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LAWRENCE LIVERMORE LABORATORY  
SPECIAL PROJECTS DIVISION

FEBRUARY 1980

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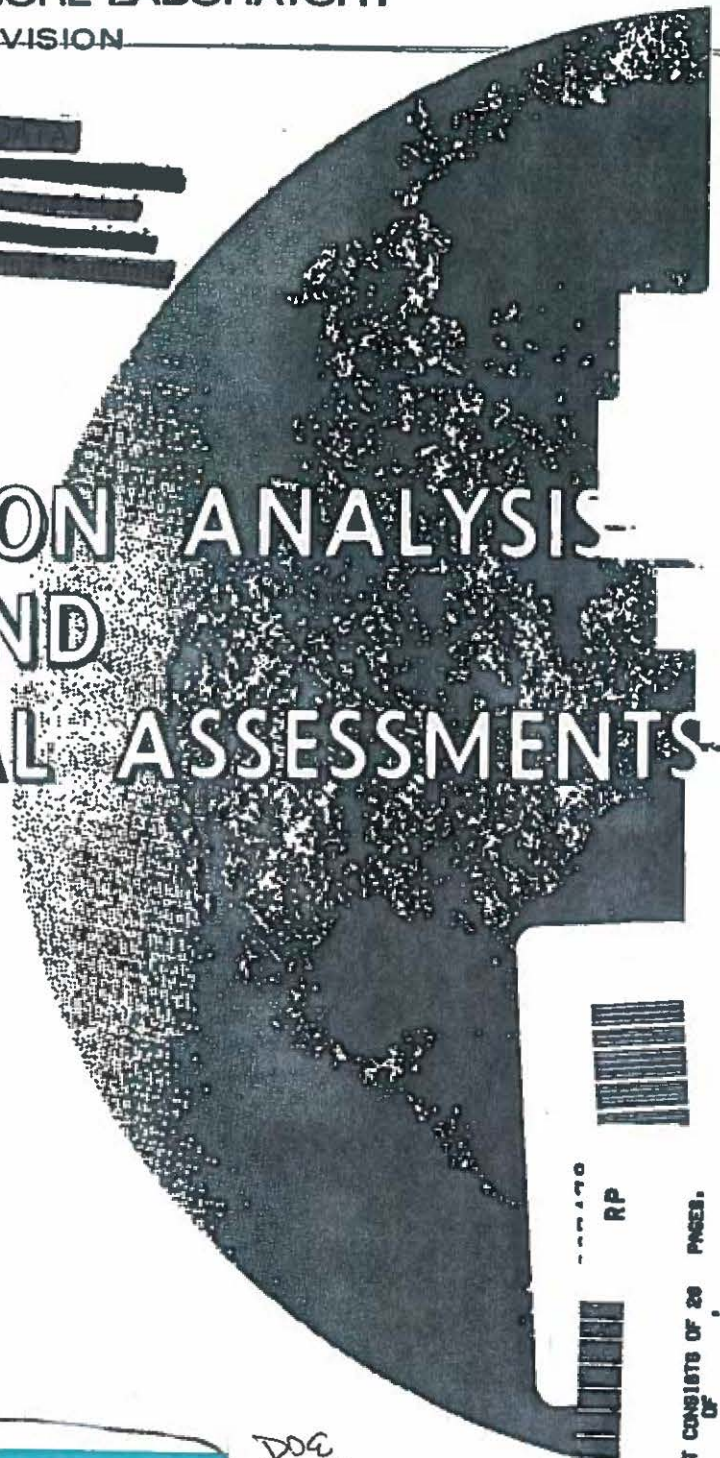
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# PROLIFERATION ANALYSIS AND INTERNATIONAL ASSESSMENTS

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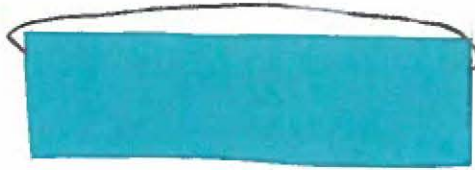
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Page i-ii

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PROLIFERATION ANALYSIS  
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INTERNATIONAL ASSESSMENTS

February 1980

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CONTENTS

PREFACE..... 1

INSTALLATION OF HEAVY WATER-RELATED EQUIPMENT AT  
 IRAQ'S TUWAITHA NUCLEAR RESEARCH CENTER ..... (S) [Redacted] OGA  
 b(1) 2

SOUTH AFRICAN SECURITY PROSPECTS: A PERSPECTIVE ON THE  
 POTENTIAL FOR NUCLEAR WEAPONS ..... (U) 7

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PREFACE

Proliferation Analysis and International Assessments is sponsored by the Department of Energy. It is designed to provide timely analysis of intelligence related to worldwide nuclear developments with particular emphasis placed on items relevant to nuclear proliferation. This publication will emphasize analysis; it is not intended to be a summary of intelligence. Although the initial editions contain articles solely from Lawrence Livermore National Laboratory, analysis will be solicited from other DOE intelligence elements as well. Comments and suggestions regarding the usefulness, content, or structure of the Assessments would be most welcomed. Please provide any feedback to:

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Page 2

INSTALLATION OF HEAVY WATER-RELATED EQUIPMENT AT  
IRAQ'S TUWAITHA NUCLEAR RESEARCH CENTER

As part of the Iraqi-French agreement for nuclear cooperation, heavy water tanks have been fitted to the two Tammuz research reactors currently under construction at the Tuwaitha Nuclear Research Center. Differing interpretations of the purpose of this equipment have been given;

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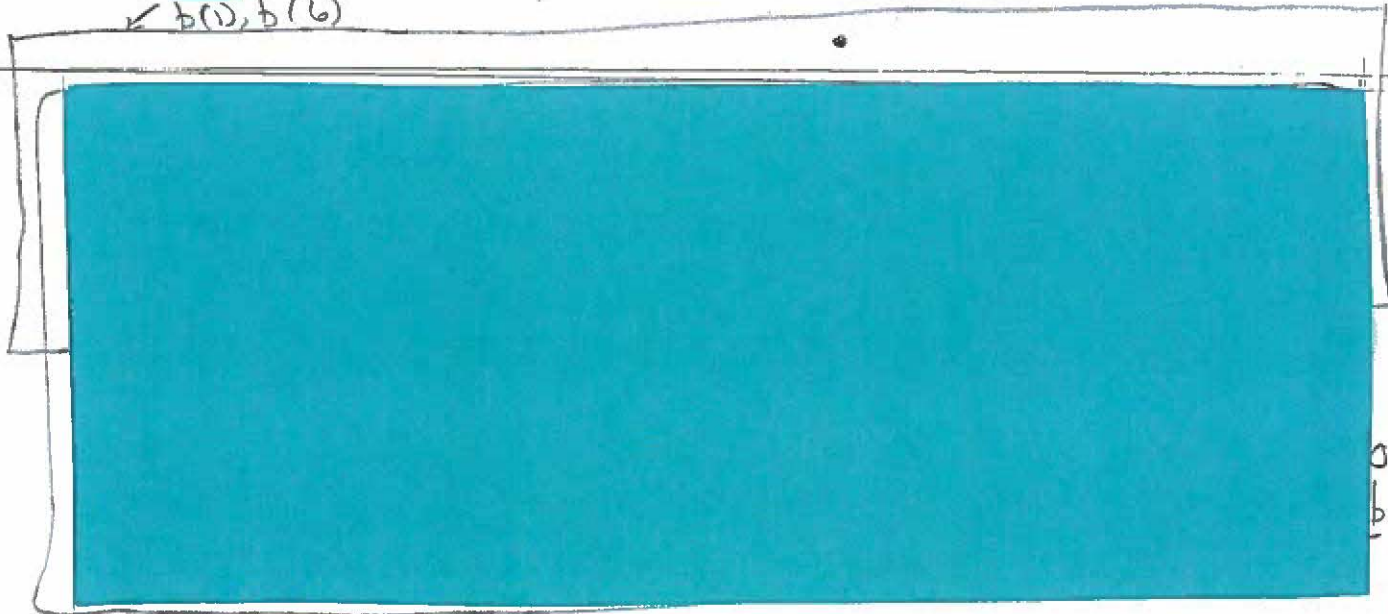
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(1) Heavy water tanks have previously been used for this purpose at other research reactors. Figure 1 shows a heavy water tank installed at an 8 MW reactor of the French nuclear research center at Grenoble.<sup>2</sup> The heavy water in the tank slows down (moderates) and traps the fast neutrons which escape from the reactor core. The beam tube (extending diagonally into the heavy water tank) extracts a portion of these neutrons, and directs them to a neutron radiography apparatus located beyond the concrete shielding shown in the figure. (Neutron radiography is an imaging technique similar to x-ray radiography. It has found industrial application in non-destructive testing of munitions, nuclear fuel rods, and other items for which x-ray radiography is unsuitable.) The report from which Fig. 1 is taken cites several advantages to the use of a heavy water moderator for the production of neutron beams. (U)

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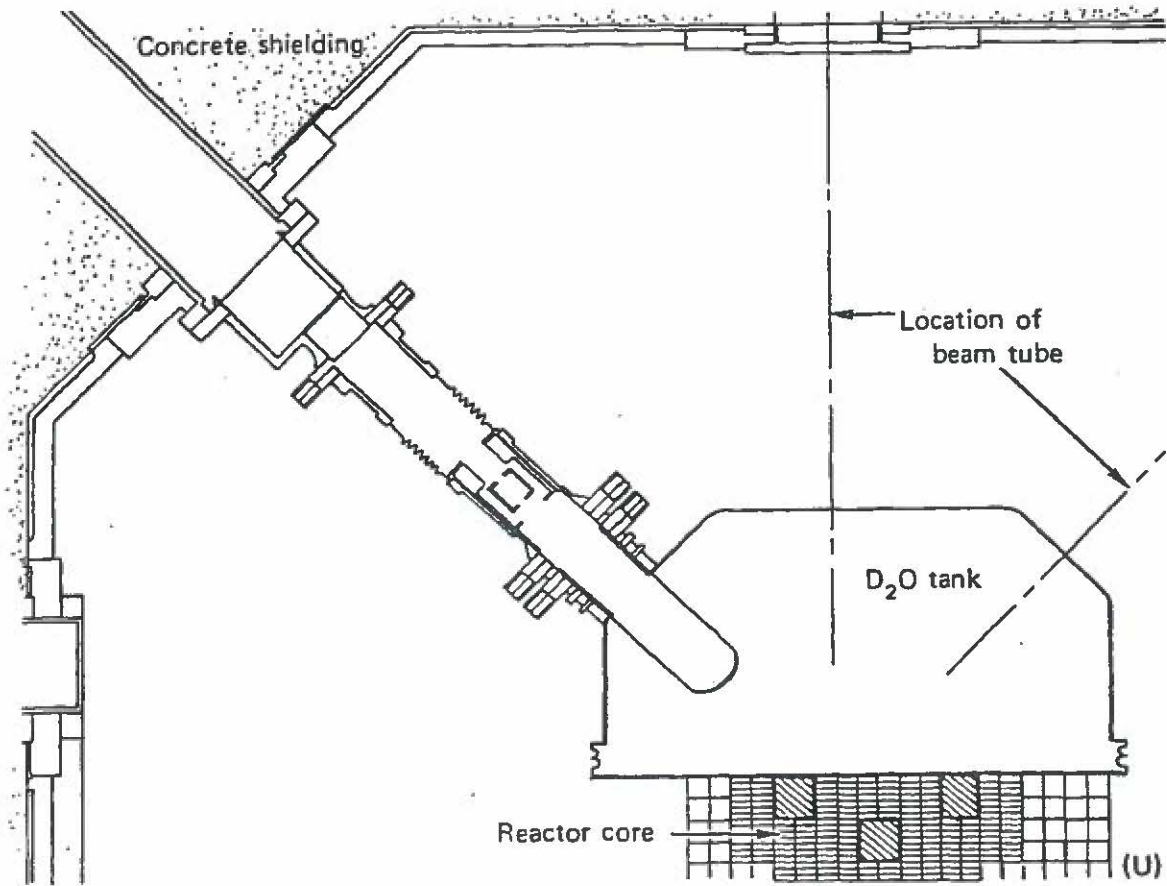


Fig. 1. Plan of neutron radiography facility at the Nuclear Research Center, Grenoble, France, showing a heavy water tank fitted to the Melusine reactor. (Redrawn from Ref. 1.)

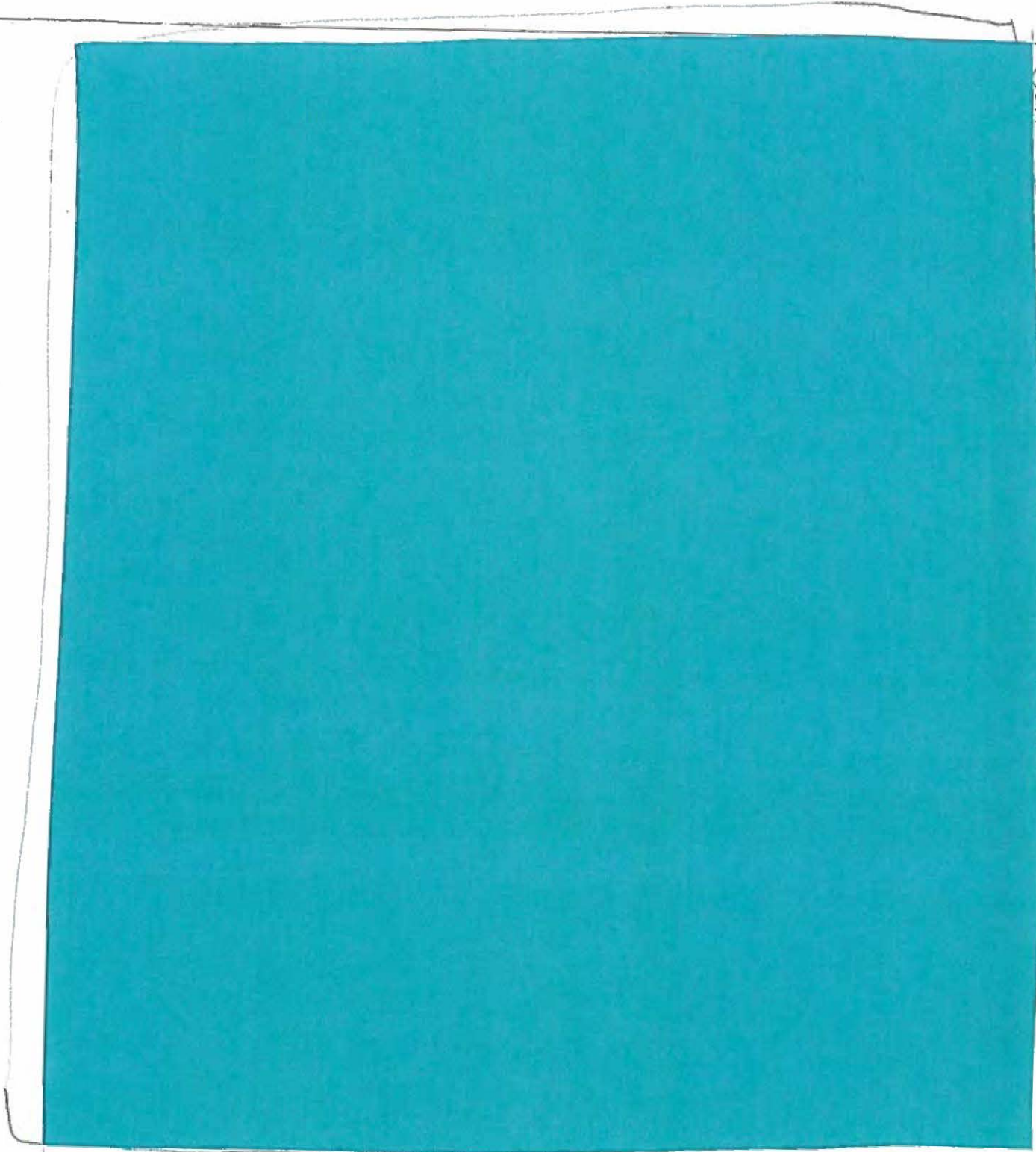
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- 2. R. H. Bossi and J. P. Perves, "Melusine Industrial Neutron Radiography Facility," Commissariat a l'Energie Atomique - Centre d'Etudes Nucleaires, Grenoble (France) PI/SEREG/910-283/78 (1978).

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SOUTH AFRICAN SECURITY PROSPECTS: A PERSPECTIVE ON THE  
POTENTIAL FOR NUCLEAR WEAPONS

Recent policy statements on nuclear developments by Prime Minister Botha coupled with reported plans for a United Nations study of South African proliferation prospects heighten the need for a closer look at South Africa's security prospects. This article examines security problems and concludes that any development of a nuclear option will likely stem from internal political and bureaucratic considerations rather than the more easily observable balance of regional military forces.

South Africa is often labeled a "pariah state" because of the perception that its neighbors are so hostile as to desire (at a minimum) the replacement of the current regime and that, in its defense, South Africa has essentially no recourse to collective security. A nuclear capability is sometimes considered a plausible instrument of national survival for states in such circumstances, but it must be remembered that, unlike other current pariah states, South Africa is by far the preponderant conventional military power in its region. In security terms, therefore, the utility of nuclear weapons for South Africa must be viewed against long range trends in the regional balance of power, and the implications of these trends must be considered in any evaluation of South African motivations to proliferate. (U)

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SC-326-00002-80

Page 8

South Africa currently maintains superiority in virtually every category of weapon and military personnel, not only over each of its neighbors individually but over any plausible group of them taken together. Moreover, while all the states of sub-Saharan Africa have between them considerably more men under arms than does South Africa, they are not now capable of employing these forces outside their own regions in any meaningful numbers. The majority of the armies of black-ruled Africa retain many of the organizational characteristics of their colonial garrison predecessors; equipped as light infantry, they lack both the transport and the heavy weapons required to engage South Africa.  
(U)

Despite its present invulnerability to conventional attack, however, South Africans cannot be so sanguine about their country's long-term prospects. To begin with, the trend among all newly independent states has been towards increased levels of military capability since the very beginning of the independence movement. Summed across all newly independent states, the totals of weapons stocks and military personnel have been increasing linearly since 1960 along with the growth of their aggregate GNP. While the relationship of GNP to military capability is not so consistent among individual states, those cases where military capability growth has outstripped GNP growth are nearly always instances in which there has been heavy Soviet involvement. This

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latter point must be especially unsettling to the South Africans as they consider the Soviet/Cuban involvement in the Angolan and Rhodesian conflicts. (U)

South Africa's ability to match the long-term growth in Third World military capability is limited by the effects of an international arms embargo, a shortage of white manpower, and the country's restricted capacity for domestic weapons production. As long as the South African government continues to rely exclusively on the white population for virtually all its military personnel, manpower shortages will be a problem. The white population is, first of all, limited in an absolute sense, and numbers only about four million people overall. Beyond this, members of other races are not permitted to hold highly skilled positions in the economy, so that there is a tight labor market for skilled (i.e. white) workers in all sectors. The result is that every white on military duty is a serious loss to the economic structure of the country. In addition, the percentage of the population which is white has been slowly decreasing. It fell from 19.3% in 1960 to 17.5% in 1970, and there is no prospect (given a continuation of current racial policies) of a significant amelioration of the white labor shortage. (~~C/N6I~~)

By the same token, as long as members of the nonwhite majority remain only marginal consumers of the country's industrial output, domestic consumption will provide only a limited

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SC-326-00002-80

Page 10

base for diversifying research, development, and production capabilities. This increases South Africa's vulnerability to foreign embargoes or boycotts, and severely contrains its ability to establish a truly indigenous and self-sufficient weapons production capability. Unlike other current pariahs, South Africa has no patron with any committment towards the maintenance of a regional military balance, a situation in which the absense of arms self-sufficiency is especially worrisome. (C/NSI)

While the danger of direct conventional assault remains distant, a more credible near-term threat to the present regime is the possibility of a campaign of domestic insurgency supported by neighboring states. Lacking such outside support, no insurgent effort has achieved widespread success to date, and South Africa's willingness to cross borders in a counter insurgency effort (as demonstrated in attacks on SWAPO bases in Angola) has helped to dissuade other states in the region from providing significant aid to guerrilla forces. This situation is subject to change, however, should the military capability of other states in the region grow (perhaps with Soviet/Cuban aid) to the extent that, although not threatening South Africa directly, it raises the cost of punitive cross-border operations to prohibitive levels. Under such circumstances, the impact of South Africa's weaknesses in the face of a long-term low-level war of attrition are maximized. (C/NSI)

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Given these mid- and long-range security problems, a variety of arguments are possible for and against the South African acquisition of a nuclear capability. The South Africans might consider that it would raise the prestige of their military forces to the extent that their enemies would abandon hope of a military victory, or that the threat of a last ditch, nuclear strike would compel some Western intervention in support of the regime in order to prevent such an attack. Nuclear weapons might also be viewed as an answer to the long-term threat of growing black African conventional power or as a deterrent to support for insurgency movements. The latter deserves further elaboration. While nuclear weapons are generally considered to have very limited utility in counter insurgency campaigns, they can threaten severe punishment to those states supporting such campaigns, even if outside support has made impractical the imposition of such punishment by conventional means. In this way, the South Africans might view nuclear weapons as a deterrent to heavy Soviet/Cuban involvement in the defense of states providing sanctuary to guerrilla forces. (U)

The arguments against nuclear weapons are that they would invite further Soviet/Cuban penetration of the region in reprisal or even provoke black-ruled states to undertake their own nuclear weapons programs. In this regard it is important to note South Africa's relative vulnerability to nuclear attack in comparison

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SC-326-00002-80

Page 12

to most other states on the continent. The white population is far more urbanized than the black, and the destruction of South Africa's four largest cities in a nuclear attack could make casualties of nearly half the white population, in addition to severely disrupting the mechanisms by which that population maintains its dominance. The regime may be unable to estimate the effect of a nuclear escalation on its own fragility, but that issue may come to be considered as the practical consequences of nuclear weapons are faced inside the South African government.

(U)

In conclusion, the future holds the potential for serious threats to the security of the present South African regime. There are powerful arguments to the effect that nuclear weapons are an answer to some of those threats, but there are equally powerful arguments that the acquisition of such weapons would prove counter productive. Therefore, it may be expected that the South African government's behavior regarding nuclear weapons will be based on internal political and bureaucratic considerations, not easily deciphered by outside observers, rather than on narrow considerations of the objective balance of military forces. (C/NSI)

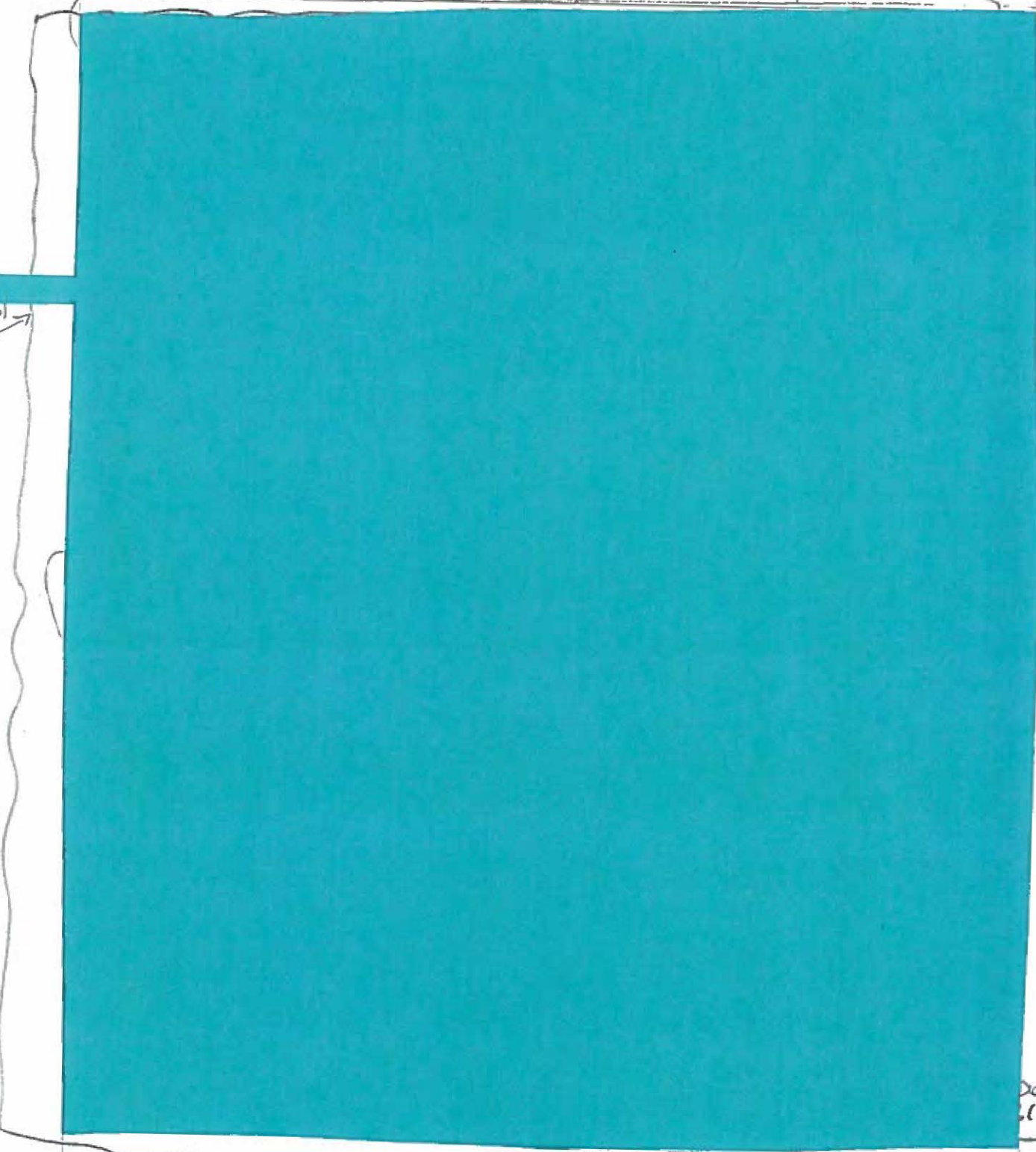
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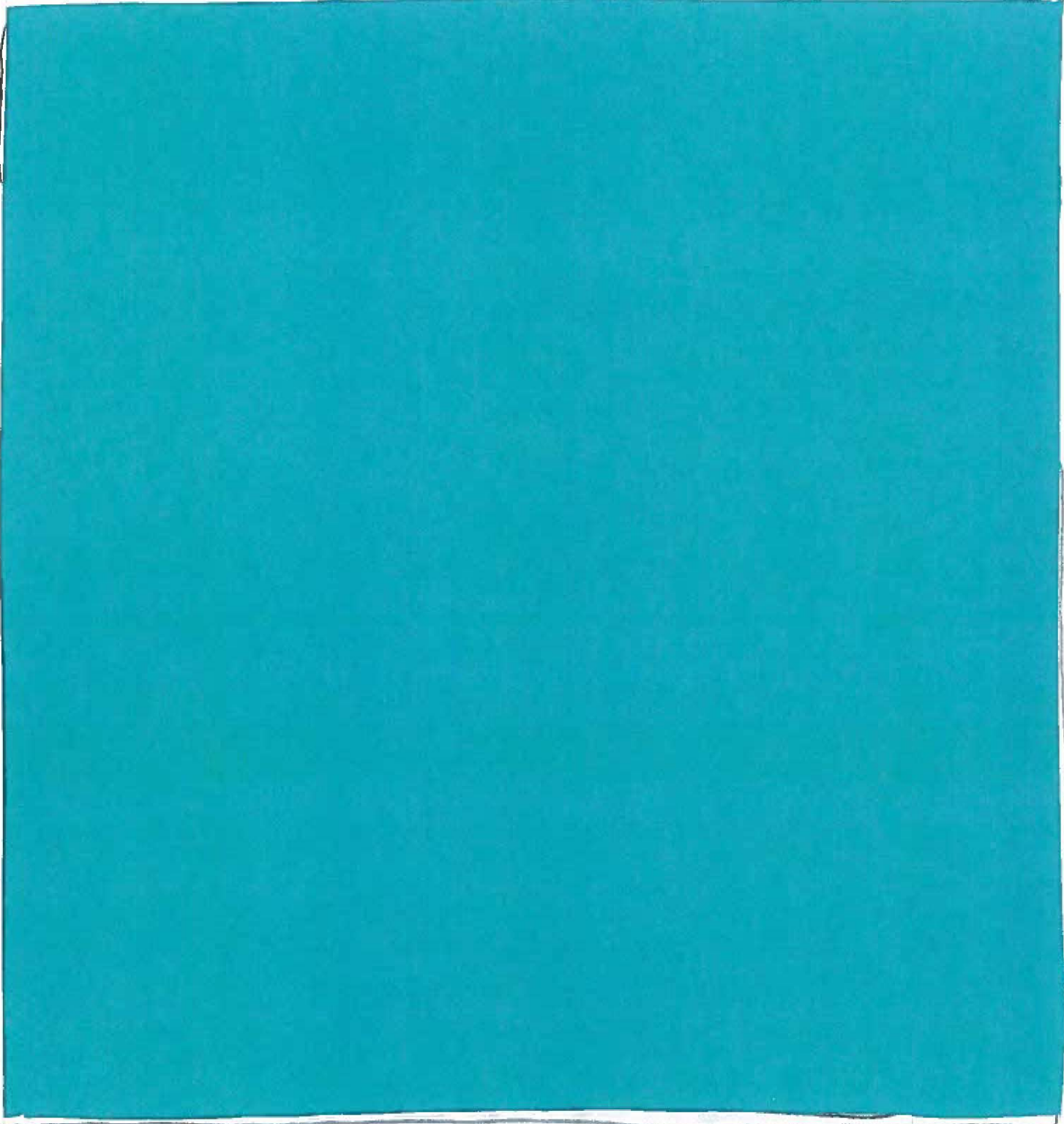
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Page 16

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