization and delivery systems. Their high prestige helped them make their case to Prime Minister B.J. “John” Vorster in an environment of secrecy that minimized dissent. But it is unclear whether he needed much persuading. Defense Minister P.W. Botha’s interest in the program and his reliance on an informal military adviser are somewhat inconsistent with an organizational explanation. The decision to dismantle the program, orchestrated by President F.W. de Klerk and supported by nuclear science officials, also runs counter to organizational politics expectations.<sup>8</sup>

A third general source of nuclear weapons policies are international nonsecurity incentives, mediated by states’ varied sensitivities to such incentives. The superpowers’ initial nuclear monopoly glamorized joining the nuclear club, for example, but later international antiproliferation sanctions and ostracism raised the costs of going nuclear.<sup>9</sup> Even after the advent of the Nuclear Nonproliferation Treaty (NPT) regime, however, some governing elites continued to see reputational, political, and economic rewards in defying international pressure. Etel Solingen has argued that the economic orientation of nuclear “fence-sitters,” states that have neither joined the NPT nor overtly joined the nuclear club, colors their sensitivity to international pressure.<sup>10</sup> According to Solingen, economic liberalizers (including politicians and interest groups as well as government agencies) dislike the budgetary burden and po-

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8. The title of the South African head of government changed from prime minister to president in the 1984 constitution.

9. On nuclear possession norms, see Scott D. Sagan, “Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb,” *International Security*, Vol. 21, No. 3 (Winter 1996/97), pp. 73–85. See also Itty Abraham, *The Making of the Indian Atomic Bomb: Science, Secrecy, and the Postcolonial State* (London: Zed, 1998); Stephen M. Meyer, *The Dynamics of Nuclear Proliferation* (Chicago: University of Chicago Press, 1984), pp. 50–55, 72, 91–111; and Thayer, “Causes of Nuclear Proliferation,” pp. 468–474. On the application and effectiveness of economic sanctions against proliferators, which have been quite uneven, see Glenn Chafetz, “The Political Psychology of the Nuclear Nonproliferation Regime,” *Journal of Politics*, Vol. 57, No. 3 (August 1995), pp. 743–775; Peter Clausen, *Nonproliferation and the National Interest: America’s Response to the Spread of Nuclear Weapons* (New York: HarperCollins, 1993); Daniel Morrow and Michael Carriere, “The Economic Impacts of the 1998 Sanctions on India and Pakistan,” *Nonproliferation Review*, Vol. 6, No. 4 (Fall 1999), pp. 1–16; and T.V. Paul, “Strengthening the Non-Proliferation Regime: The Role of Coercive Sanctions,” *International Journal*, Vol. 51, No. 2 (Spring 1996), pp. 440–465. I bundle normative with economic pressure here because they were applied in parallel to South Africa, and because the political economy theory examined below suggests that state sensitivities to both NPT norms and trade linkages are shaped by common factors.

10. Etel Solingen, “The Political Economy of Nuclear Restraint,” *International Security*, Vol. 19, No. 2 (Fall 1994), pp. 126–169. For a broader application of the theory, see Etel Solingen, *Regional Orders at Century’s Dawn: Global and Domestic Influences on Grand Strategy* (Princeton, N.J.: Princeton University Press, 1998).

litical influence of state arms and energy complexes. Liberalizers also see nuclear restraint as a means to international approval, aid, and trade. In contrast, nationalist-statist governments more readily flout international norms and risk sanctions because they care less about international finance and trade, because they gain domestic political support from state enterprises, and because they see symbolic political benefits in defying foreign demands.

In the case of South Africa, changes in state sensitivity to international sanctions and norms did correlate roughly with changes in nuclear policy. In the 1970s and 1980s, South Africa was subjected to an escalating battery of nuclear sanctions culminating in near-excommunication from Western nuclear suppliers, markets, and scientific forums. South Africa had considerable nuclear self-sufficiency, however, and what little potential leverage the sanctions had was blunted by their linkage to apartheid until de Klerk resolved to abandon it. De Klerk's 1989 ascent to the presidency also represented a liberalizing departure from the National Party's nationalist-statist ideology, so the case is consistent with Solingen's hypothesis that liberalizers are more acquiescent to NPT pressures than are nationalist-statists.

Although this case study finds important new South African evidence for each of the three general sources of nuclear weapons policy, it does not establish a clear causal priority among the theories. Fragmentary and sometimes conflicting participant recollections and the lack of a documentary record still impede a clear understanding of the roots of the program. In addition, likely causal factors—South Africa's security environment, apartheid policies, and political leadership—changed almost simultaneously, making it difficult to differentiate which matches best the timing of South African policy shifts. But viewing the South African case through the lenses of these three theories highlights new theory-relevant evidence as well as potential avenues for future research that might help solve remaining puzzles.

This article, focused as it is on these three theories, does not attempt to provide a comprehensive history of the South African nuclear weapons program. But I do report here some newly disclosed details that, though not critical to understanding the sources of South African nuclear weapons policy, contribute to the broader historical record. They include details about the delivery system, a video-guided glide bomb, and the nuclear strategy's development and last-resort threat of battlefield use.

I turn first to the South African decision to build nuclear weapons, beginning with a thumbnail overview and then providing more detail relevant

to each theory. I repeat this analysis for the demise of the program, and conclude with a summary of my findings and their theoretical and policy relevance.

### *The Decision to Build Nuclear Weapons*

South Africa began its nuclear enrichment and explosives research as civilian programs apparently aimed, at least primarily, at commercial uses. Pinpointing the date and causes of the shift to a weapons program is difficult, due in large part to limited evidence about the leadership's thinking, but also perhaps to the incremental nature of the shift. It is possible that the decision was taken as early as 1974, but clear evidence of the program's militarization appears only in 1977. Because South Africa's threat environment worsened in the mid-1970s, a decision to acquire nuclear weapons before 1975 would be harder to explain as a consequence of military insecurity than a decision to do so afterward. The significance and quickened pace of militarization decisions from 1977 to 1979 is consistent with a security explanation, as are the recollections of the interview subjects most informed about the program, although the limited utility of nuclear deterrence for South Africa's security problems and the lack of a coherent strategy at the time are not.

Organizational politics theory best explains the development of a latent weapons capability in the early 1970s, while South Africa's security environment was still very benign. Strategic incoherence and the timing of the weaponization decision are also consistent with organizational politics, because a secret weapons program was the South African Atomic Energy Board's best justification for continuing nuclear explosives research after international condemnation in 1977 precluded further work on peaceful nuclear explosives (PNEs). The Atomic Energy Board (AEB) had the advantage of tight secrecy in managing internal debate, as well as direct access to the prime minister. But it lacked powerful bureaucratic allies; the military was excluded and uninformed, though its threat inflation may have had an indirect impact on nuclear policy. Less consistent with an organizational explanation is the fact that the decision to build a nuclear arsenal was taken with great interest and control by the political leadership. Although initial strategic analysis was limited, it was performed not by the AEB but by Defense Minister P.W. Botha's personal military adviser, Army Brig. John Huyser, suggesting that the process was driven from above rather than from below.

South Africa faced moderate material and reputational incentives for nuclear restraint in this period. Western pressure against nuclear testing was intense following the August 1977 discovery of the South African test site in the Kalahari Desert, and the 1978 U.S. Nuclear Nonproliferation Act threatened to starve South Africa's nuclear power industry of fuel. The government's nationalist-statist cast might have predisposed it to defiance and self-sufficiency. But more important was the simultaneous international ostracism of South Africa over its apartheid policies, which convinced the South African government that joining the NPT would provide no relief from nuclear sanctions.

#### DATING THE DECISION

Dating the South African decision to build nuclear bombs remains difficult. Officials involved in the program contend that the initial nuclear explosives research and development program was aimed at commercial PNE applications such as digging harbors and oil storage cavities.<sup>11</sup> In 1971 the minister of mines approved an AEB recommendation made the previous year to develop PNEs.<sup>12</sup> South Africa's large mining industry, the U.S. Plowshares Program (which had been promoting commercial PNE applications globally during the 1960s), and a large Soviet PNE program gave the idea a veneer of commercial and diplomatic viability.<sup>13</sup> Nonetheless, the program was classified secret almost from the very start.

Of course, the South African leadership knew that a successful PNE program would generate a de facto nuclear weapons capability. Its abstention from the NPT, its approval of the program despite the diplomatic and economic drawbacks of PNEs, and its decision to maintain tight secrecy on the program might all seem to suggest that nuclear weapons were always the intended goal. Indeed, the fact that its pilot enrichment plant (the Y-plant, located at the Pelindaba Nuclear Research Center near Pretoria) was designed to

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11. Interviews with W.L. Grant, Pretoria, January 28, 1999; and André Buys, Pretoria, August 25, 1999. See also Stumpf, "South Africa's Nuclear Weapons Program," p. 4.

12. The AEB's 1970 proposal recommended the development of gun-type, implosion, boosted fission, and thermonuclear PNE designs; paper studies on the last of these were approved later, in 1973. Telephone conversation with David Albright, May 30, 2001.

13. Interview with Buys. On U.S. and other PNE programs, see Trevor Findlay, *Nuclear Dynamite: The Peaceful Nuclear Explosions Fiasco* (Rushcutters Bay: Brassey's Australia, 1990); Paul R. Josephson, *Red Atom: Russia's Nuclear Power Program from Stalin to Today* (New York: W.H. Freeman, 2000), pp. 243–250; and Vladislav Larin and Eugeny Tar, "A Legacy of Contamination: The Soviet Union's Peaceful Nuclear Explosions," *Bulletin of the Atomic Scientists*, Vol. 55, No. 3 (May–June 1999), pp. 18–20.

produce weapons-grade uranium suggests to some observers that Vorster had already decided by 1969 or 1970—when plans for the plant were finalized—to acquire a nuclear deterrent of some kind.<sup>14</sup> Although this endeavor was ostensibly aimed at commercial uranium enrichment, drawing on South Africa's vast uranium ore and cheap coal energy resources, the technology turned out to be too energy-intensive to be competitive.<sup>15</sup> Pretoria's public objection to the NPT at the time—that it wanted to protect its unique enrichment technology from International Atomic Energy Agency (IAEA) inspectors—was an argument also heard from other nonnuclear weapon states in the enrichment business.<sup>16</sup>

The AEB never conducted a cost-effectiveness study for South African PNEs, which would have been advisable for any commercial venture. Keeping a PNE development program secret also did not make much sense from a commercial standpoint, because secrecy would only postpone the diplomatic difficulties that would inevitably arise when the time came to test or utilize a PNE. This was particularly obvious after India's May 1974 supposed PNE test galvanized Western nonproliferation and anti-PNE policies.<sup>17</sup> As argued below, however, South Africa's decision to press ahead secretly despite these liabilities could

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14. Comments of an anonymous reviewer. According to David Albright, however, the design was also well suited as a technology test bed for commercial enrichment development. Telephone conversation with Albright.

15. Whether this was a foregone conclusion is unclear. On the one hand, a junior scientist's skeptical internal report on the economic feasibility of enrichment was buried by the AEB, and commercial mining interests had little interest in enrichment. Secondhand anecdote from A. David Rosin, telephone conversation, June 21, 1999; and correspondence with David Fischer, April 5, 2001. For retrospective critiques of commercial potential, see A.A. Eberhard, "Policy Options for the Nuclear Industry in South Africa," *Raw Materials Report*, Vol. 10, No. 1 (1994), pp. 24–31; and David Fig, "Apartheid's Nuclear Arsenal: Deviation from Development," in Jacklyn Cock and Penny MacKenzie, eds., *From Defence to Development: Redirecting Military Resources in South Africa* (Ottawa, Ontario: International Development Research Centre, 1998), pp. 163–180. On the other hand, negotiations with West Germany from 1970 to 1976 over uranium enrichment collaboration do suggest the plausibility of commercial potential; David Fig, "Sanctions and the Nuclear Industry," in Neta C. Crawford and Audie Klotz, eds., *How Sanctions Work: Lessons from South Africa* (New York: St. Martin's, 1999), pp. 75–102, especially pp. 81–84; and Barbara Rogers and Zdenek Cervenka, *The Nuclear Axis: Secret Collaboration between West Germany and South Africa* (New York: Times Books, 1978).

16. Interview with Joerg Menzel, former technical adviser to the U.S. ambassador-at-large for nuclear affairs, Washington, D.C., December 16, 1999.

17. Buys explains the secrecy surrounding the PNE program as follows: "We were initially very naive. We did seriously think that this was just an alternative use for nuclear energy. . . . So although we thought everybody's doing it, and its not a big issue, we were still a little bit worried that the reaction if South Africa would do it would be different. So the program was classified top secret right from the first day. . . . But things can change, so we won't stop the program." Interview with Buys.

have been an artifact of the AEB's organizational impulses rather than of a high-level decision to obtain a nuclear arsenal.

Informed South African sources differ on when Prime Minister Vorster decided to build nuclear weapons. In a 1993 speech disclosing the defunct program's existence, de Klerk dated the shift in motivation to "as early as" 1974.<sup>18</sup> W.L. "Wally" Grant, managing director of the Uranium Enrichment Corporation of South Africa (UCOR) from 1971 to 1979, recalls that "Vorster was informed about the bomb potential, but commercial potential was foremost" in 1971, and that "defense people" were not involved until 1975.<sup>19</sup> Waldo Stumpf, who directed a review of the program before it was dismantled, says that there was no evidence of military intent prior to 1977. All that transpired in 1974, as far as he could determine, was that the AEB reported to Vorster that it could construct a nuclear device, and Vorster authorized going ahead and preparing a test site in the Kalahari Desert.<sup>20</sup> André Buys, then a rising scientist on the AEB explosives team, agrees with the 1977 date. He thinks that the defense minister and the military heard about the PNE program only when the AEB requested a remote military firing range in the Kalahari in 1974 to use as a test site. In 1976 or 1977, a few military scientists conducted a feasibility study on nuclear weapon delivery systems, but "there was no instruction out that there was going to be a nuclear weapons program. They were merely asked to look at possibilities."<sup>21</sup> South Africa's procuring of 30 grams of Israeli tritium in 1977, later described in a secret trial as intended for use in nuclear bombs, is another indication of weaponization plans at that time.<sup>22</sup>

The difficulty of dating the decision to build nuclear weapons persists because of a dearth of evidence from the top political leaders, most of whom are either unwilling to discuss the program or have died. It is possible that Vorster

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18. F.W. de Klerk, "Speech on the Nonproliferation Treaty to a Joint Session of Parliament, March 24, 1993," in *Joint Publications Research Service, Proliferation Issues*, March 29, 1993. J.W. de Villiers, AEB chief executive officer (1979–90), agreed with the 1974 date and was de Klerk's source. Interview with Jeremy Schearer, former South African foreign affairs official, Pretoria, January 28, 1999; and Albright, "South Africa and the Affordable Bomb," p. 43. A Central Intelligence Agency report asserts that "South Africa formally launched a weapons program in 1973," but its evidence for this is unclear. Directorate of Intelligence, U.S. Central Intelligence Agency, *New Information on South Africa's Nuclear Program and South African-Israeli Nuclear and Military Cooperation*, secret document, March 30, 1983, partially released May 7, 1996, <http://www.foia.ucia.gov>.

19. Interview with Grant.

20. Interview with Waldo Stumpf, Pretoria, January 27, 1999; and Stumpf, "South Africa's Nuclear Weapons Program," p. 4.

21. Interview with Buys.

22. Court of South Africa, Cape Province Division, *The State versus Johann Philip Derk Blaauw*, case no. 270/87, top secret, September 9, 1988, p. 24.

intended to build nuclear bombs from the early 1970s, but kept this to himself until 1977 or so. Another possibility is that he really did not decide to pursue this course until around 1977. Between these is the alternative that Vorster gradually leaned toward acquiring nuclear weapons, perhaps prodded into rethinking the government's policy by the 1974 Indian test, but did not need to make a formal decision until an international furor erupted over discovery of the Kalahari test site in August 1977.

Soon after the Kalahari episode, Vorster ordered the AEB to cancel the PNE program, to close down the test site, and to develop a secret nuclear deterrent. The AEB requested clarification on what was needed for a deterrent: Some scientists believed that an ability to detonate a nuclear device underground was sufficient, while others maintained that deliverable bombs were required. Defense Minister P.W. Botha then solicited a study from the South African Defense Force (SADF) chief of staff for planning, Army Brig. John Huyser, on whom Botha often relied informally for military advice. Huyser's six to eight-page memorandum discussed three options—secret development, covert disclosure, or overt disclosure—and recommended the last (i.e., openly joining the nuclear club). Botha approved this document in April 1978 with the handwritten proviso that any disclosure should be delayed “until we are ready” and must be approved first by the government.<sup>23</sup> Huyser's memorandum did not specify numbers or types of weapons, which left the AEB still uncertain about whether a demonstration capability was sufficient.<sup>24</sup>

After Botha succeeded Vorster as prime minister in September 1978, he formed a high-level steering committee (the Witvlei, or White Marsh, Committee) on nuclear weapons policy. It included the prime minister; the ministers of defense, foreign affairs, minerals and energy, and finance; and the chiefs of Armscor (the state arms procurement and production agency), the Department of Foreign Affairs, the AEB, and the SADF.<sup>25</sup> In July 1979, the committee recommended building deliverable nuclear weapons to acquire a “credible deterrent capability” and shifting overall responsibility for the program to Armscor.<sup>26</sup>

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23. Interview and December 10, 1999, correspondence with Buys. The date is from Reiss, *Bridled Ambition*, p. 9.

24. Interview with Buys.

25. *Ibid.*; and L.J. Van der Westhuizen and J.H. le Roux, *Armscor: A Will to Win* (Bloemfontein: Institute for Contemporary History, University of the Orange Free State, 1997), pp. 174–175. (This Armscor-commissioned history is based on interviews as well as published sources.) Sources differ over whether the committee was formed in early or late 1978 and whether certain officials were on the committee.

26. Reiss, *Bridled Ambition*, p. 9.

THE NUCLEAR ARSENAL AND STRATEGY

The AEB completed its first two nuclear devices in 1978 and 1979, but neither was deliverable by aircraft. The first was dismantled for parts; the second, which was equipped with measurement instrumentation, remained dedicated for an underground test. Armscor completed its first bomber-deliverable weapon in 1982. Further refinements in reliability, safety, and delivery design delayed completion of the next weapon until August 1987, after which production accelerated so that the arsenal stood at six and a half by late 1989.<sup>27</sup> The new weapons were nuclear versions of Armscor's remotely guided H2 glide bomb, allowing greater range and penetrability than ordinary gravity bombs.<sup>28</sup> Armscor also investigated a mobile nuclear intermediate-range ballistic missile option, conducting paper studies on how the bombs might be adapted into warheads for missiles available from a joint Israeli–South African rocket and reconnaissance satellite program. A new weapons plant—Advena Central Laboratories—capable of manufacturing two to three more advanced warheads per year and loading them on missiles, was started in 1987 and completed just before the program ended in 1989.<sup>29</sup> An even longer-range rocket, a potential intercontinental ballistic missile, was on Armscor drawing boards at the time. But apparently the government had not yet authorized the physical development of ballistic missile warheads.<sup>30</sup>

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27. Albright, "South Africa and the Affordable Bomb," pp. 42–45; and Reiss, *Bridled Ambition*, pp. 11–12.

28. Interview and November 1, 1999, correspondence with Buys. The H2 was remotely guided to a target by video from an aircraft, with a range of 60 kilometers; it may have been based on a similar Israeli system. See Ronen Bergman, "Treasons of Conscience," *Ha'aretz* (English ed.), April 7, 2000; and Helmoed-Romer Heitman, "Raptor Dodges the Defences," *Jane's Missiles and Rockets*, July 1, 1998, p. 10.

29. Interviews with D.W. Steyn, minister of minerals and energy (1984–89), Pretoria, April 10, 1999; Buys; and Max Sisulu, deputy chief executive officer of Denel, Pretoria, August 23, 1999. One official says that Armscor unveiled a missile in 1987 that could reach Nairobi, with an accuracy of within 300 yards of the target; interview with W.N. Breytenbach, deputy defense minister (1987–90), Fish Hoek, South Africa, August 18, 1999. See also David Albright, "South Africa's Secret Nuclear Weapons," *ISIS Report*, Vol. 1, No. 4 (May 1994), pp. 15–16; Department for Disarmament Affairs, United Nations, *South Africa's Nuclear-Tipped Ballistic Missile Capability* (New York: United Nations, 1991); Directorate of Intelligence, U.S. Central Intelligence Agency, *Africa Review—South Africa: Igniting a Missile Race?* secret document, December 8, 1989, partially released April 27, 1997, <http://www.foia.ucia.gov>; Van der Westhuizen and le Roux, *Armscor*, pp. 179–180; and Mark Wade, "RSA," *Encyclopedia Astronautica*, <http://www.friends-partners.org/mwade/lvfm/rsa.htm>.

30. Correspondence with Buys, December 10, 1999. On the longer-range RSA-4 missile, see Wade, "RSA."

Armcor's public cost estimate for the nuclear weapons program was 680 million rand (or about \$500 million in early 1980s dollars). But a separate Armcor accounting estimates the total Defence Department cost at under 800 million rand, not including the Minerals and Energy Department's costs.<sup>31</sup> Because the latter would include fissile material costs, which constituted the lion's share of the 680 million figure as well as the PNE research budget, the total program expense may have been double Armcor's original public figure. Although very costly, the program was still easily affordable for the government. South Africa's annual military budgets ran from 2 to 4.5 billion rand, or between 4 and 5 percent of gross national product, from the late 1970s through the 1980s.<sup>32</sup>

Despite the economic and diplomatic stakes involved, the government did not think very thoroughly about nuclear strategy at first. Buys says that Huyser's memorandum "was not very concise and we often . . . had difficulties in interpreting it. There was a lot of argumentation in it that didn't lead to any clear conclusion."<sup>33</sup> Huyser's recommendation for overt disclosure had been overruled by P.W. Botha, at least for the time being, but Huyser personally interpreted Botha's proviso about "when we are ready" as meaning the completion of the first operational nuclear weapons. His memorandum, moreover, left little guidance on contingencies for nuclear disclosures, threats, or use. Buys recalls that he and other scientists worried that "nobody actually sat down and worked out a proper strategy for what they wanted to do with [the bombs]. And if they're in a desperate situation that they could take an irrational decision simply because they haven't got time to really consider."<sup>34</sup>

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31. Armcor fact sheet provided by Buys; and Stumpf, "South Africa's Nuclear Weapons Program," p. 6. Another source mentioning the 800 million rand figure reports that it did include fissile material costs, and that Armcor's weaponization efforts from 1980 to 1990 cost only 145 million rand. Hibbs, "Dismantling," p. 12. According to AEC Chief Waldo Stumpf, the 680 million figure included 85 percent of the Y-plant's capital and running costs (since 15 percent of its capacity was used to fuel the Safari I research reactor) plus Armcor's costs of producing the devices. Overhead costs that "fell through the cracks," he states, were balanced by the uncredited value of the Y-plant for designing the Z-plant built to fuel South Africa's Koeberg nuclear power station, located near Cape Town. Interview and April 25, 2001, correspondence with Stumpf.

32. Robert Scott Jaster, *South Africa's Narrowing Security Options*, Adelphi Paper 159 (London: International Institute for Strategic Studies, 1980), p. 16; U.S. Arms Control and Disarmament Agency, *World Military Expenditures and Arms Transfers, 1987* (Washington, D.C.: Government Printing Office, 1988), p. 76; and *World Military Expenditures and Arms Transfers, 1985-1995* (Washington, D.C.: Government Printing Office, 1996), p. 90.

33. Correspondence with Buys, December 10, 1999.

34. Interview and December 10, 1999, correspondence with Buys.

Because of these concerns, in 1983 Buys—by this time general manager of Armscor’s Circle nuclear weapons plant (commissioned in May 1981, 15 kilometers from Pelindaba)—formed and chaired an Armscor working group to develop a more specific nuclear strategy. The group met monthly for a year, conducting war games, reviewing the nuclear strategy literature, and selectively consulting experts, politicians, and even a leading South African theologian. On the key question of how the Soviet Union or the United States might react to South African nuclear disclosures or tests, the working group consulted P.W. Botha, Foreign Minister R.F. “Pik” Botha, and Director-General of Foreign Affairs Brand Fourie. L. Daniel “Niel” Barnard, National Intelligence Service director-general from 1980 to 1990 and one of the only South Africans who had studied nuclear weapons strategy in any depth, was also consulted. But the working group deemed his academic expertise as too focused on great power politics to apply to South Africa’s unique needs.<sup>35</sup>

The working group eventually developed a three-phase strategy emphasizing deterrence and diplomatic leverage. As long as the military threat remained remote, the government would remain at phase one—“nuclear ambiguity”—neither acknowledging nor denying a nuclear capability. If Soviet or Soviet-backed forces threatened invasion of South African territory or Namibia (controlled by South Africa since World War I), the government would try the covert disclosure or covert coercion of phase two. This involved acknowledging the capability privately to relatively friendly Western nations, in the hope of eliciting their intervention. “If they expressed doubts about the existence of our nuclear arsenal, we would invite them to send inspectors to view our bombs. If this failed to convince them to intervene on our behalf we would threaten to detonate a nuclear device underground and therefore ‘go nuclear.’” If this failed, and the situation deteriorated further, the government would move to phase three, known as the overt disclosure or overt deterrent strategy, which in turn comprised three steps. South Africa would first publicly declare its capability or conduct an unannounced underground test. If this did not work, South Africa would detonate a nuclear bomb 1,000 kilometers south over the ocean. According to Buys, “the last step would then be to threaten to use the nuclear weapons on the battlefield in self-defense.”<sup>36</sup>

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35. *Ibid.*

36. *Ibid.* The Namibian threshold is reported in Pabian, “South Africa’s Nuclear Weapon Program,” pp. 7–8. Prior official accounts of the strategy did not acknowledge the threat of battlefield use; see Albright, “South Africa and the Affordable Bomb,” pp. 8–9; Reiss, *Bridled Ambition*, pp. 15–17; and Stumpf, “South Africa’s Nuclear Weapons Program,” p. 5. Some sources indicate that the

The strategy did not specify any further steps, and the working-group members disagreed about fallback options. Buys's view was that "it was better to throw in the towel, and let the Soviet Union take us. The argument was that to actually use the weapon in any way aggressively would have been a suicidal act. The Soviet Union would have every excuse then to actually attack us with nuclear weapons. We were no match for that. Then we would still lose, but we would destroy the country and the people as well. . . . Others would argue differently, they would say fight to the bitter end. . . . But there was no strategy for that."<sup>37</sup>

P.W. Botha reportedly agreed with Buys, at one point admonishing Armscor officials—upon rejecting their proposals in September 1985 to develop implosion and thermonuclear warheads—that "these devices will never be used offensively by South Africa as it would be suicide."<sup>38</sup> Gen. Magnus Malan, SADF chief from 1976 to 1980 and defense minister from 1980 to 1991, says that he doubts whether nuclear weapons would have ever been used except in retaliation for a chemical or nuclear attack on South Africa.<sup>39</sup> But even those who opposed using the weapons offensively argued that advanced delivery systems would enhance the credibility of the bluff to do so.

The three-phase strategy was finally approved in 1986 or 1987, according to Buys. But P.W. Botha does not appear to have been highly committed to it. Buys recalls him saying of the arm-twisting concept, "Fine, you can put that in as a possibility," and Buys acknowledges that the strategy "was perhaps not taken that seriously because . . . people thought we're a long way off."<sup>40</sup> Another official had the impression that the strategy was intended only as a general guideline.<sup>41</sup>

But in late 1986 or 1987, Armscor was instructed to "make sure that the capability to actually execute the strategy is in place," according to Buys.<sup>42</sup> Because phase two required an underground test, this meant reopening the Kalahari

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three-phase strategy emerged in 1978, though Buys thinks that this is the result of confusion between Huyser's three options and the strategy developed by the working group. Correspondence with Buys, December 10, 1999.

37. Interview with Buys.

38. Correspondence with Stumpf, repeating a story from J.W. de Villiers. P.W. Botha told me that "we said amongst ourselves that for a country like South Africa to use nuclear weapons would be disastrous." Interview, Wilderness, South Africa, April 8, 1999.

39. Interview with Gen. Magnus Malan, SADF chief (1976–80) and defense minister (1980–89), Pretoria, August 27, 1999.

40. Interview and December 10, 1999, correspondence with Buys.

41. Interview with Breytenbach.

42. Interview with Buys. Also giving a 1987 date is Hibbs, "From a PNE to Deterrent," p. 6.

test site, closed since 1977. Armscor built a large hangar—disguised as a storage and training facility—over one of the test shafts, pumped out the water that had collected, and checked it for readiness.<sup>43</sup> Some ministers believe that Armscor or even P.W. Botha himself seriously considered conducting a test at the time.<sup>44</sup>

#### SECURITY INCENTIVES AND NUCLEAR ARMING

South Africa developed a nuclear weapons option while it was very secure, but political intentions and steps toward actually building nuclear weapons followed closely the emergence of new threats. Yet the danger to the South African homeland of invasion or nuclear blackmail remained remote. More pressing was the threat to South Africa's support of Angolan rebels and its long-standing occupation of Namibia, which lies between Angola and South Africa proper. But the utility of nuclear weapons for meeting these threats, even if they materialized, was borderline considering the diplomatic and security risks as well as the budgetary costs involved.

In the mid-1970s, Pretoria felt increasingly beleaguered by the collapse of Portuguese control over Angola and Mozambique (April 1974), Soviet aid to the Marxist regime in Angola (from March 1975), Cuban intervention in Angola to support the regime against South African-backed rebels (from October 1975), the election of an unsympathetic Carter administration (November 1976), a mandatory United Nations arms embargo (from November 1977), and growing Western pressure to withdraw from Namibia (from 1977).<sup>45</sup>

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43. According to Reiss, the test site activity occurred from June through October 1988. But Buys recalls that the test site activity occurred in 1986 or 1987, and Stumpf also gives a 1987 date. Interview with Buys; Reiss, *Bridled Ambition*, pp. 13–14; and Stumpf, "South Africa's Nuclear Weapons Program," p. 6.

44. Interviews with Pik Botha, Pretoria, April 9, 1999; Malan; Breytenbach; and Grant (repeating a story he heard from J.W. de Villiers). The story was discounted in interviews with Buys; Stumpf; and Gen. Jan Geldenhuys, Pretoria, August 24, 1999.

45. The South African government's threat environment and perceptions in this period are analyzed in David E. Albright, *The USSR and Sub-Saharan Africa in the 1980's* (New York: Praeger, 1983); Chris Alden, *Apartheid's Last Stand: The Rise and Fall of the South African Security State* (New York: St. Martin's, 1996); Richard K. Betts, "A Diplomatic Bomb? South Africa's Nuclear Potential," in Joseph A. Yager, ed., *Nonproliferation and U.S. Foreign Policy* (Washington, D.C.: Brookings, 1980), pp. 283–305; Neta C. Crawford, "The Domestic Sources and Consequences of Aggressive Foreign Policies: The Folly of South Africa's 'Total Strategy,'" Centre for Southern African Studies Working Paper, No. 41 (Bellville, South Africa: Centre for Southern African Studies, University of the Western Cape, 1995). Chester A. Crocker, *High Noon in Southern Africa: Making Peace in a Rough Neighborhood* (New York: W.W. Norton, 1992); Jaster, *South Africa's Narrowing Security Options*; Robert Scott Jaster, *The Defence of White Power: South African Foreign Policy under Pressure* (New York: St. Mar-

P.W. Botha recalls that the South African nuclear arsenal was developed as a “diplomatic weapon to defend South Africa.”<sup>46</sup> According to de Klerk, the weapons were built to provide “a limited nuclear deterrent capability,” necessitated by “a Soviet expansionist threat in Southern Africa, as well as prevailing uncertainty concerning the designs of the Warsaw Pact members. The buildup of the Cuban forces in Angola reinforced the perception that a deterrent was necessary—as did South Africa’s relative international isolation and the fact that it could not rely on outside assistance, should it be attacked.”<sup>47</sup>

Yet throughout the 1970s and 1980s, South Africa faced neither nuclear-armed neighbors nor a foreseeable invasion threat, unlike other proliferators such as Israel, India, and Pakistan or states that held back (if under strong U.S. pressure) from developing a nuclear capability such as Taiwan.<sup>48</sup> The SADF’s primary mission was engaging in counterinsurgency near the South African and Namibian borders. Public rhetoric about a threat of Soviet-backed aggression notwithstanding, the Soviet Union lacked logistical support capabilities for deploying large ground forces in southern Africa, and even an improbable 80,000 Soviet airborne, air assault, and naval infantry units in combination with the Cuban forces would have been hard-pressed to defeat the SADF.<sup>49</sup> Gen. Jan Geldenhuys, SADF chief from 1985 to 1990, acknowledges that “invasions were seen as slight possibilities, adventurous transgressions of borders on such small scale that nuclear capability never came into the picture.”<sup>50</sup> The chief of military intelligence in the 1970s, Gen. H. de V. du Toit, now recalls, “I don’t think we ever thought it was feasible for anyone to attack us from the north.”<sup>51</sup> Pik Botha states that “we did not have a clinical, sober analysis of

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tin’s, 1989); Annette D. Seegers, *The Military in the Making of Modern South Africa* (London: I.B. Tauris, 1996); and Jack E. Spence, *The Soviet Union, the Third World, and Southern Africa*, Bradlow Series No. 5 (Johannesburg: South African Institute of International Affairs, 1988).

46. Interview with P.W. Botha.

47. De Klerk, “Speech on the Nonproliferation Treaty,” p. 27. Also interview with Malan; and Stumpf, “South Africa’s Nuclear Weapons Program,” p. 5.

48. On Taiwan’s early ambitions, however, see David Albright and Corey Gay, “Taiwan: Nuclear Nightmare Averted,” *Bulletin of the Atomic Scientists*, Vol. 54, No. 1 (January–February 1998), pp. 54–60; and William Burr, *New Archival Evidence on Taiwanese “Nuclear Intentions,” 1966–1976*, <http://www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB20/>.

49. Albright, *USSR and Sub-Saharan Africa*, p. 100; and Directorate of Intelligence, U.S. Central Intelligence Agency, *Trends in South Africa’s Nuclear Policies and Programs*, secret document, October 4, 1984, partially released April 27, 1997, <http://www.foia.ucia.gov>.

50. Interview with Geldenhuys, August 24, 1999.

51. Quoted in Reiss, *Bridled Ambition*, p. 28.

what the Soviet Union could do in Africa," and in fact South African expertise on Soviet foreign and military policy was negligible.<sup>52</sup>

The defeat of Jonas Savimbi's Angolan rebels (Uniao Nacional para a Independência Total de Angola, or UNITA) and an enemy incursion into Namibia were more realistic threats. Since 1975, South Africa had supported UNITA with arms and periodic interventions to deny a southern Angolan sanctuary to Namibian insurgents and to maintain a buffer against the Angolan regime. Emboldened by infusions of Soviet arms and Cuban troops, the Angolan government increased its efforts to crush UNITA starting in September 1985. Deliveries of advanced Soviet aircraft and air defenses, and an infusion of 15,000 more Cuban troops, enabled a Cuban-Angolan offensive between August 1987 and June 1988 to press into southern Angola for the first time. Cuban President Fidel Castro warned at the time that South Africa risked "serious defeat" and hinted at an offensive into Namibia. The offensive was effectively beaten back by the SADF, but the increased casualties and war costs were political liabilities for Pretoria.

Some sources suggest that the decision to reopen the Kalahari test site was motivated by concern about the Angolan situation. Buys recalls that the site was revisited because "for the first time the government started considering the possibility that we might lose the war militarily." The second stage of the nuclear strategy "would come into operation once we were confronted by a serious and escalating military threat. We got close to that in 1987 . . . in Angola."<sup>53</sup> In a private conversation late in 1987, P.W. Botha reportedly quipped to an associate, "Once we set this thing off, the Yanks will come running."<sup>54</sup> Botha's precise motivations and intentions for reopening the test site remain somewhat unclear, but the weight of evidence suggests he was prompted by the escalating Angolan conflict.<sup>55</sup>

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52. Interview with Pik Botha, April 9, 1999. See also Margot Light and Philip Nel, "South African Research on Soviet Foreign Policy," *Politikon*, Vol. 17, No. 1 (June 1990), pp. 66-72.

53. Interview and December 10, 1999, correspondence with Buys. Botha "acted immediately" to authorize reopening the test site after the Soviet deployment of air defense systems in southern Angola negated Pretoria's air superiority, according to Hibbs, "PNE to Deterrent," p. 6.

54. Interview with Breytenbach.

55. Reiss argues that the satellite-observable activity around the test site was intended as a signal to persuade the superpowers to secure the removal of Cuban troops in an overall Angolan-Namibian settlement. But the undetectable checking of the test shaft beneath the newly constructed shed suggests an attempt to provide an actual option to test, as Buys and Pabian contend. In a more anodyne interpretation, Stumpf suggests that the test preparations were merely the culmination of a strategic planning process unrelated to the Angolan conflict. See Pabian, "South Af-

Another fear was the possibility that the Cubans or Soviets would use chemical, biological, or nuclear weapons against South African troops or soil. As mentioned above, Malan thought that this might be a possibility. Some in military intelligence—though not civilian intelligence—circles even believed UNITA reports that chemical and nuclear weapons had already been deployed in Angola.<sup>56</sup>

Nuclear weapons, however, provided a limited remedy to these threats. Because South Africa could not threaten the Soviet homeland in a nuclear showdown, at least until South Africa could acquire an intercontinental ballistic missile capability many years hence, it could not credibly threaten a nuclear response to invasion or even to tactical nuclear or chemical attack. As South African officials were well aware, actually using nuclear weapons against Cuban or African troops or Soviet naval assets in southern Africa would have been suicidal. The prospect of such a disaster might still have dampened Soviet aggressiveness or invited Western involvement, providing a degree of existential deterrence. But South Africa's well-known uranium enrichment capability and test site by themselves had already accomplished much of this effect. A secret nuclear arsenal added the option of heightening deterrence when unveiled in a crisis. But the Soviet Union might have reacted to South African nuclear saber rattling by deploying its own nuclear weapons to the region or even by attacking South African nuclear installations.<sup>57</sup>

The covert coercion strategy of enticing Western assistance banked on U.S. aversion to the overt spread and use of nuclear weapons. Washington's reaction to the discovery of the Kalahari test site apparently encouraged South African strategists to think that a catalytic strategy might succeed in drawing U.S. support in the event of a future crisis.<sup>58</sup> But a plausible alternative lesson of the Kalahari debacle was that the strategy could well have failed or even backfired. A South African blackmail attempt might have angered London or Washington, discouraging Western assistance rather than prompting it.<sup>59</sup>

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rica's Nuclear Weapon Program," pp. 8–9; Reiss, *Bridled Ambition*, pp. 13–14; and Stumpf, "South Africa's Nuclear Weapons Program," p. 6.

56. Interviews with Breytenbach; and Niel Barnard, Cape Town, August 18, 1999.

57. South African strategists believed that maintaining absolute secrecy about the existence and location of South Africa's arsenal minimized the latter danger. Interview with Buys.

58. Correspondence with Buys, December 10, 1999.

59. For critiques of the strategy, see Betts, "A Diplomatic Bomb?" pp. 297–302; David Fischer, "South Africa," in Robert Litwak and Mitchell Reiss, eds., *Nuclear Proliferation after the Cold War* (Washington, D.C.: Woodrow Wilson Center Press, 1994), p. 216; Reiss, *Bridled Ambition*, p. 28; and

The scant attention that Pretoria devoted to these questions is inconsistent with a security explanation. Huyser's confusing memorandum remained official policy for several years. The strategy working group gave key policy questions closer scrutiny, and the group sensibly consulted top foreign ministry officials Pik Botha and Brand Fourie about likely foreign reactions to South African nuclear disclosures. "The answer we got from them was very qualified," says Buys. "They said, maybe if we speak to Margaret Thatcher, it might work. Ronald Reagan might also be persuaded. But for the rest, we don't think we would get anywhere."<sup>60</sup> But more detailed staff studies were not conducted. Although the working group's war games appeared to confirm the strategy's viability, the participants were predominantly senior SADF officers and Armscor technocrats, rather than officials or experts more knowledgeable about Soviet and U.S. diplomacy and strategy.

Faith that the strategy would work derived in part from a lesson drawn from the 1973 Yom Kippur War. At a low point early in the war, Israeli warnings to the United States and a nuclear alert may have prompted a U.S. decision to provide Israel with desperately needed munitions. According to Buys, members of the strategy working group "were aware of the alleged use by Israel of its nuclear capability to obtain U.S. assistance during the 1973 war. We had no proof that this was factual. . . . The allegation probably subconsciously influenced our thinking. We argued that if we cannot use a nuclear weapon on the battlefield (as this would have been suicidal), then the only possible way to use it would be to leverage intervention from the Western Powers by threatening to use it. We thought that this might work and the alleged Israel-USA case gave some support to our view."<sup>61</sup> South African political leaders often drew geopolitical comparisons between the two nations.<sup>62</sup> The close Israeli-South

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Sagan, "Why Do States Build Nuclear Weapons?" p. 70. For a more favorable assessment, see Richard J. Harknett, "Nuclear Weapons and Territorial Integrity in the Post-Cold War World," in Ken R. Dark, ed., *New Studies in Post-Cold War Security* (Brookfield, Vt.: Dartmouth Publishing, 1996), pp. 49-65.

60. Interview with Buys.

61. Correspondence with Buys, December 10, 1999. An anonymous South African defense official also stated in 1993 that the South African strategy was similar to that of Israel, which "used its bomb as a bargaining chip to get concessions from the U.S." Hibbs, "From a PNE to Deterrent," p. 10. On the 1973 episode, see Seymour M. Hersh, *The Samson Option: Israel's Nuclear Arsenal and American Foreign Policy* (New York: Vintage, 1991), pp. 225-231.

62. P.W. Botha repeated his affinity for Israel in an interview. Another potential source of strategic ideas was French Gen. André Beaufre, whose writings on "total strategy" for counterinsurgency warfare strongly influenced SADF and P.W. Botha's thinking. Beaufre also wrote a book on nuclear

African military partnership, which included ministerial visits from 1974 onward, trade in nuclear materials, rocket codevelopment, and possible cooperation on an Israeli nuclear test in 1979, offered ample opportunity for high-level strategic discussions.<sup>63</sup> (One piece of circumstantial evidence that these discussions occurred was that the minister of mines and the Bureau of State Security chief procured tritium from Israel in 1977, against the wishes of the AEB.<sup>64</sup> Because these officials were not well versed in nuclear science, it seems quite likely that they learned of tritium's military utility from their Israeli contacts.) Although South African leaders may have emulated Israeli nuclear policy, geopolitical and diplomatic differences between the two nations ought to have qualified any analogies drawn from Israeli experience.<sup>65</sup>

#### ORGANIZATIONAL POLITICS AND NUCLEAR ARMING

It appears that Vorster's formal decision to acquire a deterrent in 1977 involved primarily AEB Chairman A.J. "Ampie" Roux and Defense Minister P.W. Botha, with the latter being the most influential.<sup>66</sup> While Vorster reportedly was con-

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strategy that discussed how small power nuclear arsenals could leverage great power assistance, but Buys says that his working group was not familiar with it. Correspondence with Buys, December 10, 1999. See also André Beaufre, *Deterrence and Strategy*, trans. R.H. Barry (New York: Praeger, 1965), p. 84.

63. Shimon Peres, the chief architect and strategist of Israel's nuclear weapons program, met with Vorster and P.W. Botha in November 1974, and Vorster visited Israel in April 1976. Bergman, "Treasons of Conscience"; William E. Burrows and Robert Windrem, *Critical Mass: The Dangerous Race for Superweapons in a Fragmenting World* (New York: Simon and Schuster, 1994), pp. 448–466; and Hersh, *The Samson Option*, pp. 259–283. Other sources on South African–Israeli military collaboration include James Adams, *The Unnatural Alliance* (London: Quartet, 1984); Benjamin M. Joseph, *Besieged Bedfellows: Israel and the Land of Apartheid* (New York: Greenwood, 1987); U.S. Central Intelligence Agency, *New Information on South Africa's Nuclear Program and South African–Israeli Nuclear and Military Cooperation*. On Peres's role in the Israeli program, see Avner Cohen, *Israel and the Bomb* (New York: Columbia University Press, 1998), pp. 17–21. For a look back at the suspected 1979 test, see David Albright and Corey Gay, "A Flash from the Past," *Bulletin of the Atomic Scientists*, Vol. 53, No. 6 (November–December 1997), pp. 15–17.

64. According to Stumpf, AEB Chief A.J. Roux initially refused to collect the tritium shipment until ordered to do so by Minister of Mines S.P. Botha. Telephone conversation with Waldo Stumpf, June 4, 2001.

65. The South African–Israeli alliance could have influenced South African nuclear policy through nonsecurity mechanisms as well as through strategic learning. For example, Israel's possession of "a bomb in the basement" might have burnished the status appeal of going nuclear to the South African leadership.

66. The roles of Prime Minister Vorster and Roux are emphasized in Donald B. Sole, "The South African Nuclear Case in the Light of Recent Revelations," in James Brown, ed., *New Horizons and Challenges in Arms Control and Verification* (Amsterdam: V.U. University Press, 1994), pp. 71–80, p. 75. But Botha's involvement was clear from his commission of a delivery feasibility study and of Huyser's memorandum (discussed above).

tent to “let the program develop at its own pace,” Botha was “singularly fixated on getting nuclear weapons.”<sup>67</sup> Hendrik van den Bergh, the head of civilian intelligence, and Minister of Mines S.P. “Fanie” Botha may also have been involved; together they directed clandestine tritium and uranium ore trade with Israel in 1977.<sup>68</sup> It would have been characteristic of Vorster to make such a decision after conferring with only one or two advisers.<sup>69</sup> This would have heightened the influence of these advisers at the expense of those less likely to support the program.

Many South African sources describe Roux as the “driving force” behind the enrichment and PNE programs.<sup>70</sup> According to Buys, the PNE program was initially conceived as a way to retain roughly two dozen nuclear scientists idled by the 1969 cancellation of the Pelinduna nuclear reactor program, as well as to gain prestige for the AEB and the nation by demonstrating advanced technology.<sup>71</sup> The 1971 authorization of initial PNE research by the minister of mines rather than the prime minister reinforces this explanation. Thus the initial pursuit of commercially ill-fated enrichment and PNE programs, which some observers see as evidence of early nuclear weapons ambitions, may instead have been by-products of the AEB’s organizational incentives and influence.

Roux had long-standing direct access to the prime minister.<sup>72</sup> Laurence “Louw” Alberts, AEB vice president from 1971 to 1977, recalls Roux saying, “I can ask this government for anything I want and I’ll get it.”<sup>73</sup> This could reflect

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67. This is the assessment of a “well-placed” source quoted by Hibbs, “From a PNE to Deterrent,” p. 5. A former foreign affairs director-general surmises that P.W. Botha persuaded Roux to support a nuclear weapons program, because Roux was not particularly interested in military affairs. Interview with Neil van Heerden, Johannesburg, April 6, 1999. Botha’s general influence increased in the last years of the Vorster administration, according to Jaster, *Defence of White Power*, p. 80.

68. Supreme Court of South Africa, *State versus Blaauw*, pp. 21–25. Van den Bergh was a close confidant of Vorster’s, but van den Bergh did not inform his own staff about the nuclear program; telephone conversation with George Gruwar, former deputy director-general of the Bureau of State Security, August 24, 1999.

69. Jaster, *Defence of White Power*, pp. 25–26.

70. Interview with Grant; correspondence with Stumpf; Reiss, *Bridled Ambition*; and Sole, “South African Nuclear Case,” p. 75. See also A.R. Newby-Fraser, *Chain Reaction: Twenty Years of Nuclear Research and Development in South Africa* (Pretoria: Atomic Energy Board, 1979), pp. 36–42, 197.

71. Interviews with Buys; and an Armscor official, Pretoria, August 1999. On the Pelinduna reactor program, see also Newby-Fraser, *Chain Reaction*, pp. 115–125; and Renfrew Christie, *Electricity, Industry, and Class in South Africa* (Albany: State University of New York Press, 1984), p. 182.

72. Correspondence with Stumpf; and interviews with Piet Koornhof, minister of minerals and energy, 1976–79, Cape Town, August 16, 1999; Grant; and S.P. Botha, Pretoria, August 20, 1999.

73. Interview with Laurence Alberts, Pretoria, August 26, 1999.

prior nuclear enthusiasm on Vorster's part, but it could also have been a result of the nuclear scientists' general prestige, their monopoly on nuclear expertise, and the tight secrecy shrouding nuclear explosives research. Buys explains the lack of critical evaluation of the PNE program as a result of "an era which in hindsight we would call the Kingdom of Science, science for its own sake."<sup>74</sup> Alberts likewise recalls the 1960s and 1970s as "golden years" in which the "priest with the white coat had more impact than the priest with the black coat."<sup>75</sup> Piet Koornhof, minister of minerals and energy from 1972 to 1976, recalls that it would have been unthinkable for him and the other politicians to question the scientists' advice on such technical matters.<sup>76</sup>

Secrecy enhanced the AEB's authority in high-level decisionmaking by removing potentially critical voices and analyses. Knowledge of the program remained on a strict need-to-know basis, and need was interpreted very narrowly at all levels of government. The military was informed about the PNE program only when the AEB requested a remote military base in the mid-1970s to prepare a test site. Even General Malan, then SADF chief, says that he was not involved in Vorster's decision to acquire a deterrent.<sup>77</sup> Pik Botha, foreign minister from April 1977 until May 1994, learned of his government's nuclear capability only in August 1977, when the U.S. ambassador demanded an explanation for the Kalahari test site. When Botha asked Vorster if the charges were true, Vorster simply instructed him to say that the program was for peaceful purposes, and left it at that.<sup>78</sup>

The AEB's organizational interests might also have inclined it toward the militarization of the program in 1977 or 1978. Once the 1977 Kalahari imbroglio had forced the cancellation of the PNE program, a secret nuclear weapons program would have provided an alternative *raison d'être* for continued nuclear explosives work and for operation of the uranium enrichment Y-plant, even if the AEB were to lose control over a militarized program to Armscor.

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74. Interview with Buys.

75. Interview with Alberts.

76. Interview with Koornhof.

77. Interviews with Gen. H. de V. du Toit, Pretoria, January 27, 1999; Buys; and Malan.

78. Interview with Pik Botha, Pretoria, August 25, 1999. The foreign ministry was kept in the dark about other security matters as well, such as the SADF's 1975 intervention in Angola. Interview with van Heerden; and Alden, *Apartheid's Last Stand*. The weak position of the diplomats also limited their ability to sell their more sanguine view of the Soviet threat, and hence the need for a deterrent in the first place. "We diplomats thought Russian policy was mischief making," says a former South African ambassador, "but the military people believed the total onslaught." Interview with Donald B. Sole, Cape Town, April 7, 1999.

Roux and UCOR Managing Director Grant were both enthusiastic about the program; Grant recalls that “fighting the communists was our job” and wishing that South Africa had gone ahead and tested a device.<sup>79</sup> The scientists working on the explosives program were divided, with some opposed on moral grounds.<sup>80</sup>

P.W. Botha increased the number of ministers, if not their staffs, involved in nuclear weapons policy with the 1978 establishment of the Witvlei Committee mentioned above. But internal secrecy remained a hallmark of the program for its lifetime. The whole cabinet was never officially informed about the nuclear program until after it had been dismantled. Nor was the program ever discussed in the State Security Council, a powerful interdepartmental agency that coordinated internal and external security policy.<sup>81</sup> The military intelligence chief, General du Toit, was informed only in 1977, when asked to provide security for the cold (i.e., without a fissionable core) underground test planned at the Kalahari site. Even General Geldenhuys, the army chief of staff of the early 1980s, was not informed about the program until he became SADF chief in 1985.<sup>82</sup>

Defense Minister P.W. Botha’s support for nuclear weapons did not necessarily reflect the military’s preferences or role. As mentioned, the military leadership was not involved in the decision to acquire a deterrent, as was also the case in Israel and India.<sup>83</sup> Had it been properly consulted, it probably would have been unenthusiastic. When later asked to help develop delivery systems, according to Buys, “the military was initially rather reluctant to become involved.” While the service chiefs were loyal to Malan, who favored the program, the staff officers’ reaction was that “this was not invented here. Thanks very much, but we can do without this. In fact, we don’t think there is any utility for this, so you carry on on your own.” The air force “was in a battle for finances, and they needed fighter aircraft. They were having a hard time in Angola against Soviet aircraft. That was their highest priority, that was in their

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79. Interview with Grant. He was less politically connected than Roux, but highly respected as a scientist. Buys thinks that Roux was not a driving force in the weaponization decision. Interview with Buys.

80. Interview with Buys.

81. Interviews with Niel Barnard, Cape Town, January 22, 1999; and various former cabinet members.

82. Interviews with du Toit; and Gen. Jan Geldenhuys, Pretoria, January 25, 1999.

83. Cohen, *Israel and the Bomb*; and George Perkovich, *India’s Nuclear Bomb: The Impact on Global Proliferation* (Berkeley: University of California Press, 1999).

strategic plan. They'd rather stop the nuclear program and [use the resources to] buy fighter aircraft."<sup>84</sup> Brigadier Huyser did strongly advocate a nuclear weapons program; Buys calls him "the champion of the program" in the late 1970s, even though he "did not get along very well with the civilian scientists." But as the SADF chief of staff for planning, Huyser was not in the normal chain of command.<sup>85</sup> Defense Minister P.W. Botha's use of a maverick for nuclear policy advice indicates the malleability of organizational forces in the South African case.

That said, the SADF may have indirectly and inadvertently fueled the politicians' appetite for nuclear weapons by overselling the Soviet-Cuban threat. In his long-standing role as defense minister (1966–80), P.W. Botha could have absorbed the military's threat perceptions.<sup>86</sup> It remains unclear, however, whether it was the military that impressed upon the politicians the invasion peril or vice versa. Botha promoted the concept of a Soviet-backed "total onslaught" (i.e., an aggressive, multidimensional campaign to install a loyal Marxist regime in Pretoria) from the early 1970s, and as defense minister he could easily have shaped the military's threat assessment process. Moreover, National Party leaders had domestic political incentives for exaggerating the Soviet threat—to stiffen white support for regional intervention, internal repression, and race policy reforms.<sup>87</sup>

Internalization or "blowback" of alarmist propaganda, whatever its origins, could have heightened actual perceptions of the Soviet threat.<sup>88</sup> As South Afri-

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84. Interview with Buys.

85. *Ibid.*; and correspondence with Buys, December 10, 1999.

86. Botha continued to favor the military after becoming prime minister in 1978; in fact, he retained the defense portfolio until 1980, when he took the unprecedented step of promoting the SADF chief to defense minister. Botha also tapped military officers for important positions in the strengthened State Security Council and for his own staff. The SADF, however, was always loyal to its civilian overseers. For analyses of the rising influence of the military, see Philip H. Frankel, *Pretoria's Praetorians: Civil-Military Relations in South Africa* (Cambridge: Cambridge University Press, 1984); Deon Geldenhuys, *The Diplomacy of Isolation: South African Foreign Policy Making* (Johannesburg: Macmillan, 1984); Kenneth W. Grundy, *The Militarization of South African Politics* (Bloomington: Indiana University Press, 1986); and Jaster, *Defence of White Power*. Some observers even allege that Botha owed his political ascent in 1978 to the military's leaking of information damaging to his cabinet rivals; cf. Dan O'Meara, *Forty Lost Years: The Apartheid State and the Politics of the National Party, 1948–1994* (Athens: Ohio University Press, 1996), pp. 246–247.

87. Heribert Adam and Hermann Giliomee, *Ethnic Power Mobilized: Can South Africa Change?* (New Haven, Conn.: Yale University Press, 1979), pp. 128–144; Frankel, *Pretoria's Praetorians*; O'Meara, *Forty Lost Years*, p. 266; and Spence, *Soviet Union, the Third World, and Southern Africa*.

88. On blowback, see Jack Snyder, *Myths of Empire: Domestic Politics and International Ambition* (Ithaca, N.Y.: Cornell University Press, 1991).

can diplomat Donald Sole put it, "The concept of a 'total onslaught' by Communist forces, controlled by the Soviet Union, was increasingly being promoted, partly for party political purposes. Indeed the propaganda to this effect was introducing a degree of paranoia among senior military officers and other government personnel."<sup>89</sup> General Geldenhuys, when discussing the implausibility of invasion scenarios, observed that "sometimes states come to believe their own propaganda."<sup>90</sup> This provides an intriguing explanation for South African perceptions of the need for a deterrent, but it is not an organizationally rooted one unless the propaganda originated in the SADF.

The vagueness and incoherence of South Africa's initial nuclear weapons policy (i.e., Huyser's memorandum) is consistent with an explanation stressing the influence of the AEB and Armscor. (Although a lack of strategic planning could also be explained by a policy that sought nuclear weapons as a status symbol, the tight secrecy maintained on the program suggests that this was not a critical goal.) Vorster's lack of foreign policy experience, and the tight circle of advisers he drew upon, shielded the policy from critical examination. The scientists' initiative to form a strategy working group in 1983 would seem a risky organizational move, because securing approval for a new doctrine could expose the entire program to further debate. But Armscor's control over the working group's staffing and operation minimized this hazard. According to Neil van Heerden, director-general of foreign affairs from 1987 to 1992, "The soldiers argued that this was, in effect, a diplomatic instrument, but the diplomats did not have enough access to test that thesis . . . [and to show that it is wrong and that it] won't be feasible to project this as a diplomatic instrument."<sup>91</sup> Stumpf also stresses Armscor's autonomy, claiming that Armscor's development of advanced delivery systems was permitted by a prime minister mindful of "keeping his scientists happy."<sup>92</sup>

#### INTERNATIONAL PRESSURE, STATE SENSITIVITY, AND NUCLEAR ARMING

International pressure deterred South Africa from openly testing or declaring its nuclear weapons, but militated only weakly against a "bomb in the basement." Extensive nuclear embargoes and boycotts were imposed on South Af-

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89. Sole, "South African Nuclear Case," p. 75.

90. Interview with Geldenhuys, August 24, 1999.

91. Interview with van Heerden.

92. Correspondence with Stumpf.

rica from the mid-1970s. But they were not highly costly in economic terms, and they were seen by Pretoria as anti-apartheid bullying rather than as being selectively targeted against the nuclear weapons program. Because apartheid remained nonnegotiable for the South African government until the end of the 1980s, this linkage blunted the sanctions' coercive potential, as did possibly the leadership's nationalist-statist predisposition.

The United States, France, and West Germany halted their considerable trade and collaboration in nuclear energy and science with South Africa in the late 1970s. Although many of the sanctions cited South Africa's refusal to join the NPT or accept IAEA safeguards on the Y-plant, they were also driven by the broader anti-apartheid campaign that gained steam after the 1976 Soweto uprising and massacres and the 1977 prison murder of Steve Biko, leader of the Black Consciousness movement. Anti-apartheid congressional leaders prompted the Ford administration's 1975 cancellation of nuclear fuel deliveries and 1976 withdrawal of power plant bids. South Africa was voted off the IAEA's board of governors in June 1977, yet another proliferator, India, was not.<sup>93</sup> The 1978 U.S. Nuclear Nonproliferation Act banning nuclear cooperation with non-NPT states made no reference to apartheid, but anti-apartheid domestic sentiment would have made it difficult for a U.S. president to restore cooperation with South Africa even had it joined the NPT. The South African government concluded that "Pretoria's accession to the NPT without fundamental political reform at home would not gain South Africa international acceptance" or an end to nuclear sanctions.<sup>94</sup>

Besides injuring South African pride, nuclear sanctions necessitated a scramble for fuel for its nuclear power plants. But this was circumvented, if expensively, by the building of a second enrichment plant (the Z-plant) and a fuel assembly facility to attain nuclear energy self-sufficiency.<sup>95</sup> More compelling were the harsher and more targeted threats against an overt nuclear weapons policy. The August 1977 U.S., French, and West German *démarches* against South African testing included threats of broken diplomatic relations, trade

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93. Stumpf, "South Africa's Nuclear Weapons Program," p. 4. On the heightened international anti-apartheid campaign, see Crawford and Klotz, *How Sanctions Work*; and Audie Klotz, *Norms in International Relations: The Struggle against Apartheid* (Ithaca, N.Y.: Cornell University Press, 1995).

94. Stumpf, "South Africa's Nuclear Weapons Program," p. 5. Pretoria's ambassador to the United States from 1977 to 1982 concurred; Donald B. Sole, "The Rise of Nuclear Sanctions against South Africa," *American Review*, Vol. 6, No. 4 (Autumn 1986), p. 4.

95. Fig, "Sanctions and the Nuclear Industry"; Pabian, "South Africa's Nuclear Weapon Program"; and Sole, "Rise of Nuclear Sanctions."

sanctions, and French cancellation of a contract to build the Koeberg nuclear power plants north of Cape Town. Vorster responded by abandoning the test site, promising not to conduct any tests and declaring that South Africa's nuclear research was aimed only at peaceful uses.

Reputational and normative incentives also did not militate heavily against a nuclear capability. Pretoria thought that the nuclear weapon states' NPT advocacy was hypocritical, given their own expanding nuclear arsenals and inconsistent application of sanctions.<sup>96</sup> In confronting international anti-apartheid pressure, some South African officials even saw a nuclear option as a diplomatic shield. When recently asked how South Africa could have used its nuclear arsenal for diplomatic purposes, P.W. Botha replied that it enabled the country "to maintain its self-respect."<sup>97</sup> National Intelligence Service Director-General Niel Barnard, though he says he was not involved in nuclear policy-making, thought that a "psychological deterrent" would command respect and leverage for South Africa.<sup>98</sup> According to Buys, Brigadier Huysler had "grandiose ideas about the 'status' that nuclear weapons would bestow on South Africa."<sup>99</sup> Defying foreign pressure on the nuclear issue might also have garnered domestic political support from white voters fearful of Pretoria yielding to foreign pressure on apartheid.<sup>100</sup> Such thoughts may have been suggested by the strident Western reaction to the discovery of the Kalahari test site, and could help explain the timing of weaponization decisions following that episode.<sup>101</sup> But the decision to keep the program secret suggests that Vorster and P.W. Botha thought that the costs of joining the nuclear club overtly outweighed the benefits, at least in the near term.<sup>102</sup> Stumpf discounts diplomatic leverage arguments, on the grounds that there was no reason to think that South Africa could obtain any quid pro quos for nuclear restraint.<sup>103</sup>

Etel Solingen's theory would predict that South Africa's nationalist-statist government in the 1970s would be rather insensitive to international pressure and would seek domestic and international reputations for toughness. The rul-

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96. Interview with Barnard, January 22, 1999; and correspondence with Stumpf.

97. Interview with P.W. Botha.

98. Interview with Barnard, January 22, 1999.

99. Correspondence with Buys, December 10, 1999.

100. One British observer speculated in 1987 that "the development of nuclear weapons might provide a much needed moral boost" to the embattled regime. Christopher Coker, *South Africa's Security Dilemmas*, Washington Papers No. 126 (New York: Praeger, 1987), p. 91.

101. Betts, "A Diplomatic Bomb?" pp. 202–203.

102. As one cabinet member puts it, "We knew we were in a minefield." Interview with H.J. "Kobie" Coetsee, deputy defense minister (1978–80), Cape Town, August 16, 1999.

103. Telephone conversation with Stumpf.

ing National Party was predominantly an Afrikaner nationalist party.<sup>104</sup> While its nationalist fervor was ebbing in the 1970s and 1980s, P.W. Botha himself remained “above all else an Afrikaner nationalist and a National Party loyalist whose language and religious faith were of profound importance to him.”<sup>105</sup> The National Party also extensively managed the economy to favor Afrikaners through state employment, education, constraints on wages for blacks, protection of unskilled white labor against black competition, and favoritism to Afrikaner capital.<sup>106</sup> It sustained the import-substituting industrialization policy protecting South African consumer goods production since the 1920s, although the economy remained highly dependent on international trade and capital.<sup>107</sup> Pretoria also responded to sanctions by making massive state investments in coal-to-oil conversion, oil stockpiling, nuclear energy, and military industries.<sup>108</sup> The National Party’s nationalist-statist orientation thus may have made it more amenable to the expense of nuclear self-sufficiency and further blunted international NPT pressure.

### *The Decision to Dismantle*

Of the nine nations that have built nuclear weapons, South Africa remains the only one to dismantle them (though post-Soviet nuclear inheritors surrendered their arsenals as well). It would be hasty to generalize from this one case, especially one as unique as South Africa, which embarked on political transforma-

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104. Adam and Giliomee, *Ethnic Power Mobilized*; and O’Meara, *Forty Lost Years*.

105. Robert Schrire, *Adapt or Die: The End of White Politics in South Africa*, South Africa Update Series (New York: Ford Foundation and Foreign Policy Association, 1991), p. 36.

106. By 1970, 27 percent of white workers (predominantly Afrikaners) were employed by the state or its parastatal industries. Merle Lipton and Charles Simkins, “Introduction,” in Lipton and Simkins, *State and Market in Post-Apartheid South Africa* (Boulder, Colo.: Westview, 1993), pp. 1–34, p. 6. See also Adam and Giliomee, *Ethnic Power Mobilized*, pp. 145–176; Milton J. Esman, “Ethnic Politics and Economic Power,” *Comparative Politics*, Vol. 19, No. 4 (July 1987), pp. 395–418; Merle Lipton, *Capitalism and Apartheid: South Africa, 1910–84* (Totowa, N.J.: Rowman and Allanheld, 1985); and O’Meara, *Forty Lost Years*.

107. Modest trade liberalization occurred in 1972–76, but the government remained highly protectionist and interventionist at the time that it decided to build nuclear weapons. Botha’s government favored market reforms more than did Vorster’s, but did little more than loosen several racial labor and financial restrictions that had become highly burdensome to industry. Trevor Bell, “Should South Africa Further Liberalise Its Foreign Trade?” in Lipton and Simkins, *State and Market in Post-Apartheid South Africa*, pp. 81–128; Graham A. Davis, *South African Managed Trade Policy: The Wasting of a Mineral Endowment* (Westport, Conn.: Praeger, 1994); and Stephen R. Lewis, Jr., *The Economics of Apartheid* (New York: Council on Foreign Relations Press, 1990).

108. Neta C. Crawford, “Oil Sanctions against Apartheid,” in Crawford and Klotz, *How Sanctions Work*, pp. 103–126; and Fig, “Sanctions and the Nuclear Industry.”

tion at the same time that it dismantled its nuclear arsenal. But nuclear rollback decisions provide additional evidence for theories normally used to explain nuclear acquisition decisions, on the assumption that the removal of the causes of a policy should lead to its reversal. This assumption, however, needs some qualification. While security theories predict that threats cause arming, they only weakly predict disarmament when threats evaporate. Superfluous military power endangers a state's security only when it saps economic strength or provokes other states to arm. Nuclear rollback is even harder for organizational politics to explain, because the establishment of government programs increases the size and influence of their bureaucratic constituencies. Exogenous changes in the nuclear weapons establishment's political power or interests must be added to any organizational explanation of disarmament.

In the South African case, dismantlement followed improvements in the security environment in key respects: the winding down of the Cold War, the removal of Cuban troops from Angola, and the expectation that democratizing reforms would end South Africa's regional tensions and international isolation. This is consistent with the security model's weak prediction that a decline in threat may lead to disarmament.

Organizational politics expectations are confounded by the program's demise, because agencies that have pushed a program should become only more motivated and better equipped to protect what they have gained. Although the nuclear establishment and military lost influence under F.W. de Klerk, this was because he and his political allies had decided to denuclearize and demilitarize. The role of a high-level, handpicked cabinet committee and the loyalty of the nuclear agency chief who had helped direct the program for nearly a decade also contradict organizational politics expectations.

International pressure to dismantle did not grow dramatically in the late 1980s, but Pretoria's sensitivity to the economic and diplomatic liabilities of the program did. Over the course of the 1980s, the National Party leadership, motivated to a significant extent by the desire to break South Africa out of its isolation, increasingly favored reforming apartheid. De Klerk and other liberalizers felt international pressure more keenly than had P.W. Botha, consistent with Solingen's NPT sensitivity hypothesis, but the leadership's new sensitivity was due primarily to its decision to end apartheid.

#### SCRAPPING THE WEAPONS PROGRAM

P.W. Botha showed little interest in nuclear disarmament throughout his time in office. In de Klerk's view, the nuclear program was something of a "pet proj-

ect” for Botha.<sup>109</sup> Botha did reject Armscor proposals for developing (beyond paper studies) advanced nuclear weapon designs in September 1985, citing budgetary constraints and the pointlessness of an offensive capability.<sup>110</sup> He also publicly announced in 1987 that South Africa was ready to discuss NPT accession, but this was probably little more than a ploy to avert South Africa’s possible expulsion from the IAEA at the time.<sup>111</sup> There were some discussions in Pretoria among foreign and military department heads in 1987 and 1988 about joining the NPT, but Foreign Affairs Director-General van Heerden says that the group was stacked with military, Armscor, Atomic Energy Corporation (AEC, the renamed AEB), and intelligence officials who supported the program; that it had little authority anyway; and that it may have been just a sop to Foreign Minister Pik Botha. Although the authorization of these discussions might have indicated a tentative step toward reevaluating South Africa’s nuclear weapons policy, according to van Heerden, “P.W. never had any truck with the idea of us joining the NPT.”<sup>112</sup> The construction of the \$10 million Advena Central Laboratories starting in 1987, the 1987 or 1988 reopening of the Kalahari test site, and Botha’s reported 1993 view that de Klerk’s dismantling policy was “sabotaging the country,” all support this assessment.<sup>113</sup>

F.W. de Klerk changed South Africa’s nuclear policy soon after becoming president on September 14, 1989. About two weeks later, he formed an ad hoc cabinet committee to consider NPT accession. Chaired by the newly appointed minerals and energy minister, Dawid de Villiers, it also included the foreign minister, defense minister, finance minister, and the newly appointed minister of administration and privatization. An “experts committee” of Armscor, AEC, and SADF officials provided the staff work, with AEC Chairman J.W. de Villiers and his deputy, Waldo Stumpf, serving as liaisons.<sup>114</sup>

According to Stumpf, who attended the first meeting of the ad hoc cabinet committee, de Klerk “informed those present of his decision to normalize the internal political situation of the country and that the nuclear devices would be

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109. Interview with F.W. de Klerk, Cape Town, April 7, 1999.

110. Correspondence with Stumpf.

111. Jaster, *Defence of White Power*, p. 168. The nuclear strategy working group had already concluded that “not signing the NPT but expressing our interest in doing so, and then stalling any negotiations, would be in line with our ‘strategy of uncertainty.’” Correspondence with Buys, December 10, 1999.

112. Interviews with Barnard, January 22, 1999; and van Heerden. The group included van Heerden, National Intelligence Service Director-General Niel Barnard, AEC Chairman J.W. de Villiers, and Johannes Steyn of Armscor.

113. Interview with a South African official.

114. Correspondence with Dawid de Villiers, September 6, 2000.

a liability in South Africa gaining international acceptance in the process. . . . There was no debate about the decision but rather how it should be implemented and how South Africa should accede to the NPT.”<sup>115</sup> De Klerk’s intention is also evident in his selection for the committee of only officials—other than Malan—with no loyalty to the nuclear program and a chairman who he knew opposed it. In fact, de Klerk recalls having “had no enthusiasm for this massive spending programme” back in the early 1980s, and having decided to dismantle between his election as National Party leader in February 1989 and his taking over the presidency.<sup>116</sup>

Stumpf presented a dismantlement plan to the ad hoc committee in November, and de Klerk approved it as well as closure of the Y-plant.<sup>117</sup> The Y-plant was shut down by February 1, 1990, and the weapons were dismantled between July 1990 and July 1991. South Africa formally joined the NPT on July 10, 1991, and its safeguards agreement with the IAEA entered into force in September.<sup>118</sup>

#### MILITARY SECURITY AND NUCLEAR ROLLBACK

The decision to disarm, like the decision to acquire nuclear weapons, followed significant changes in South Africa’s threat environment. Although de Klerk’s decision to dismantle preceded the unequivocal end of the Cold War, marked to many observers by the November 1989 breach of the Berlin Wall, South Africa’s improved security position had become increasingly evident in the year or two prior.<sup>119</sup> In December 1988, protracted U.S.-mediated negotiations resulted in an agreement for the withdrawal of Cuban and South African troops from Angola and for Namibian independence. In 1988 and 1989, Moscow scaled back aid to Angola, Mozambique, and the African National Congress and discouraged the ANC from continued armed struggle and pursuit of a

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115. Correspondence with Stumpf. Dawid de Villiers recalls that de Klerk’s instructions were more open-ended; correspondence, September 6, 2000; cf. Reiss, *Bridled Ambition*, p. 17.

116. Interview with de Klerk; and F.W. de Klerk, *The Last Trek: A New Beginning* (London: Macmillan, 1998), p. 273. De Klerk knew about the program from his tenure as minerals and energy minister from 1980 to 1982. After suggesting (during brief remarks at a small ribbon-cutting ceremony) that the government use the nuclear capability “for the benefit of all South Africans,” Buys recalls receiving a scowl from P.W. Botha but a private appreciation from de Klerk. Interview with Buys.

117. Correspondence with Stumpf.

118. Reiss, *Bridled Ambition*, pp. 17–19.

119. Arguing that a pre-November decision undermines a security explanation is Sagan, “Why Do States Build Nuclear Weapons?” p. 70.

radical socialist agenda.<sup>120</sup> Though de Klerk had believed earlier that the “Soviet Union and Cuban allies had established threatening positions in some of our neighboring countries,” by the time he became president, his “advisers’ threat analysis was that the threat in southern Africa has changed dramatically because of the implosion of Russia as an expansionist world power.”<sup>121</sup> De Klerk also expected that his intended political reforms “would help end confrontation with our neighbors in southern Africa and with the international community.”<sup>122</sup> Furthermore, “if we’re no longer a pariah, then we can . . . rely on allies to help us in whatever threat might rise again.”<sup>123</sup> A 40 percent rollback of overall military expenditure between 1989 and 1993 reflected this sea change in threat perception.<sup>124</sup>

Although the timing of South Africa’s nuclear dismantlement is consistent with a security explanation, the declining threat was at best a permissive condition for dismantling. A residual nuclear capability would not have endangered South African security, and the budgetary savings from dismantlement were relatively small. South Africa thus did not have strong security incentives to disarm. Nuclear rollback in this case would constitute strong evidence for the security model, as a weak but successful prediction, were there not other plausible explanations for this outcome. But other factors, though not organizational imperatives, do appear to have played important roles.

#### ORGANIZATIONAL POLITICS AND NUCLEAR ROLLBACK

The dismantlement decision followed a change in the advisers and agencies involved in nuclear policy decisionmaking. Pro-NPT foreign and economic advisers outnumbered military advisers in de Klerk’s ad hoc cabinet committee, whereas military and Armscor officials (plus the pronuclear national intelligence chief) had outnumbered van Heerden in the interdepartmental discussions of 1987–88. But it was de Klerk’s clear antinuclear preferences that shaped the new constellation of participants, rather than vice versa.

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120. Crocker, *High Noon in Southern Africa*, pp. 373–464; Daniel R. Kempton, “New Thinking and Soviet Policy towards South Africa,” *Journal of Modern African Studies*, Vol. 28, No. 4 (December 1990), pp. 545–572; and Michael McFaul, “Rethinking the ‘Reagan Doctrine’ in Angola,” *International Security*, Vol. 14, No. 3 (Winter 1989/90), pp. 99–135.

121. Interview with de Klerk; and de Klerk, *Last Trek*, p. 114.

122. De Klerk, *Last Trek*, p. 274.

123. Interview with de Klerk.

124. Peter Batchelor and Susan Willett, *Disarmament and Defence Industrial Adjustment in South Africa* (New York: Oxford University Press, 1998), pp. 67–68.

De Klerk's charge to the ad hoc cabinet committee, his choice of its members, and his own recollections suggest that he had made his mind up to dismantle the program before allowing an internal debate. Contrary to organizational politics expectations, this points to presidential leadership in nuclear policymaking.<sup>125</sup> It is also surprising, from an organizational politics perspective, that the agencies with the most to lose from dismantling did not try harder to stop it, if only by leaking word about the program and its imminent demise.

Foreign Minister Pik Botha describes himself as a long-standing opponent of the nuclear program, though other officials question how early and forcefully he pressed the issue.<sup>126</sup> In the 1980s, says his deputy van Heerden, "we consistently tried to enter that inner circle by saying that this is an area that has considerable international implications and that the diplomatic arm of government should be brought into the picture. But that was at the time of the maximum perception of threat . . . and the soldiers were flying high and those who were in favor of diplomatic measures played second fiddle."<sup>127</sup> Van Heerden portrays Pik Botha as master of "the art of the possible," and describes the foreign minister's approach on the nuclear issue under P.W. Botha as "salami-slicing tactics."<sup>128</sup>

Finance Minister Barend du Plessis also says that he disliked the program, which would be expected given his budgetary and financial responsibilities. In March 1989, he openly questioned South African "economic survival in the face of an internationally organized assault on the economy. . . . The answer for us clearly lies in the full-scale effort to break the isolation imposed on us, by dynamic expansion of our trade with the outside world and a restoration of our creditworthiness by means of the correct economic measures and political progress."<sup>129</sup> Du Plessis still recalls his angst over the budgetary costs of the nuclear enrichment, weapons, and missile programs.<sup>130</sup>

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125. Presidential interest often favors clinging to failing policies to avoid admitting error, but sustained secrecy would have minimized the domestic fallout from a policy reversal. At most, organizational politics might explain Botha's stronger preference for military over diplomatic policy instruments, compared to de Klerk. This strains the theory, however, because it had been nearly a decade since Botha had given up the defense portfolio.

126. Interview with Pik Botha, August 25, 1999. Botha's characterization was echoed in an interview with Grant. Skeptical impressions were heard in interviews with Steyn, Malan, and Buys.

127. Interview with van Heerden.

128. Ibid.

129. March 1989 budget speech, quoted in Robert M. Price, *The Apartheid State in Crisis: Political Transformation in South Africa, 1975–1990* (New York: Oxford University Press, 1991), p. 275.

130. Telephone conversation with Barend du Plessis, August 26, 1999.

Armcor and UCOR had the greatest stake in keeping the program going. Armcor tripled the personnel working on the nuclear weapons program in the 1980s, from 100 to 300, and completed the new Advena Central Laboratories in 1989. Armcor had also made a major investment in a missile program, which was partly aimed at providing a nuclear warhead delivery option.<sup>131</sup> These were only two of many projects for Armcor, which in 1989 employed 26,348 (up from 10,590 in 1977) and controlled 2.2 billion rand in assets (up from 1.2 billion in 1977).<sup>132</sup> The provision of substantial resources to Armcor and the AEC to prevent a “brain drain” may have dampened Armcor’s objections. But, enlarged by its role in combating international arms embargoes against South Africa, Armcor should have had considerable political resources to defend its turf.

The nuclear science and energy complex had also grown, despite having lost the weapons program to Armcor. The nuclear scientists’ prestige had faded along with the global dimming of expectations for nuclear energy. But UCOR had just built an expensive semicommercial uranium enrichment plant (the Z-plant) to fuel the Koeberg power plants. Restoring access to international nuclear suppliers by joining the NPT would turn both enrichment plants into embarrassing white elephants. In fact, AEC employment would drop from about 8,200 to less than 2,000.<sup>133</sup> Yet D.W. Steyn, minerals and energy minister in the mid-1980s, had recommended disarming and joining the NPT sometime around 1987.<sup>134</sup> Seemingly even more inconsistent with organizational politics expectations was AEC Chairman de Villiers’s enthusiastic support for de Klerk’s disarmament policy.<sup>135</sup>

The military’s stake in the nuclear program was less clear-cut. Military attachment to the program is suggested by de Klerk’s suspicion that his disarma-

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131. Albright, “South Africa’s Secret Nuclear Weapons,” pp. 14–16.

132. Batchelor and Willett, *Disarmament and Defence Industrial Adjustment*, p. 38.

133. John Walmsley, “The South African Nuclear Industry,” *Nuclear Engineer*, Vol. 38, No. 4 (July 1997), pp. 99–103, at p. 100.

134. Interview with Steyn.

135. Fig, “Sanctions and the Nuclear Industry,” p. 96. De Villiers was never as enthusiastic about the weapons program as his predecessor, Ampie Roux. Interview with Grant; and correspondence with Stumpf. One possible incentive to scrap the bomb, pointed out to me by Andrew Marquard, might have been to shed apartheid-era baggage in order to maintain support for the AEB under future black governments. South African nuclear power officials were also eager to join the NPT, though this would have been more in line with their organizational interests, because South Africa’s state-owned electricity utility—Eskom—needed international capital and technology to expand power production and was paying exorbitant prices for the AEB’s low-enriched uranium; cf. Mark Hibbs, “Eskom Will Not Order New Reactor before 1992,” *Nucleonics Week*, September 6, 1990, p. 14.

ment policy “was resented in some circles in the military establishment,” as well as a senior official’s claim that de Klerk rushed to dismantle in order to steamroll the defense establishment during his presidential honeymoon period.<sup>136</sup> But Magnus Malan, defense minister and former SADF chief, thought only that South Africa should hold out for tangible Western concessions in return for joining the NPT.<sup>137</sup> SADF Chief General Geldenhuys agreed, though he had never seen any military utility in the arsenal and anyway was not consulted on de Klerk’s decision.<sup>138</sup> The South African air force had gained a significant management role in the nuclear weapons program, which might have raised its enthusiasm about it.<sup>139</sup> But top generals are rumored to have strongly opposed an Armscor push for nuclear testing and to have feared politicians’ reckless use of the capability.<sup>140</sup> Whatever the military’s attitude, its influence waned under de Klerk. In addition to cutting military spending drastically, he ended the heavy reliance on military officers in political decisionmaking instituted by Botha.<sup>141</sup> Malan himself had never gained his own power base in the National Party and would be sidelined to a minor cabinet post in mid-1991.<sup>142</sup>

#### INTERNATIONAL PRESSURE, STATE SENSITIVITY, AND NUCLEAR ROLLBACK

After the near-total nuclear isolation of the late 1970s, only a few further Western sanctions were threatened, and no incentives offered, to change South Africa’s nuclear policies. Despite this, van Heerden estimates that U.S. lobbying contributed “30 to 60 percent” to the decision to dismantle, once the external threat had receded.<sup>143</sup> This points to changes in Pretoria’s sensitivity to pressure rather than to changes in the economic or diplomatic incentives it faced. De Klerk’s decision to abandon apartheid opened the door to normalization, a process that could be accelerated (if not initiated) by joining the NPT. Though the apartheid Rubicon distinguishes South Africa from other nuclear fence-sitters, the government’s newly liberalizing orientation is consistent

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136. De Klerk, *Last Trek*, p. 274; and Hibbs, “Dismantling,” p. 10.

137. Interview with Malan.

138. Interview with Geldenhuys, January 25, 1999.

139. Ibid. According to Buys, over time “there was a change in attitude. . . . eventually I managed to get very good cooperation from the [military], particularly on the safety and security aspect.” Interview with Buys.

140. Interviews with Grant; and Breytenbach. This story, however, was discounted in an interview with Geldenhuys, August 24, 1999.

141. Seegers, *Military in the Making of Modern South Africa*, pp. 266–268.

142. O’Meara, *Forty Lost Years*, p. 398.

143. Interview with van Heerden; but see Reiss, *Bridled Ambition*, p. 32.

with Solingen's hypothesis about state sensitivity to NPT norms and incentives.

After the Reagan administration relaxed some nuclear-related sanctions in the early 1980s, congressional and public anti-apartheid mobilization led to a tightened ban on nuclear cooperation in 1985 and a complete ban in 1986.<sup>144</sup> Starting in 1986, the United States stepped up attempts to persuade South Africa to join the NPT in a series of confidential meetings between U.S. Ambassador-at-Large for Nuclear Affairs Richard T. Kennedy and Foreign Minister Pik Botha, some with representatives of other NPT depository states. Kennedy told Botha that the Reagan (and later the Bush) administrations would do everything possible to restore commercial and scientific nuclear cooperation after South African NPT accession, but he acknowledged that they could not prevent an anti-apartheid Congress from raising the bar and keeping nuclear sanctions in place.<sup>145</sup> In addition, Kennedy rebuffed Botha's query about whether South Africa might gain broader sanctions relief for joining the NPT, saying that proliferation could not be rewarded with *quid pro quos* for reversal. Washington and London threatened to escalate anti-apartheid sanctions further in 1989, but did not offer any incentives specifically for NPT accession.<sup>146</sup>

Neither sanctions nor norms appear to have had much impact on P.W. Botha's nuclear policy, although they did lead Minerals and Energy Minister Steyn to recommend joining the NPT to P.W. Botha around 1987.<sup>147</sup> An avalanche of new Western anti-apartheid sanctions in 1985 and 1986, combined with a debt crisis in South Africa, might have put the NPT on the agenda. De Klerk speculates that Botha's 1987 NPT remarks might have reflected an interest in exploring whether the nuclear program could be used as a bargaining chip to relieve economic sanctions.<sup>148</sup>

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144. Fig, "Sanctions and the Nuclear Industry," pp. 87–89; and Pabian, "South Africa's Nuclear Weapon Program," pp. 6–7.

145. Interviews with van Heerden; Pik Botha, August 25, 1999; and Richard J.K. Stratford, former special assistant to the U.S. ambassador-at-large for nuclear affairs, Washington, D.C., December 13, 1999. On additional nuclear sanctions in the 1980s, see Fig, "Sanctions and the Nuclear Industry," pp. 88–89. The South African government did press the United States for a new peaceful nuclear cooperation agreement soon after signing the NPT. Correspondence with Fred McGoldrick, former U.S. State Department official, May 31, 2001.

146. Paul Rich, "Changing Relations with the United States," in Greg Mills, ed., *From Pariah to Participant: South Africa's Evolving Foreign Relations, 1990–1994* (Johannesburg: South African Institute of International Affairs, 1994), pp. 98–104.

147. Interview with Steyn.

148. Interview with de Klerk.

De Klerk responded differently to the same incentives faced by P.W. Botha. Unlike Botha, de Klerk and much of the National Party leadership were finally reconciled to real power sharing.<sup>149</sup> De Klerk had a conservative track record, but he appears to have experienced an evolutionary conversion culminating in his September 1989 inauguration as president.<sup>150</sup> As soon as reversal of anti-apartheid sanctions became possible, joining the NPT became an attractive strategy for hastening the process, as a way of placating antiproliferation governments and of demonstrating the irrevocability of change to foreign capitals.<sup>151</sup> De Klerk also saw joining the NPT as a means to draw Western support for his preferred domestic settlement (i.e., protected minority rights and private property): “The ANC must somehow or another be moved to the position where they were really negotiating in the true sense of the word. . . . For that I needed to have credibility outside South Africa that I mean what I say, I have a good cause, and I wanted support for my way of doing things.”<sup>152</sup> Van Heerden similarly recalls de Klerk’s thinking that “if I can get the Americans and others off my back on this [NPT] issue, then there will be more sympathy for the kind of arguments which I will have to put forward on a domestic settlement.”<sup>153</sup> De Klerk also believed that economic improvement from a relaxation of sanctions would help “ensure that the constitutional reform takes place in a hopeful, positive economic atmosphere.”<sup>154</sup>

The argument was a subtle one and not universally shared in Pretoria. Many officials, including de Klerk’s defense minister, minister of justice, deputy defense minister, national intelligence chief, and SADF chief, thought that de

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149. Sanctions and isolation were important reasons for the change, but probably not the main ones. Black political resistance, apartheid’s economic inefficiency, defections of hard-liners from the National Party to the Conservative Party, an eroding white demographic base, Soviet retrenchment (including withdrawal of support for the ANC), and de Klerk’s personality all had an impact. Debating the impact of sanctions are Crawford and Klotz, *How Sanctions Work*; and Anton D. Lowenberg and William H. Kaempfer, *The Origins and Demise of South African Apartheid: A Public Choice Analysis* (Ann Arbor: University of Michigan Press, 1998). For fuller explanations of democratization, see Hermann Giliomee, “Democratization in South Africa,” *Political Science Quarterly*, Vol. 110, No. 1 (Spring 1995), pp. 83–105; O’Meara, *Forty Lost Years*; Price, *Apartheid State in Crisis*; Timothy D. Sisk, *Democratization in South Africa: The Elusive Social Contract* (Princeton, N.J.: Princeton University Press, 1995); and Patti Waldmeir, *Anatomy of a Miracle: The End of Apartheid and the Birth of the New South Africa* (New York: W.W. Norton, 1997).

150. Allister Sparks, *Tomorrow Is Another Country: The Inside Story of South Africa’s Road to Change* (Chicago: University of Chicago Press, 1995), pp. 91–108.

151. Interview with Pik Botha, April 9, 1999.

152. Interview with de Klerk. Also making this point is Giliomee, “Democratization in South Africa.”

153. Interview with van Heerden.

154. Interview with de Klerk. Du Plessis also made this argument; Patti Waldmeir, “Born Again into Capitalism,” *Financial Times*, June 11, 1990, Survey, p. 2.

Klerk should hold out for a Western quid pro quo for dismantlement. Some of these officials attribute de Klerk's haste to disarm to his being overly hungry for Western approval, though this could reflect their unfamiliarity with the lack of bargaining opportunities evident from the Kennedy-Botha sessions.<sup>155</sup> De Klerk's inner circle believed that conservative nationalists would be even more opposed to disarmament, as removing a pillar of white power, which is one reason they concealed the decision at least until after the March 1992 white referendum on democratization.<sup>156</sup>

Solingen's theory predicts a correspondence between a state's economic orientation, nationalism, and its nuclear policies.<sup>157</sup> Indeed diminishing Afrikaner-nationalist ideology, accelerated by the 1982 defection of hard-liners to the new Conservative Party and an increasing proportion of English-speaking supporters, may not have only moved the National Party toward political reform but also heightened its receptivity to international pressure.<sup>158</sup> Although its attention was focused almost entirely on the question of political liberalization, the National Party appears to have shifted its economic bearings by 1989 as well. De Klerk was more inclined to free-market policies than his predecessor had been.<sup>159</sup> His government reduced import tariffs and quotas, privatized the national steel corporation, dismantled racial labor restrictions, and liberalized foreign-exchange controls.<sup>160</sup> As mentioned above, both du Plessis and

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155. Interviews with Barnard, January 22, 1999; Breytenbach; and Coetsee. De Klerk's eagerness, in his own words, to fully "rejoin the international community" does suggest the importance of international norms, to him at least. Interview with de Klerk.

156. Correspondence with Dawid de Villiers, May 16, 2001; and telephone conversation with Stumpf.

157. Political leaders can select policies that advance the coalition's overall interests even in the absence of overt mobilization. Thus the lack of antinuclear mobilization by South African business and other societal liberalizers does not contradict the theory.

158. On declining Afrikaner nationalism in the National Party, see Hermann Giliomee, "Broedertwis: Intra-Afrikaner Conflicts in the Transition from Apartheid," *African Affairs*, Vol. 91, No. 364 (July 1992), pp. 339–364.

159. De Klerk, *Last Trek*, pp. 151, 154, 228. On business support for de Klerk and political reform, see Robin Lee, Margaret Sutherland, Mark Phillips, and Anne McLennan, "Speaking or Listening? Observers or Agents of Change? Business and Public Policy: 1989/90," in Lee and Lawrence Schlemmer, eds., *Transition to Democracy: Policy Perspectives, 1991* (Cape Town: Oxford University Press, 1991), pp. 95–126; Louwrens Pretorius, "The Head of Government and Organised Business," in Robert Schrire, ed., *Malan to De Klerk: Leadership in the Apartheid State* (New York: St. Martin's, 1994), pp. 209–244; Giliomee, "Democratization in South Africa"; Jan Hofmeyr, *The Impact of Sanctions on White South Africa*, Part 2, *Whites' Political Attitudes* (Washington, D.C.: Investor Responsibility Research Center, 1990); O'Meara, *Forty Lost Years*; and Annette Strauss, "The 1992 Referendum in South Africa," *Journal of Modern African Studies*, Vol. 31, No. 2 (June 1993), pp. 339–360, especially pp. 348–349.

160. Bell, "Should South Africa Liberalise Its Foreign Trade?"; Trevor Bell, "Trade Policy," in Jonathan Michie and Vishnu Padayachee, eds., *The Political Economy of South Africa's Transition: Policy Perspectives in the Late 1990's* (New York: Dryden, 1997), pp. 71–90; W. Duncan Reekie, "Should

de Klerk were critical of the program's budgetary burden. De Klerk's tapping of three economic liberalizers (Dawid de Villiers, Barend du Plessis, and Willem de Villiers) for the ad hoc NPT committee may have also reflected a view that internationalist economic priorities should influence nuclear policy.<sup>161</sup>

### *Conclusions*

Three general sources of nuclear weapons policy—security incentives, organizational politics, and international pressure and state sensitivity—shed light on the rise and fall of South Africa's nuclear weapons program. Limited evidence makes it impossible to establish which of the theories best explains the case, but viewing the program through these three theoretical prisms reveals some of the strengths and weaknesses of each from development to dismantlement.

Organizational politics best explains the development of a latent nuclear weapons capability in the early 1970s. The AEB's information monopoly and strict secrecy enabled it to obtain authorization directly from the prime minister and the minister of mines for early research on nuclear explosives. At the time, South Africa's security environment was still very benign, and one would expect greater consultations with defense officials had the program been initially designed to be a deterrent. Although a nationalist-statist outlook predisposed the government to favor state-run projects with potential commercial and prestige value, the lack of international NPT pressures at the time made state sensitivity to such pressures moot.

Organizational politics provides a weaker explanation for the decisions to weaponize and especially to dismantle. A high degree of secrecy continued to limit political debate at the time the Vorster government formally opted for a deterrent sometime in late 1977. Aside from the chief of staff of planning, the military was unenthusiastic about going nuclear, so any organizational push

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South African Parastatals Be Privatized?" in Lipton and Simkins, *State and Market in Post-Apartheid South Africa*, pp. 129–160; and Waldmeir, "Born Again into Capitalism." Some observers suggest that the ANC persuaded de Klerk in 1990 to slow down privatization, to give a successor democratic government more say over economic policy. As it turned out, the ANC proved more liberal than the National Party.

161. Dawid de Villiers had previously been involved in developing tariff reduction and privatization policy as trade and industry minister, as had du Plessis as minister of finance. Willem "Wim" de Villiers was a former industrialist and leading free marketeer whom de Klerk appointed minister of administration and privatization.

had to come from the AEB and Armscor. But P.W. Botha's involvement in the decision to weaponize, his reliance on a personal military adviser, and his reaffirmation of the weaponization decision after broadening the decision-making process as prime minister all suggest a top-down rather than bottom-up decision.

The decision to dismantle was directed even more decisively by the head of government. Organizational politics would predict that the agencies that had successfully pushed or accepted the program should have become only more motivated and better able to protect it. Although it is true that the armaments and military establishments lost influence under F.W. de Klerk, this was because he had already decided to demilitarize the country. The nuclear agency chief's enthusiasm for disarmament is also inconsistent with organizational predictions.

South Africa's decisions to build nuclear weapons and then to disarm followed changes in the country's security environment. Official recollections emphasize new threats as the primary incentive for building the weapons, and their disappearance as a necessary condition for dismantling them, though security rationalizations could cloak other motives. The main problems with a security explanation are the remote invasion or nuclear blackmail threats to South Africa, the debatable utility of nuclear deterrence and diplomacy in meeting those threats, and a lack of systematic policy analysis supporting the decision to weaponize. These observations suggest either that the insecurity threshold required to trigger nuclear weapons programs is quite low, extending to threats to non-homeland territories (such as Namibia), at least for states that can do so rather cheaply, or that organizational or other factors contributed to the decision.

The decision to dismantle is also consistent with a security explanation, arriving as it did so soon after the Angolan settlement. But the timing of the decision corresponds more closely to de Klerk's political ascent, as does evidence that P.W. Botha would not have so easily relinquished the program. De Klerk and his associates acknowledge that an improved security environment was a precondition for change, though de Klerk also says that he was never keen on the program. Of course, because apartheid was the root of South African insecurity, political reform and declining threat were inseparably intertwined causes of dismantling.

South Africa's nuclear policies were consistent with Solingen's theory that nationalist-statist regimes favor nuclear weapons programs more than do liberalizing ones, at least among nuclear fence-sitters. But there is little evidence

from policy participants that the government's statism or liberalism had a major impact on NPT sensitivity, certainly not compared to the apartheid issue. The international nuclear sanctions that had mounted by 1978 were closely linked to apartheid. The government's nationalist-statist ideology may have made more palatable the costly investments required for nuclear energy self-sufficiency. But any South African government committed to apartheid would have seen little material benefit in joining the NPT, and perhaps some in defying it, though tight secrecy precluded any reputational benefits from actually possessing nuclear weapons.

Although international pressure to dismantle (unlike pressure to reform apartheid) did not intensify much further in the late 1980s, Pretoria's sensitivity to the diplomatic liabilities of the program did. The National Party leadership, motivated to a significant extent by the desire to break South Africa out of its isolation, increasingly favored reforming apartheid over the course of the 1980s. De Klerk's decision to engage in fundamental political change opened the door to economic and diplomatic opportunities that could be attained more quickly by joining the NPT. The National Party had grown less nationalistic and more market oriented, which might have disposed the leadership even more to nuclear disarmament, but much less critically than the decision to break with apartheid.

Clearly, the South African case does not provide a critical case study for testing the three theories. Only organizational politics theory's prediction that disarmament will not occur is clearly disconfirmed. Fragmentary and ambiguous evidence (particularly about the weaponization decisions) and the simultaneous changes in South Africa's security environment, diplomatic relations, and domestic politics impede further weighing of causal influences. It seems possible that combinations of factors discussed here were necessary for key decisions. The South African bomb might never have materialized had one or two of the following factors not been present in the late 1970s: a worsened security situation, a nuclear science establishment with a surplus of expertise and shortage of projects, and linkage of nuclear sanctions to apartheid. Likewise, dismantlement might not have occurred had the security environment not improved, or had a stroke not loosened P.W. Botha's grip on power in 1989.

My focus on the three theories in this article is not meant to imply that they provide the only important explanations for the rise and fall of South Africa's nuclear program. P.W. Botha's personality may have had a large impact. As defense minister, prime minister, and then president, he wielded considerable

discretion over the small, secret program. Exaggerated fears of the Soviet threat, of whatever origin, facilitated nuclear acquisition. The impact of strategic transmission or emulation, particularly for pariah states thrown together for lack of other allies, is another possible factor, though one unlikely to be admitted for obvious reasons. Also often, but not always, denied is the impact on the disarmament decision of worries about future ANC governments' handling of the capability. Van Heerden acknowledges hearing this argument, that he worried about it as well, and that it "could well have been an element" in de Klerk's thinking.<sup>162</sup> De Klerk, however, says that it "was not a significant factor in our discussions and our decision," because the political settlement was still five years away, and that he "was thinking about the immediate two years ahead, in which the ANC as power-sharers did not figure at all."<sup>163</sup>

The complexity and ambiguity of this case suggest several alternative policies that might have resulted in greater South African nuclear restraint. Most of them are hard to imagine being adopted, however, given other incentives and constraints that U.S. and other policymakers faced at the time. The United States or other powers might have guaranteed South African security in the event of a Soviet-backed invasion or the use of weapons of mass destruction. Public opposition to apartheid made this an improbable option, though Western officials might have done more to convince Pretoria of the improbability of such threats. Negotiating the withdrawal of Cuban troops from Angola was a more pragmatic though difficult effort in this vein, and U.S. officials recognized the potential side benefits of this policy for nonproliferation.<sup>164</sup>

Had the U.S. Plowshares Program not promoted peaceful nuclear explosives so assiduously in the 1960s, the AEB might never have launched a PNE program in 1970, and might have been less eager to go ahead with a weapons program in the late 1970s. Alternatively, though more difficult politically, would

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162. Interview with van Heerden.

163. Interview with de Klerk. Stumpf told a reporter in 1991 that "the prospect of black-majority rule . . . was a major consideration" in the government's decision to end the strategic emphasis of the program and join the NPT, but now explains that he believed that the weapons would have been an albatross for a Mandela government. Telephone conversation with Stumpf; and Pabian, "South Africa's Nuclear Weapon Program," p. 19. Malan, but neither Pik Botha nor van Heerden, says that he heard U.S. contacts argue against an ANC nuclear inheritance. Interviews with Pik Botha, August 25, 1999; Malan; and van Heerden. On this issue, see also David Albright and Mark Hibbs, "South Africa: The ANC and the Atom Bomb," *Bulletin of the Atomic Scientists*, Vol. 49, No. 3 (May–June 1993), pp. 32–37, at p. 33; and Reiss, *Bridled Ambition*, pp. 20–21.

164. Telephone conversation with Chester Crocker, U.S. assistant secretary of state for Africa (1981–88), February 18, 2000.

have been to actively engage South African scientists in other pursuits. International codevelopment of enrichment facilities in South Africa, on condition of full-scope safeguards, might also have diminished the AEB's interest in weapons research.<sup>165</sup> International collaboration on reactor research might have soaked up AEB personnel idled by the 1969 cancellation of South Africa's indigenous nuclear reactor program. These days, the collapse of fissile material prices and the disrepute of PNEs have undercut programs that might generate bureaucratic momentum for nuclear weapons. But nonproliferation policies should aim to limit the growth of the civilian nuclear fuel and power industries of nonnuclear weapon states, while being mindful that restricting overt civilian programs may divert organizational impulses toward secret military ones.

States have few foreign policy levers to affect the political-economic orientation of governing coalitions of other nations, but they can tailor economic and social pressures to the sensitivities of the target state. One lesson of the South African case is that successful coercion requires a credible commitment to reward compliance. Harsher sanctions—and not merely nuclear ones—could have been imposed, but these too would not have worked without strong commitments to remove them when South Africa joined the NPT. Against nationalist-statist regimes, however, even finely tuned sanctions can backfire, and in the South African case, the political battles over anti-apartheid sanctions in the United States and Europe would have made it difficult to craft such policies anyway.

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165. Sole, "South African Nuclear Case," p. 74.