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South Africa's Nuclear Options and Decisionmaking Structures

An Intelligence Memorandum

EO 13526 3.3(b)(1)>25Yrs

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INTERAGENCY INTELLIGENCE MEMORANDUM

SOUTH AFRICA'S NUCLEAR OPTIONS AND DECISIONMAKING STRUCTURES

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NOTE

Much effort has gone into collecting and analyzing data, particularly technical data, on South African nuclear developments. Yet, some eight months after the discovery last August in the Kalahari Desert of activity suggesting an imminent nuclear test, we are still far from certain what the South Africans are up to. We do not know precisely what their capabilities are, or how they got there.

The assessment that follows has a twofold purpose. First, it attempts to set forth and analyze what we think we know about South Africa's nuclear development: its genesis and direction, the institutions and leading people involved, its economic and financial aspects. Second, it takes a look at the political side of an assumed nuclear weapons program: what alternate strategies would be available to the South African leaders, and what might they see as the advantages and drawbacks to each. While this cannot be a definitive assessment of South Africa's nuclear programs, it offers a framework for interpreting future facts about them.

It is beyond the scope of this paper to examine the role that foreign cooperation may have played in helping South Africa to develop a nuclear weapons capability. Although the conclusions of this memorandum would probably be affected only marginally by such an examination, more substantial modifications are at least conceivable. Briefly stated, South Africa's options for imminent test readiness would be enhanced to the extent that it were engaged in strategic nuclear exchanges with Israel, Taiwan, or other countries.

This memorandum is the product of an informal interagency working group, chaired by CIA under the auspices of the Associate National Intelligence Officer for Africa and the National Intelligence Officer for Nuclear Proliferation. The memorandum has been coordinated at a working level.

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KEY JUDGMENTS

South Africa's leaders almost certainly have been pursuing a program deliberately designed to give them the option to produce nuclear weapons: we think it likely they will continue to pursue such a program, even if they accede to the Non-Proliferation Treaty and thus are forced to conduct parts of the program clandestinely. In particular, we believe the South Africans will attempt to build a reserve of highly enriched uranium to be readily available for fabricating weapons and will continue to design and develop nuclear weapons, without necessarily intending to test them.

The South Africans will probably be more prepared to accede to the obligations of the NPT once they have accumulated a stockpile of highly enriched uranium--even if international safeguards were to be applied to it. The price they will demand of the United States for adherence to the NPT, however, will be high. In addition to securing US commitments to supply both research and power reactor fuel and to continue cooperation with South Africa in the nuclear area, they will seek broader US political support and greater acceptance of South Africa's perceptions of its long-term security needs.

Meanwhile, contrary to what we judge to have been South Africa's earlier intentions, we consider it unlikely that it may feel compelled to detonate a nuclear device in the near future, and particularly not in the next few months.

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DISCUSSION

I. THE DEVELOPMENT OF SOUTH AFRICA'S NUCLEAR PROGRAMS

A. Uranium Processing and Sales

1. South Africa's nuclear program since it began has been oriented primarily toward the commercial exploitation of vast domestic uranium deposits. Those deposits, which amount to more than 250,000 metric tons of uranium, have permitted South Africa to become one of the largest producers of natural uranium.

2. All uranium sales are arranged by the Nuclear Fuels Corporation, commonly called NUFCOR. Together with the Atomic Energy Board (AEB) and the National Institute for Metallurgy, NUFCOR has developed and constructed several pilot plants for the production of uranium compounds. At present, South Africa can produce modest amounts of uranium tetrafluoride (UF_4), uranium hexafluoride (UF_6), uranium dioxide (UO_2), and very pure metal, in addition to the capability of producing about 6,000 metric tons of natural uranium concentrates per year.

3. The AEB is responsible for managing South Africa's nuclear projects, most of which are located at the national nuclear research center, Pelindaba. The Pelindaba center dates back to the early 1960s; the original facilities include a modified version of the US Oak Ridge research reactor and a small (3 million electronvolts) accelerator.

4. One of the announced goals of the AEB in the early 1960s was the development of a domestic reactor system that would make use of natural uranium fuel. One of the unannounced aims was to develop a process for enriching natural uranium in the U-235 isotope. In the mid-1960s, according to fairly sketchy evidence, the secret work on uranium enrichment had yielded sufficiently successful results to warrant a large-scale research program. South Africa decided in 1967, to shift its available resources from attempting to develop its own nuclear reactors to concentrating on nuclear enrichment studies,

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including the designing of a complete uranium enrichment plant. Although the secrecy of this work may reflect military intentions, it also can be attributed to a commercial interest in protecting proprietary information.

5. In July 1970 Prime Minister John Vorster announced that South Africa was beginning the construction of a pilot uranium enrichment plant. Vorster, stressing the peaceful intentions behind the nuclear program, noted that South Africa would accept international safeguards over the pilot plant when certain conditions were resolved--that is, if its proprietary information could be protected. The announcement focused worldwide attention on the development of Valindaba--the site that had been chosen for the headquarters of a new Uranium Enrichment Corporation (UCOR) and for construction of the pilot uranium enrichment plant.

6. Valindaba, adjacent to the Pelindaba research center, now consists of three large enrichment buildings, several administrative buildings, and support buildings used in the fabrication and assembly of sensitive (proprietary) equipment. The site has been expanded to include a new prototype facility, designed to test a new generation of process equipment that is to be used in a future commercial enrichment plant.

7. Construction of this future uranium enrichment plant is valued primarily as an important step in the commercial exploitation of natural uranium resources. The South Africans plan ultimately to export finished reactor fuel, and completion of the necessary enrichment plant is considered a major project in the peaceful nuclear program.* Establishment of a commercial enrichment plant will put South Africa in a unique position to consolidate the normally separate marketing steps for uranium mining, conversion, and enrichment--all of which are controlled by the state.

8. Successful completion of the commercial enrichment project will require purchases of foreign equipment and technology, however. The most sophisticated components, approximately 100 axial flow compressors, were to be ordered this year,

* Other important projects include, for the short term, production of fuel for the research reactor and--for the medium term--producing fuel for two power reactors scheduled to begin operation in four years.

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but South Africa was unable to line up the necessary foreign suppliers. important suppliers in West Germany and France would not be permitted to export equipment for the enrichment project. The United States, as well, has imposed export restrictions which have frustrated the project managers and government officials alike.

9. Because of the reluctance of foreign governments to provide assistance in the commercial enrichment venture, the Minister of Mines revealed in February that South Africa would postpone use of the complex "helikon technique" which had been developed for this project, and which requires the axial flow compressors, in favor of a simpler design. Using less sophisticated technology, probably not much different from that used in the pilot plant, additional enrichment facilities are being constructed adjacent to Valindaba to permit annual production of perhaps 100 tons of reactor-grade uranium. This course was chosen both to keep the enrichment program alive and to ensure a supply of fuel for domestic power reactors. The new facilities, which we think probably were designed to facilitate safeguards inspections, may enhance South Africa's overall ability to reach high enrichment levels.

B. Nuclear Power Generation

10. A modest plan exists for the construction of nuclear power plants in South Africa. The first station--to include two 925-MWe (megawatt electrical) reactors of French origin--is under construction at Koeberg near Cape Town, where the distance from coal deposits has made nuclear power economically practical. The AEB has projected the construction of several power stations, totaling about 10,000 MWe by the late 1990s. All of these power reactors are expected to be purchased abroad. This plan is consistent with South Africa's strong desire to reduce its dependence on foreign energy suppliers, but because most of the nuclear generating capacity is projected to be built during the 1990s, construction of nuclear power stations is not deemed to be a pressing issue.

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C. Nuclear Weapons Development

11. Evidence that South Africa is working to develop nuclear weapons, is circumstantial but persuasive. It relates to the Valindaba uranium enrichment plant and to an isolated facility south of the Pelindaba research center.

Valindaba

12. A veil of secrecy has continued to surround the Valindaba uranium enrichment plant since Vorster's announcement in 1970, and, aside from one open paper and several published photographs, information concerning the technical details of the plant has been very tightly held. Assessments of the capabilities of the Valindaba plant, as a result, are based primarily on estimates and assumptions.

13. Aerial photography of the plant acquired during its construction shows positions or cells for an estimated 329 groups of process equipment. Photographs released by South Africa in 1975 show the kinds of equipment that presumedly is installed in each cell. Because the functions of certain pieces of equipment are open to question, differing models can be made of process flow streams in the system. These differing interpretations of the process arrangement support the same basic conclusion: that the plant could be used to produce highly enriched uranium. The major differnce in the models is that one indicates the need for only one pass of feed material through the plant to reach 90 percent enrichment and the other requires more passes of the material through the plant--the latter involving more difficulty in reaching a high level of enrichment.

14. The size of the Valindaba plant suggests that South Africa undertook this project with a nuclear weapons option in mind. Although laboratory-scale pilot operations undoubtedly preceded the Valindaba plant, it nevertheless was a demonstration--a first large-scale application of the technology--which normally would be limited in both enrichment levels and capacity. But Valindaba is large and costly--much more so than is needed simply to prove that the enrichment process is economically feasible. Thus it is clear that South Africa built the plant

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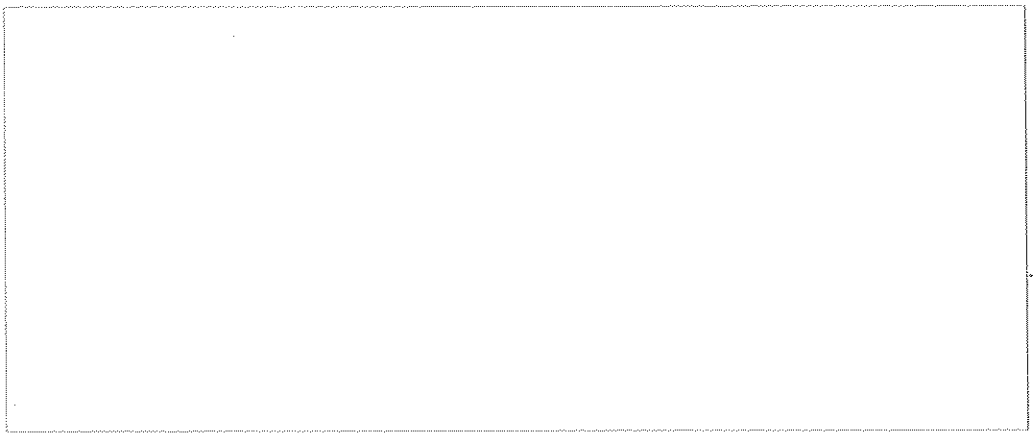
specifically to be capable of producing significant quantities of enriched uranium. The intended enrichment level is not clear, but our limited knowledge of the plant's capacity indicates that the attainable annual output of reactor-grade uranium falls short of that needed to fuel even one of the Koeberg power reactors. This suggests that the desired capability was for high enrichment.

15. With a mode of operation dedicated to high enrichment, several hundred kilograms of highly enriched uranium probably would be produced per year, far more than is needed to fuel the Safari research reactor, which is the only known consumer of highly enriched uranium (HEU) in South Africa.

16. One cannot deduce, from the existence of the HEU capability of the plant alone, that South Africa ever planned actually to exercise its high enrichment option. In terms of national security, the desire to have the high enrichment capability might in itself be sufficient motive for expanding the role (and size) of an otherwise simple pilot plant. Similarly, operation of the plant need not equate to production of highly enriched uranium since the plant probably can be operated to produce a limited amount of reactor-grade uranium.



18. In sum, it appears that South Africa has intended from the outset--the late 1960s--to translate its uranium enrichment technology into not only a commercial advantage but also a nuclear weapons option. Substantial quantities of weapons-grade uranium may become available in the near future or may already exist. The operating history of the plant indicates, however, that the South Africans have encountered technical

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problems in their efforts to bring the plant up to full capacity. Although officially the Valindaba plant has been operational since 1975, it is fairly certain that as of April 1977 it had not reached a significant capacity. The present operational status of the plant is unclear. Reports of technical difficulties have persisted; Thus, while the South Africans apparently wish to produce highly enriched uranium at Valindaba, their capability yet to do so is not clear.

Weapons Design Laboratory

19. We believe that a facility at Pelindaba, just south of the main complex and separately secured, probably has been engaged in the development of nuclear weapons technology for several years.

20. The facility was first occupied in 1972; the group which moved there from the main complex at Pelindaba is called the Reactor Development Division. According to the AEB Annual Report of 1968 (the year this division was created), the Reactor Development Division is responsible for "applications of nuclear technology in the broad sense." Its main overt responsibility is the development of fast breeder reactor technology, but the level of this effort indicated by the Annual Reports falls far short of justifying the observed expansion of RDD facility buildings.

21. At least one member of the Reactor Development Division is known to have studied in a weapons-related field.

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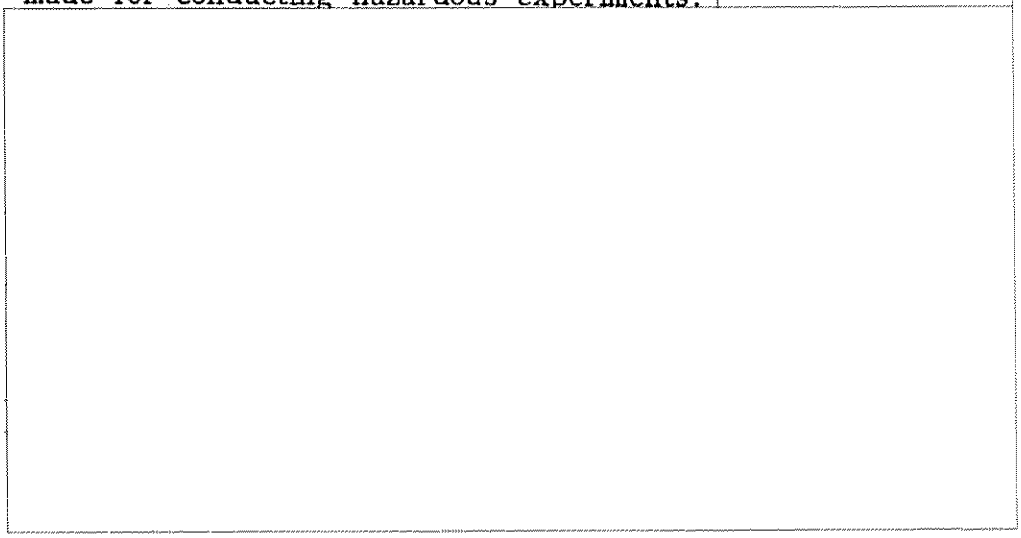
22. The physical layout of the RDD facility, as observed in overhead photography, indicates that provisions have been made for conducting hazardous experiments.



23. Several general statements can be made about nuclear weapon designs. Because of its simplicity, a gun-type design can be developed relatively easily. This type of device is suitable for a one-shot demonstration of capability, or perhaps for a very limited number of weapons; but, as compared with implosion devices, the design is very inefficient in terms of both yield and quantities of nuclear material required. Development of the necessary high-explosive implosion systems requires high-explosive testing, but is certainly not beyond the capability of South Africa, a country particularly strong in the development, production, and application of high explosives. Although it could be disguised at Somerset West or elsewhere, no facility for conducting such tests has yet been identified in South Africa. Regardless of whether South Africa has opted for a gun-type or an implosion device, a finished design could be in hand now.

Delivery Systems

24. South Africa has several potential nuclear delivery systems on hand; none, however, is specifically adapted for the task. The most likely delivery mode would be by aircraft. The

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South African Air Force inventory includes light bombers, long-range reconnaissance bombers, medium-range transports, maritime strike aircraft, all-weather fighter-bombers, and all-weather fighter aircraft--all of which could provide some delivery capability. In addition, medium-range and long-range transport aircraft are available in the domestic civil air inventory. Each type has its limitations--for example, range, payload, escape capability, or the need for overtarget delivery modifications. It is unlikely that nuclear delivery modifications to any of these aircraft have been undertaken. Atlas Aircraft Corporation, a government-funded corporation which overhauls both civilian and military aircraft could perform some straightforward modifications to some of these aircraft. The South Africans have for a number of years attempted to modify the Mirage III to accept the local air-to-air missile (Whiplash), but with little success; and they may also have difficulty in making the sophisticated changes necessary for precision and safe nuclear delivery from strike aircraft.

25. It is possible that the South Africans are working toward producing their own rockets and surface-to-surface missiles, but none are known to have been produced. The near-term prospects for domestic development of a ballistic missile delivery system are poor. Such a project would be hindered by cost, complexity, and lack of foreign assistance. Prospects for conventional artillery delivery are remote.

D. Kalahari Facility

26. Against the backdrop of evidence concerning nuclear weapons development, the facility discovered a year ago in the Kalahari Desert, 80 kilometers north of Upington, was identified as a probable nuclear test site. Construction of the site is estimated to have begun in mid-1976. As the site developed, elements appeared which are not normally associated with a facility constructed for nuclear testing. There are several explanations which have been offered for this. One is that the facility never was intended to be a nuclear test site and that its marked similarity to a nuclear test site in certain respects was therefore transitory. The other is that the facility originally was designed to be a nuclear test site but that it has been altered since last August because South Africa--presumably in response to US pressure--has postponed or abandoned plans to conduct a nuclear test there.

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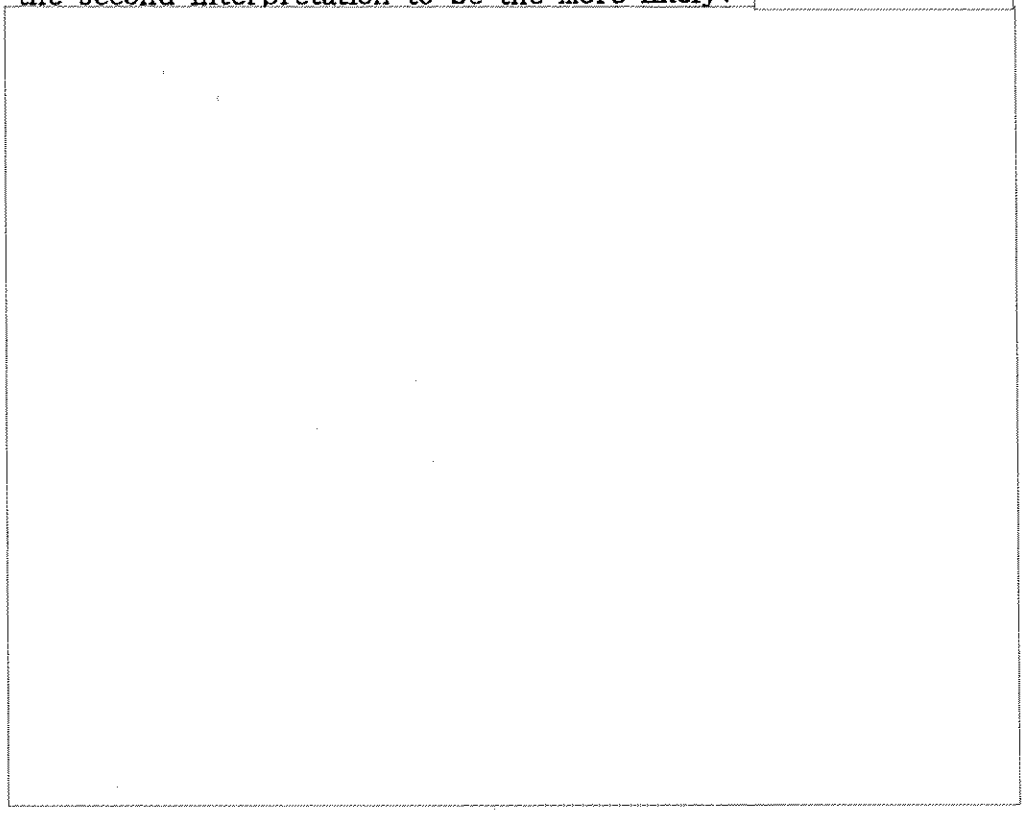
27. Although the evidence remains ambiguous, we judge the second interpretation to be the more likely.



29. In sum, while the Kalahari facility has features that suggest a nuclear testing role, it appears likely that the planned development of the site was changed in late 1977--that is, following public knowledge of the site. Regardless of current intentions, however, the holes which have been drilled and capped are believed to be of sufficient depth and diameter to permit small-yield nuclear detonations. This being the case, the facility remains a potential nuclear test site, but it does not as yet constitute reliable evidence concerning South African plans for production of nuclear weapons.*

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E. Weapons Development Versus Weapons Production

30. It is not clear whether South Africa intends to go beyond the development of nuclear weapons technology to the actual production and stockpiling of nuclear weapons. Open statements by South Africans who are likely to be knowledgeable about nuclear weapons plans have included vague references to a nuclear weapons capability, but none have indicated an intention to exploit that capability. On the contrary, the open statements deny any military goals in the South African nuclear program.

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31. Whatever the South African plans were a year ago, it is almost certain that they have since been carefully reviewed. We have noted that, as a result, the South African Government probably has suspended plans for conducting a nuclear test. We have also noted that scientists at Pelindaba are preparing to make their own fuel for the Safari research reactor. These two developments may be related. Use of domestically produced Safari fuel would necessarily be an overt demonstration of nuclear capability. If South Africa once planned to conduct a nuclear test as a demonstration of strength or toughness, this decision may have been reversed in favor of overt production of highly enriched fuel, the political impact being comparable and the costs being significantly smaller. If South Africa has planned to develop an actual nuclear weapon system, on the other hand, perhaps including plans to detonate a series of test devices, production of Safari fuel would not represent a crippling diversion of material. Indeed, production of Safari fuel might be supported to provide a legitimate (peaceful) purpose for the production of highly enriched uranium.

F. The Nuclear Decisionmaking Process

32. Our knowledge of how nuclear decisions are made in the South African Government is fragmentary. The South African system is highly personalized and informal; maximum secrecy prevails, particularly on sensitive national security matters. Nevertheless, we can deduce certain premises from our general knowledge of overall decisionmaking procedure at the high levels of the government.

33. Although the constitution of the Republic of South Africa provides for a parliamentary system similar to the government of the United Kingdom, the Cabinet exercises virtually supreme power. The National Party, which has been in power since 1948 and now has an 82-percent majority in Parliament, represents the bulk of the 2.7 million Afrikaners, and its extraordinary solidarity reflects their long struggle to secure

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their language and culture against alien inroads. Johannes Vorster, who has been Prime Minister since 1966, is the unrivaled leader of the party. His cabinet appointees have included the party's next most influential personalities. Especially in matters related to national security, cabinet ministers exert sweeping executive powers that are seldom effectively challenged in Parliament or in the courts.

34. Although Vorster has maintained the Cabinet's tradition of collective responsibility, qualified observers believe that he has also asserted a decisive role in shaping the politically important decisions. He usually works his own way to a difficult decision, then sets the stage for posing the matter to the Cabinet. His informal manner of decisionmaking is facilitated by his mastery of an executive structure that is much less complex than its American counterpart.

35. Before a policy problem is posed to the whole Cabinet, Vorster usually consults the relevant cabinet ministers and key civilian officials or military officers. He tends to set up small ad hoc working groups to deal with problems that are politically important or substantively complex. Vorster apparently uses such ad hoc groups not only for genuine consultation and problem assessment, but also to postpone difficult decisions and contribute toward his usual consensus-building process. If the latter motives are foremost, a working group may emerge as a special commission, rounded out with prominent nongovernmental "experts." Whatever the apparent policy formulation process, Vorster very likely makes the critical decisions outside the confines of the Cabinet or any other identifiable body.

36. One authentic working group has been formalized as the South African Security Council, although it does not meet regularly or maintain its own staff. Its core membership includes the Prime Minister, Defense Minister Pieter Botha, and Foreign Minister Roelof Botha, as well as General Magnus Malan, Chief of the South African Defense Force, and General Hendrik Van den Bergh, Director of the Bureau of State Security, the principal intelligence service. Our scant information on the Security Council indicates that the council has set up special working groups, each chaired by a regular member of the council.

37. The Security Council very likely would be the primary locus for a decision to test a nuclear device, or to take other critical steps in a nuclear weapons program. The Council

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might set up a special working group that would include key members of the existing bureaucratic entities that would be involved in planning and implementing the various facets of a weapons program. Both the Atomic Energy Board and the National Institute for Defense Research would be involved in formulating a nuclear weapons program. Among the key personnel in the AEB and the NIDR, Dr. Abraham J. Roux, who has directed the AEB since 1959, is the official most likely to be called upon to assess the technological pros and cons of a test explosion. Roux has supervised not only the component that would produce a nuclear explosive, but the civil nuclear programs that would be affected by diversions of South African facilities or cutoffs of foreign inputs. (See annex A.)

38. Although a group tasked with weighing the pros and cons of nuclear weapons developments normally might be expected to include the government officials considered best able to discuss the economic costs of various options, neither the Finance Minister nor the Minister of Economic Affairs is reputed to be particularly influential with Vorster. Rather, he apparently relies for economic advice primarily on the key figures in the South African Reserve Bank--Governor Theunis de Johgh and Deputy Governor Gerhardus de Kock.

39. Because the critical decisions concerning a nuclear weapons program require weighting an extraordinarily complex pattern of military, technological, and economic factors, Vorster may pay more heed to the specially qualified professionals than the politicians while working toward a decision. His essentially political instincts, however, are likely to prevail when it comes to reaching the final decision. For a critical nuclear decision, he may well be as anxious to reach a binding consensus among all cabinet ministers as he apparently has been anxious for consensus on the most sensitive racial policy decisions. If Vorster follows his usual tactics, he will listen more attentively to the stronger members of the Cabinet and allow them ample opportunity to shape the final decision and convince their colleagues in the shaping process.

40. For a decision to test a nuclear device, Foreign Minister Roelof Botha as well as Defense Minister Pieter Botha and Cornelius Mulder, Minister of Information and Plural Relations, probably would be among the key actors. We have no reason to doubt that these men share with Vorster the basic belief that national defense has top priority. Conceivably they may have significantly different views concerning how a nuclear weapons

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program would affect South Africa's overall military strength or foreign relations, but we have no reliable evidence of such differences on this subject.

41. Any presently conceivable successor to Vorster will be similarly subject to the Afrikaner concern for solidarity, and probably will emulate his moderator role--within the Cabinet and throughout the National Party. As in the past, future decisions on critical steps in South Africa's nuclear weapons program probably would be made by the Prime Minister in concert with a few key technicians and cabinet colleagues. The Prime Minister and whomever he consults on a sensitive nuclear problem are likely to share a common perception of fundamental South African interests.

42. In sum, Vorster, unlike prime ministers in other industrial non-Communist states, need not consult or accommodate a wide variety of constituencies on nuclear matters. The South African electorate traditionally has shown an unusually high degree of trust in its top leadership; so long as the government is not seen as failing its supporters on the key issues of national security and white supremacy, the leaders are able to exercise a far greater degree of latitude in policy matters than is the case in the United States or West European countries. This clearly gives Vorster at least the internal political flexibility to initiate, change, or terminate a nuclear program without broad accountability to the South African people. It also enhances the chances of maintaining secrecy about such matters.

II. ALTERNATIVE NUCLEAR STRATEGIES FOR SOUTH AFRICA

A. Shifting South African National Security Strategy

43. The dramatic political changes which have occurred in southern Africa over the past few years have altered Pretoria's perceptions of South African national security, and have led to significant shifts in its general strategy. South Africa's 1977 White Paper on Defense noted that it no longer is possible to define national security aims with little or no thought for trends and events outside South Africa. On the contrary, it states that:

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developments in Africa and elsewhere have today thrust the Republic of South Africa against its will into the foreground, where the attainment of national security aims is directly affected by occurrences and trends of thought beyond our borders.

The South Africans see the basic nuclear balance between the United States and the Soviet Union "lending itself to instability at lower levels, and southern Africa is one of the many victims of this regional instability."

44. In the white paper's threat assessment it is noted that the pace of change has accelerated during the past few years, thus bringing the threat to South African security nearer in time. Of special concern is "the relative proximity of Soviet influence and military aid," which is said to have had an impact both on guerrilla activities along South-West Africa's northern border and on the internal situation in South Africa. While it is stated that African states are not strong enough to attack the Republic, "some African countries are supported by a superpower with the ability simultaneously to wage integrated revolutionary and conventional warfare." The threats, in terms of the goals of its unnamed "enemies," are:

-- Expansion of Marxism by fomenting revolution in southern Africa.

-- The overthrow of the remaining white regimes "so that the militant African bloc can [destroy] so-called colonialism and radicalism and [establish] Pan-Africanism."

-- The development of an indirect strategy to unleash revolutionary warfare in the region, isolate the Republic of South Africa, and force it to change its domestic race policy.

45. Although Defense Minister Botha's preface to the white paper asserts South Africa's growing strategic importance to the Free World, the theme of South African defense as a part of the Free World's defense is much less evident in this than in earlier white papers. Indeed, the twin notes of independent military capability and self-sufficiency in weapons get heavy emphasis in the latest paper. For example:

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> The [Republic of South Africa] does not form part of any alliance with any foreign power, nor can it rely on such an ally in time of war. Our forces must be so structured that they can meet the threats against the RSA without outside help.

46. The South African Government appears to be paying more than lipservice to this new strategy. It has announced a new role for the Navy: instead of its traditional role of defending the Cape sea route, its mission now is to defend the seaward extensions of South Africa's borders with Angola and Mozambique. In addition, recent Army maneuvers were directed toward stopping an enemy armored division, supported by aircraft, which had entered the country via South-West Africa: an attack well beyond the capability of any neighboring state's armed forces, let alone that of a guerrilla group.

47. How, then, does South Africa's emerging strategic outlook bear on the question of nuclear weapons? Does the perceived threat to South African security suggest the need for such a weapon? There is no direct evidence one way or the other; that is, we have no information that the South African military establishment has either sought or rejected nuclear weapons. Nor have we any strong evidence that the defense forces have incorporated nuclear warfare into their strategy or tactics.*

48. Nevertheless, contingency planning to acquire a nuclear weapons capability would be consistent with the published South African military doctrine. Having given up (apparently) the notion that they could count on the West ultimately to come to their rescue, South African leaders are attempting to prepare for any type of attack, conventional or unconventional, that might be launched from within southern Africa. Moreover, it seems clear--from the recent white paper, statements by Vorster and other leaders, and the character of recent Army exercises--that the South Africans have revised their threat projections. The threat no longer is seen exclusively as a low-key guerrilla war with only distant rumbles of something larger. It seems

* In 1976 the South African Air Force issued a public release describing practice toss bombing by Buccaneer (Hawker-Siddely) jets, a bombing technique normally associated with nuclear weapons delivery. This was an isolated piece of evidence, however.

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likely that South Africa's leaders now think there is a good chance they may ultimately face something far more serious: a large-scale, Soviet- and Cuban-supported ground and air attack across South Africa's borders.

49. Yet South Africa's revised strategy also is consistent with a decision not to go nuclear. Its military leaders may well have concluded that their most effective defense is a flexible, well-trained strike force equipped with the most advanced conventional weapons; and that a nuclear weapon would, in terms of their perception of the threat to South Africa, have only limited use militarily while running grave risks politically--for example, that South African possession of a nuclear weapon might lead a number of black African states to seek a similar capability.

B. Alternative Nuclear Strategies: The Political Dimension

50. Neither the technical evidence analyzed in part I of this paper, nor the above review of shifting South African military doctrine and strategy are conclusive, one way or the other, as to South Africa's nuclear intentions and capabilities. Large areas of uncertainty remain. In this section we try to sort out and weigh the political factors that we think would bear on the RSA's decision. We do this in terms of alternate nuclear strategies, all based on the assumption that South Africa has or soon can have a weapons capability. The evidence and analysis in part I raise the strong possibility that South Africa has in fact continued to keep the nuclear weapons option alive. Although we have no evidence of the actual production or stockpiling of nuclear weapons, we consider it likely that South Africa has planned for some years to develop the capability to produce weapons-grade uranium, and that it may already have, or may soon have, substantial quantities in hand.

51. The question is, how would South Africa use such a capability? What political objectives would its leaders seek through nuclear weapons options?

52. The options should be seen as being exercised at various points along a nuclear continuum, beginning with the decision to develop a capability to produce weapons-grade fuel and ending only with the actual demonstration, threat, or use of a nuclear explosive. Before a test, a program may be

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accelerated, slowed, suspended, or redirected at various points along the continuum. If the technically determined, or "normal," momentum of a program is interfered with, however, considerable costs--both financial and technical--could (but need not) result. Generally the nearer the test date, the greater the costs of postponement. Suspension or redirection may also have political costs--for example, in terms of disappointed scientific or military constituencies.

53. We do not know where the South Africans are along the continuum. We believe that they now have the technical capability to produce a suitable test device, and may have sufficient fissile material to do so. While we suspect that South Africa was preparing for nuclear tests until mid-1977, we do not know its current intentions. Several alternative strategies can be envisaged:

> To move deliberately toward developing and testing a nuclear weapon according to South Africa's own technically derived timetable--presumably within the next 6-12 months--while officially denying any intention to do so.*

54. This strategy would rest on the proposition that the Vorster government is determined to acquire a recognized nuclear weapons capability; that this goal is of such high priority that it outweighs Vorster's concern over likely world reaction to a test as well as any hope he might have of extracting Western concessions by refraining from a test.

55. There is, in fact, good reason to believe that the Vorster government is determined to join the world's nuclear powers as a coequal. Vorster and other top South African leaders have publicly stressed their concern over the serious and growing external threat to the country's security, and their view that South Africa is diplomatically isolated and must prepare to face the threat alone. Vorster might also perceive that an acknowledged nuclear capability would be highly valuable as a domestic political asset--in this case, to reassure the Afrikaner people that their survival as a nation is secure. Moreover, Vorster, like De Gaulle, is convinced that his country has not

* The South African Government has given private assurances to the United States and public ones to the International Atomic Energy Agency that South Africa has no plans to produce or test a nuclear device.

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had the recognition it deserves; he may see a demonstrated nuclear capability as a means of elbowing South Africa's way into the inner councils of the Western powers.

56. This policy would be consistent with the so-called "Afrikaner mentality"--its inner-directedness, its single-minded pursuit of narrowly defined, Afrikaner interests, and its bias toward using aggressive and forceful means for attaining goals. Moreover, while personal integrity and honor are prime virtues to the Afrikaner, deception of the United States on South African nuclear intentions could easily be rationalized in terms of a higher good: survival of the Afrikaner people.

57. Yet this course would entail serious political risks. A test explosion could be expected:

-- To intensify antiapartheid and antiwhite South African feeling abroad.

-- To make it even more difficult for any African or Western industrial state to maintain overt friendly relations with the Vorster government.

-- To undermine any chance of continued open cooperation in nuclear matters between Western European states and South Africa.

-- To increase the chances that various punitive measures, including various forms of economic sanctions, will be applied to South Africa.

-- To raise the prospect that neighboring states might seek and obtain a security treaty with the USSR.

-- To terminate completely US - South African nuclear cooperation.

58. Vorster might, of course, be willing to bear these costs in order to demonstrate conclusively to Presidents Neto of Angola and Machel of Mozambique, to the other "front-line" states, and to others that South Africa has nuclear weapons in its arsenal, and that any serious provocation against South Africa would risk nuclear reprisal. A conceivable, though less likely, South African motive for testing might be to attempt to internationalize the southern African conflict; that is, by

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frightening the black border states into seeking a strong military alliance with the USSR, Vorster might hope to force the United States to acknowledge the importance of South Africa as a regional military power.

A second possible strategy is to proceed with the research and development of a weapon, but to refrain from testing while South Africa seeks to maximize Western--particularly US--concessions in exchange for swearing a nuclear weapons program.

59. This strategy is politically more sophisticated than the first. It would be based on a perception that the rest of the world already considers South Africa an incipient nuclear power; hence there is no overriding need for a demonstration of its capability. But Vorster would nevertheless expect to negotiate from a position of a state with an acknowledged nuclear capability.

60. Using this strategy, what would Vorster seek? For a variety of reasons, we believe that his price for formally agreeing to relinquish the nuclear option would come high. For one thing, he is aware that the US Government attaches great importance to halting the spread of nuclear weapons. For another, we believe that Vorster may have a strong personal and political incentive to provide South Africa with a nuclear capability. At a time when South Africans feel themselves isolated as never before and threatened militarily by Soviet- and Cuban-Supporter neighbors, the attainment of a nuclear capability would have strong appeal as a way to reinforce confidence in the government's ability to maintain the status quo and to discourage potential attackers. Moreover, as we noted last August,* it is consistent with Vorster's personality to favor proceeding with weapons development and to undertake testing. Vorster has shown throughout his career a strong inclination toward actions which project power, positive action, and tough-mindedness. Moreover, Vorster is much concerned with his place in Afrikaner history and has lamented privately that his achievements in maintaining the status quo are not appreciated.

* South Africa: Policy Considerations Regarding a Nuclear Test, Interagency Assessment NI M 77-023J, 8 August 1977.

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He may therefore view development of a South African nuclear capability as a dramatic achievement for which he will be remembered.

61. At a minimum, therefore, South Africa would demand guaranteed supplies of reactor fuel and generally close cooperation in the nuclear area. But it remains our best judgment, as it was last August, that Vorster would seek US concessions ranging over an area broader than the nuclear one alone; in particular, he would like to buy time for South Africa to work out its domestic policies. What he most wants is a general softening of US policy toward South Africa. His position may well be put something like this: if you want us to renounce the acquisition of nuclear weapons, you must make it easier for us (white South Africans) to survive as a nation. He probably would seek a US undertaking not to take punitive economic or financial measures against South Africa and to help stave off UN sanctions.

A variant of the second strategy would be to plan on delaying a test indefinitely, while taking observable small incremental steps toward an apparent readiness to test. The objective would be to enable South Africa to extract maximum concessions from the West before officially giving up its weapons program.

62. Although this strategy should not be ruled out, it appears a far less likely one--particularly since the dismantlement at the Kalahari site. In addition, while it would create uncertainty for the US Government, it would also lead to uncertainty for South Africa--for example, how long before the strategy would be discerned, what would the reactions then be, and what concessions if any, could be got in the meantime? Our feeling is that the South African leadership does not tolerate ambiguity well enough to be comfortable with such a strategy.

A third strategy would be to develop a weapons capability clandestinely without the intention to carry out a test, or possibly with the intention to conduct a clandestine nuclear test.

63. This strategy is an attractive one for South Africa, particularly because its leaders feel that their actions are under intense scrutiny from abroad. Clandestine development would

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avoid the heavy political repercussions that a test would bring on, would be relatively easy to deny plausibly, and would give the South Africans the capability which we believe they seek.

64. If this is the South African strategy, however, we are left with the need to explain the construction of the Kalahari site; hence we would judge such a strategy to have been developed only since August 1977.

C. Net Assessment

65. Ambiguities and uncertainties surrounding virtually all aspects of South African nuclear developments make us cautious about judging South Africa's capabilities and intentions in this area. There are nevertheless a number of general propositions which can be made with a fair degree of confidence:

-- We think the chances are high that South Africa's leaders have deliberately followed a program to give them the option of producing nuclear weapons.

-- We also believe that they will continue to pursue this option, with the result that it is likely South Africa will take the following steps toward a weapons production program.

- Creation of a reserve of highly enriched uranium which would be readily available for fabricating weapons.

- Completion of all weapons design work and high explosives testing short of an actual nuclear detonation.

-- The South Africans' success to date is not clear. We judge the chances better than even that they are near or past the point of producing the necessary quantities of highly enriched uranium. We have little doubt about South Africa's capability to produce a device, but we have little evidence that they have yet developed a deployable weapon.

66. The question remains: of the various nuclear strategies open to South Africa, which is it most likely to choose?

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Our assessment of the Kalahari facility leads to the conclusion that in early 1977 South Africa was preparing for a series of nuclear tests. That is, it probably intended to detonate more than one nuclear device, which indicates that the South Africans were developing a nuclear weapon that was sufficiently complex to require testing. Furthermore, unless the test site was built only for contingency planning purposes--that is, unless there were no firm plans for scheduling a test--the construction of this facility implies that a nuclear weapon system was intended to be perfected, acknowledged openly, and deployed.

67. The fact that South Africa has since given assurances that no test is forthcoming, and has partially dismantled the Kalahari facility--thus moving farther away from a test-ready state--suggests that South Africa has suspended plans for a test: in short, that it has given up option one. It is also likely in this case (50- to 60-percent probable) that the weapons development work would be redirected toward developing a reliable weapon of predictable yield without the need to test.

68. Also, at about the same time as the original international attention to the Kalahari facility (and quite possibly because of this attention) South Africa decided to produce its own highly enriched fuel for the Safari research reactor. A fuel fabrication facility which will use highly enriched uranium from Valindaba is well on the way to completion. The South African Government almost certainly regards this project as an unmistakable, yet plausibly deniable, demonstration of nuclear weapons capability, because it is generally assumed that any country capable of producing such fuel (enriched 30 percent or more) is also almost certainly capable of producing weapons-grade uranium.

69. Bearing in mind South Africa's possible nuclear strategies, we then must ask: what will its position be toward negotiating over the imposition of various constraints on nuclear weapons development? We doubt that the South African Government is willing to give up its nuclear weapons options, but it may well be willing to forgo the future production of weapons in advance of their need. Generally, the more advanced South Africa is in accumulating the ingredients for a weapons stockpile, the easier it will be for the government to sign the Non-Proliferation Treaty, or to accept international (IAEA) safeguards on its nuclear facilities. Once a stockpile of weapons-grade uranium is in hand, South Africa probably would attempt

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to pursue a covert weapons program separate from the facilities under safeguards, notwithstanding its NPT commitments. Tough negotiations are nonetheless likely, however, given South Africa's desire for concessions on other matters, as discussed in section B above. We anticipate the production of a few hundred kilograms of weapons-grade uranium, probably in parallel with the production of Safari fuel. Thus, we consider it likely (60- to 70-percent probable) that South Africa will be prepared to sign the NPT or accept similar commitments soon after the domestic production of Safari reactor fuel is accomplished, reportedly scheduled for the end of this year.

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ANNEX A

The Nuclear Establishment

1. The Atomic Energy Board (AEB), established in 1949, formulates policies governing all South African activities in the nuclear field, including research, uranium production, and the nuclear power program. The AEB includes key officials from the state corporations responsible for the industrial aspects of nuclear operations, the Department of Mines, and the Department of Foreign Affairs, as well as representatives of the mining industry and the Council for Scientific and Industrial Research (CISR). (See figure.)

2. The principal industrial operations involving uranium are conducted by several state corporations:

-- The Uranium Enrichment Corporation (UCOR) operates the pilot uranium enrichment at Valindaba (near Pelindaba), which is to be expanded for production of slightly enriched reactor fuel in the early 1980s.

-- The Nuclear Fuels Corporation (NUFCOR) handles international uranium sales on behalf of South African mining companies and supplies the basic input for the enrichment plant.

-- The Electricity Supply Commission (ESCOM) will operate the nuclear power station now under construction near Cape Town, as well as any future power plants.

3. In addition to its coordinating role for all nuclear related activities in South Africa, the AEB maintains its own staff (some 1,700 in 1976) which operates the National Nuclear Research Center at Pelindaba and performs various support functions, such as licensing the industrial uses of radioactive materials and maintaining industrial safety standards. Although the AEB is nominally under the Department of Mines for budgeting and administrative purposes, its research and support components constitute a virtually autonomous agency, directed by the president of the AEB, who also serves as chairman of the governing board. The title, AEB, is commonly applied to the research and support components as well as the board proper.

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Figure

ATOMIC ENERGY BOARD

CHAIRMAN: Dr. A.J.A. ROUX, PRESIDENT

MEMBERS

Dr. R. L. STRASZACKER
Chairman, Electricity Supply Commission

Dr. C. v.d.M. BRINK
President, Council for Scientific and Industrial Research

Mr. J. M. CHRISTOPHER
Director of Companies

Mr. J. P. COETZEE
Managing Director, S.A. Iron and Steel Industrial Corporation

Mr. B. G. FOURIE
Secretary for Foreign Affairs

Mr. C. J. F. HUMAN
Managing Director, Federale Volksbeleggings Beperk

Mr. J. J. KITSHOFF
Chairman, Industrial Development Corporation of S.A. Limited

Prof. S. F. OOSTHUIZEN
Consultant

Dr. P. E. ROUSSEAU
Chairman, Roessing Uranium Limited

Mr. A. W. S. SCHUMANN
Chairman, Nuclear Fuels Corporation of S. A. Limited

Mr. W. P. VILJOEN
Secretary for Mines

EXECUTIVE COMMITTEE
Up to 31 October 1976
CHAIRMAN: Dr. A.J.A. Roux

MEMBERS

Dr. R. L. Straszacker
Dr. C. v.d.M. Brink
Dr. P. E. Rousseau
Mr. A. W. S. Schumann
Mr. W. P. Viljoen

From 1 November 1976
CHAIRMAN: Dr. A. J. A. Roux

(Alternate Chairman: Dr. R. L. Straszacker)

MEMBERS

Three members designated by the Chairman

MANAGEMENT

Dr. A. J. A. ROUX, President
Dr. J. P. B. Hugo, Deputy President
Dr. J. W. L. de Villiers, Deputy President
Dr. L. Alberts, Vice President
Mr. C. Moeller, Manager (Technical)
Mr. J. O. Tattersall, Manager (Licensing)
Mr. J. G. W. van Zyl, Manager (Administration)

Source: Annual Report of the South African AEB, 1976

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4. Four of the scientific divisions at Pelindaba--the geological and the three metallurgical divisions--are engaged primarily in research related to uranium mining and processing. Others are concerned primarily with the industrial, agricultural, or medical potentialities of nuclear materials. For instance, the Chemistry Division, along with the center's engineering and instrumentation services, has cooperated with the South African Citrus and Subtropical Fruit Research Institute in designing an experimental irradiator, to be used for controlling moths that attack citrus fruits. As noted earlier, the Reactor Development Division may be engaged in developing a nuclear weapon.

5. South Africa's bureaucratic structure pertaining to nuclear programs is so complex that bringing a nuclear weapons program to completion very likely would involve a good many components. These would include the AEB at its Pelindaba facilities; UCOR which could produce the necessary highly enriched uranium; and the National Institute for Defense Research (NIDR), which regularly receives funds for secret projects from the Department of Defense. The NIDR is a component of the Council for Scientific and Industrial Research, which in turn is represented on the governing board of the AEB. Although the weapons program presumably is not discussed in the regular meetings of these bodies, the open linkage facilitates discreet coordination of sensitive matters.

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ANNEX B

Financing Nuclear Development

Energy Expenditures

1. Reported expenditures by government and industry on nuclear development and operations have totaled about $1.4 billion since South Africa began producing uranium oxide in 1952. (See table 1.) Industry expenditures for mining and processing are estimated at $850 million to $900 million, or about 60 to 65 percent of the total. Nuclear expenditures reported in government budgets have totaled $540 million to $550 million.

2. Spending by private industry on mining and processing more than doubled in 1977 to $85 million, reflecting increased investment in response to new export contracts. Production is rising sharply, reaching about 3,700 tons in 1977, as compared with 2,800 tons in 1975. (See table 2.)

3. Nuclear spending by the government is listed in the public budget under allocations for the Ministry of Labor and Mines. About three-fourths ($340 million) of allocations for the period 1971-77 was to fund construction and operation of the pilot enrichment plant at Valindaba. Allocations in the same period for the Atomic Energy Board (AEB) totaled $120 million. About one-quarter of AEB funding was for capital construction and equipment and the remainder for administration and operating expenses.

4. Total government nuclear spending increased rapidly during fiscal years 1971-76, reflecting construction outlays for the pilot enrichment plant. Spending then leveled off at $70 million to $80 million a year in FYs 1977 and 1978.

Weapons Expenditure

5. None of the expenditures that are openly identified as being for nuclear programs are flagged for weapons development or construction. Pretoria either could mask such expenditures under other budget allocations or could withhold reporting on them altogether.

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Table 1

South Africa: Private and Public Nuclear Expenditures
1952-77

	Total [a]	1977	1976	Million US $ 1971-75	1952-70
Total [a]	1415	160	115	485	655
Industry	875	85	35	180	575
Government [b]	540	75	80	305	80
of which:					
Uranium enrichment	340	50	60	230	0
Atomic Energy Board	200	25	20	75	80 [c]
Miscellaneous	5	negl	negl	1	1

[a] Components may not add to totals because of rounding.

[b] Data are for fiscal years, April-March

[c] Data are for 1959-70.

Table 2

South Africa: Uranium Oxide Production
1952-77

	Metric Tons		Metric Tons		Metric Tons
1952	40	1962	4,558	1972	3,629
1953	515	1963	4,112	1973	3,094
1954	1,466	1964	4,033	1974	3,074
1955	2,998	1965	2,669	1975	2,809
1956	3,963	1966	2,981	1976	3,111
1957	5,174	1967	2,915	1977	3,700 [a]
1958	5,669	1968	3,522		
1959	5,846	1969	3,610		
1960	5,814	1970	3,737		
1961	4,961	1971	3,800		

[a] Estimated.

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6. There is no doubt that South Africa can afford to develop and test a nuclear explosive if it chooses. The pilot enrichment plant at Valindaba is believed to be capable of producing weapons-grade enriched uranium. Given the enriched charge, the cost of constructing and testing a crude explosive would be almost insignificant.

7. Inflation since 1974, plus added technical costs if South Africa were planning a more sophisticated device, would raise the costs considerably. Even $100 million, however, would be easily handled in South Africa's $11 billion budget (FY 1978).

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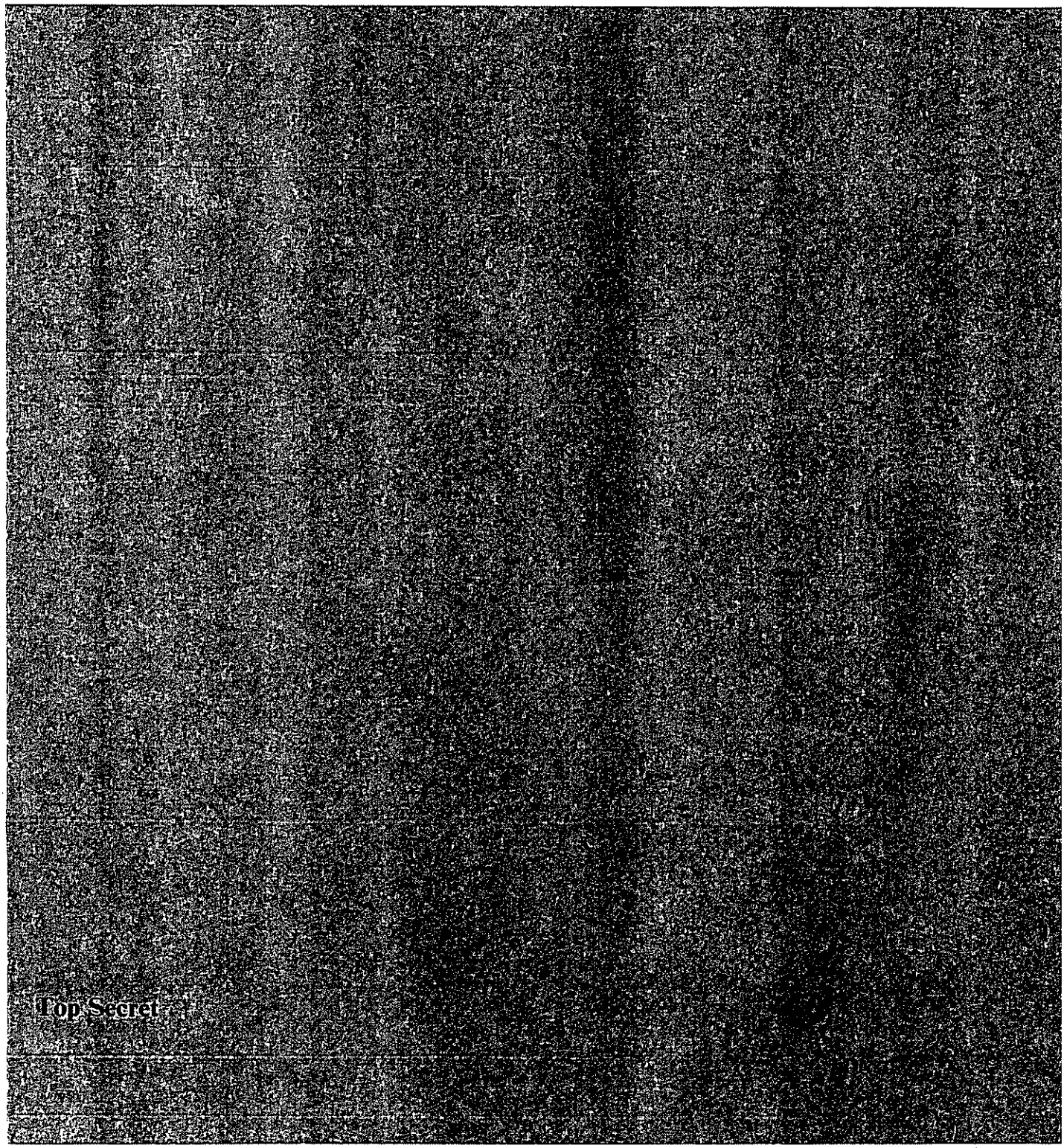

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