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South Africa's Defense Industry: One Step Behind

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A Research Paper

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South Africa's Defense Industry: One Step Behind [Redacted]

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A Research Paper

This paper was prepared by [Redacted]
Office of African and Latin American Analysis. It
was coordinated with the Directorate of
Operations [Redacted]

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Comments and queries are welcome and may be
directed to the Chief, Africa Division, [Redacted]
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South Africa's Defense Industry: One Step Behind

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Summary

*Information available
as of 10 February 1989
was used in this report.*

South Africa's defense industry has not made the country self-sufficient in military weaponry despite its highly publicized claims to the contrary, and Pretoria is likely to remain a step behind in state-of-the-art technology. South Africa currently manufactures the weapons, ammunition, and supplies needed to maintain internal security, to support or defend against a guerrilla war, and to maintain relative superiority over most of its neighbors for some years to come. The defense industry, however, has been unable to produce, without substantial foreign help, the larger, more sophisticated weapons systems in South Africa's arsenal. Virtually all of the combat and intelligence-gathering aircraft, helicopters, missiles, tanks, and submarines currently fielded by South African forces are foreign weapons either purchased or assembled in South Africa before the imposition of the mandatory UN arms embargo in 1977, or subsequently modified and upgraded with foreign technical and material assistance.

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Cuba's deployment last year of well-equipped armor and air forces to the Namibian border in southwestern Angola highlighted South Africa's deficiencies in high-technology military equipment. In our judgment, this has magnified Pretoria's concerns about its ability to defend against a numerically superior force equipped with modern weapons. Even if the US-brokered regional peace agreement succeeds in removing the Cuban threat from Angola, we believe South Africa will seek to develop and maintain an edge in military hardware to ensure its place as the region's preeminent military power over the long term.

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Pretoria will focus on upgrading existing hardware and obtaining major new weapons systems, including combat aircraft, missiles, and electronic warfare equipment. Some work undoubtedly will be done by the domestic defense industry, led by the government-owned Armaments Corporation of South Africa (Armcor). Work has already begun on upgrading the Air Force's fleet of Mirage III and Mirage F.1 fighter-bombers, the ground force's fleet of Oliphant tanks, and the Navy's three Daphne-class submarines. Both the upgrading of existing armaments and the development of new weapons systems, however, will require sophisticated technology beyond Armcor's likely capabilities, forcing Pretoria to redouble its

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search for foreign assistance [redacted]

[redacted] Pretoria, however, probably will have difficulty acquiring high-profile items because of some suppliers' concerns about the stigma associated with providing arms to South Africa. [redacted]

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Pretoria probably believes that it has little choice but to try to build, largely by itself, combat aircraft and modern anti-aircraft missiles. Although the modernization program will improve the capabilities of present weapons systems, it will not increase the number of available weapons or counter a threat posed by such modern weapons as Soviet MiG-29 aircraft, which Zimbabwe reportedly has considered purchasing. [redacted]

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Several major barriers stand in the way of a domestically built combat aircraft, and we do not know how Pretoria plans to overcome these obstacles. Almost certainly, Armscor will try to short-circuit the costly development process by acquiring the plans for an existing combat aircraft, probably the Israeli Lavi. Even with plans, however, Armscor may have great difficulty building or acquiring a suitable engine. Only five nations—the United States, the United Kingdom, the USSR, France, and China—have successfully produced high-performance jet engines; none have close relations with Pretoria or want to be seen violating the UN arms embargo.

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Even assuming that Pretoria can clandestinely secure supplies of critical foreign parts and technology—presumably at a high markup—development of the arms industry will exact a heavy economic price. South Africa's inadequate and inequitable education system will ensure a continued shortage of skilled labor. As a result, Armscor's success or failure may depend heavily on its ability to recruit foreign engineers and technicians, a difficult task in view of possibly renewed domestic unrest. In addition, the country's small industrial base will probably make it extremely expensive to produce sophisticated weapons. Finally, declining export revenues, due in part to sanctions, may eventually force Pretoria to cut back on some weapon programs. [redacted]

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Unless South Africa can secure reliable foreign commitments to supply certain critical components, such as key jet engine parts, we judge it highly unlikely that the domestic defense industry can succeed in producing the

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aircraft, missiles, armor, and electronics systems needed to defeat a numerically superior force equipped with modern weapons. This failure would be unlikely to have an immediate military impact because of the relatively weak position of South Africa's neighbors. Pretoria, however, will remain vulnerable to major conventional threats such as the one that was posed last year by Cuban forces in southwestern Angola, and could eventually see its military options limited by a neighbor's acquisition of significant advanced weaponry. [REDACTED]

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The United States, in our judgment, will have little direct influence over South Africa's weapons development priorities. The South Africans are unlikely to ask for direct US military assistance, except in the most dire circumstances, because of Pretoria's expectation that the United States would demand far-reaching racial reforms in return. In our view, any significant leverage that the United States may have over South Africa's weapons projects would stem from US influence over those allies and other arms exporters who might be willing, in spite of the UN arms embargo, to supply South Africa with technology, equipment, tools, and parts. [REDACTED]

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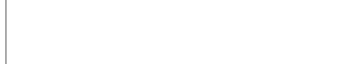
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Contents

	<i>Page</i>
Summary	iii
Scope Note	ix
Introduction	1
Development of the South African Weapons Industry	1
Origins	1
Production by Weapons Type	2
Arms Exports	10
Facing New Challenges	11
Upgrading the Inventory	11
New Programs	12
Paying the Piper	13
Outlook and Implications	15

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Scope Note

This Research Paper examines Pretoria's prospects for achieving its stated goal of self-sufficiency in armaments production, particularly in advanced weaponry. The subject was last addressed in DI Research Paper ALA 83-10160C (Top Secret [redacted] November 1983, *South Africa: Armaments Industry*. [redacted]

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Since 1983, South Africa's armaments industry has developed the capability to produce more modern weapon systems, particularly to meet many of its ground force needs, but has not been able to keep pace with state-of-the-art technology. Pretoria's military deficiencies and the mounting financial and human costs of its combat operations in Angola and Namibia were primary factors in South Africa's political decision in 1988 to accept the US-brokered regional peace settlement. Even so, we believe South Africa will continue to try to develop sophisticated weapons systems. [redacted]

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This paper is deliberately narrow in scope, and it focuses on the technical, economic, and foreign assistance aspects of South Africa's ambitions to develop further its defense industry. Political and strategic military factors outside the scope of the paper could also have an impact and will be addressed in future studies. [redacted]

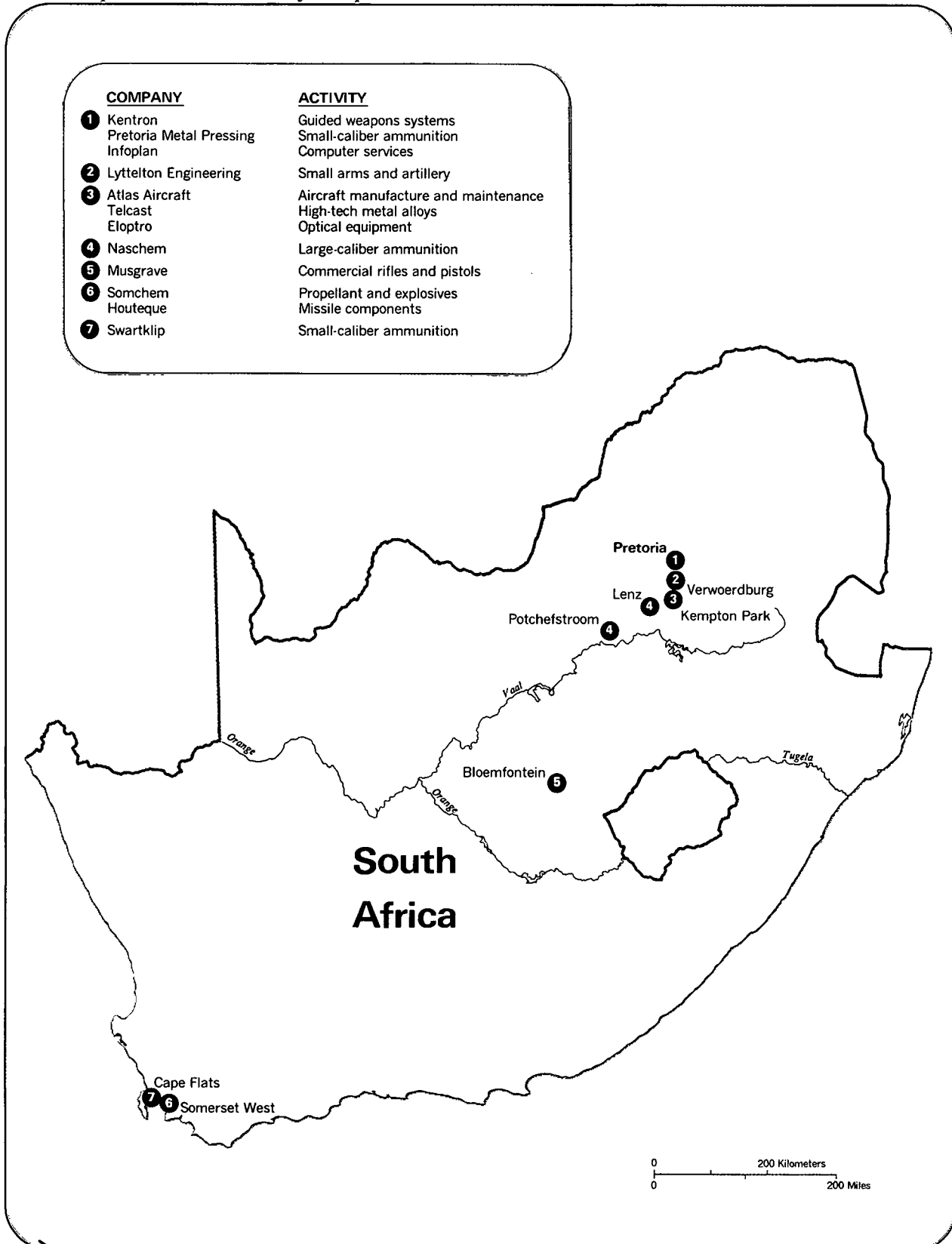
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Figure 1
Principal Armscor Subsidiary Companies



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South Africa's Defense Industry: One Step Behind [Redacted]

Introduction

Pretoria has developed a substantial defense industry in the last 15 to 20 years capable of producing a broad range of military equipment. The South Africans are not completely self-sufficient, however, and recent events in the region—notably the deployment in 1988 of superior Cuban armor and air forces close to the Namibian border and Zimbabwean attempts to acquire advanced combat aircraft—have highlighted South Africa's deficiencies in high-technology items.

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[Redacted]

This paper examines the recent development of South Africa's weapons industry—including current armaments production and arms exports—and describes Pretoria's efforts to upgrade and develop new armaments. The paper then assesses various economic, technical, and foreign assistance constraints that South Africa faces in achieving self-sufficiency in modern weaponry and examines the implications of these issues for the United States.

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Development of the South African Weapons Industry

Origins

The origins of South Africa's defense industry go back nearly 50 years. During World War II, South Africa manufactured ammunition, armored vehicles, and small arms in substantial numbers as an integral part of the war effort of the British Empire. Armaments production declined, however, in later decades. As late as 1960, South Africa produced few weapons on its own. During the 1960s, foreign governments began to deny South Africa access to the international arms market because of its policy of apartheid, and Pretoria—anticipating a complete embargo—started to increase its own production capabilities, mostly by copying foreign weapons. In 1961, private South African companies obtained no less than 127 licenses

UN Arms Embargo Resolutions Against South Africa

- 1963 *Security Council recognized South Africa as a "threat to the maintenance of international peace and security" and urged all nations to stop the sale of arms, ammunition, military vehicles, and equipment to manufacture armaments to South Africa.*
- 1970 *General Assembly and Security Council passed resolutions strengthening the voluntary arms embargo by expanding the definition of prohibited items to include spare parts, licensing agreements, and training of SADF personnel.*
- 1977 *Security Council adopted Resolution 418, making the heretofore voluntary arms embargo against South Africa mandatory.*

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from Western firms for the local manufacture of military equipment. By 1967, private defense contractors were producing various types of ammunition, explosives, electronic equipment, and French-designed Panhard armored cars.

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Shortly after the United Kingdom acceded to the voluntary UN arms embargo in 1964, the South African Government became directly involved in armament production through the creation of an Armaments Production Board. In 1967, Pretoria established a second organization, the Armaments

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Structure of Armscor

Armscor has grown rapidly over the past 20 years. At its inception in 1967, Armscor consisted of just two manufacturing plants: Lyttelton Engineering Works and Pretoria Metal Pressing. Armscor subsequently gained ownership or control of Atlas Aircraft, Swartklip Products, Musgrave Manufacturers, and two chemical factories. In 1977, the Armaments Development and Production Corporation, Limited, was merged with the Armaments Board to form the current Armaments Corporation of South Africa, Limited, known—like its predecessor—as Armscor. The mission of the new company was to involve the private sector effectively and economically in developing local arms production capacity, eventually making the country self-sufficient in armaments. Armscor's policies are set and executed by a Board of Directors whose members are drawn from the military (the Chief of the South African Defense Forces), the government (the Director General of Finance), private industry, academia, and Armscor's senior management.

Armscor and hundreds of companies involved in some facet of armament production. At present, 75 percent of South Africa's armaments are produced by the private sector, although Armscor reportedly manufactures the technologically complicated "sharp end" of all weapons systems.

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Armscor is now an important part of South Africa's economy as one of the largest employers and industrial concerns, with assets of over \$700 million. The company employs nearly 20,000 workers at its corporate headquarters and various subsidiaries; its network of more than 450 contractors and subcontractors is estimated to employ an additional 100,000 South Africans. Virtually all of South Africa's leading corporations, and many subsidiaries of well-known international firms, are associated in one way or another with Armscor.

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Armscor is funded directly through the South African Government's defense budget. Allocations for the production and procurement of armaments are carried under line items for Armscor and a "Special Defense Account." Together, Armscor and SDA allocations have made up 60 to 70 percent of the defense budget on average since 1975.

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Armscor has expanded its production base by contracting work to established companies rather than by trying to create new companies that would compete with existing firms for material and manpower. A symbiotic relationship has developed between

Development and Manufacturing Corporation (Armscor), a state-owned enterprise that was tasked with coordinating the development and manufacture of armaments.

the extensive use of licensed production and codevelopment programs with other countries. These projects—carried out primarily with Italy and France—provided not only a formidable arsenal of modern weapons, but also technology and industrial know-how.

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By 1977, when the mandatory UN arms embargo was imposed, South Africa had much of the industrial infrastructure needed for domestic armaments production and had obtained additional technology from foreign partners. South Africa had an advanced steel industry, an explosives industry that had been producing high-quality explosives for mining for several decades, and car assembly plants since the 1930s. This defense industrial base was enhanced through

Production by Weapons Type

Many of the weapons produced by Armscor are modest—small arms and ammunition—but the South Africans also manufacture other sophisticated

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Figure 2. Infantryman with R-4 assault rifle [redacted]



Figure 3. General purpose machinegun [redacted]

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South Africa claims self-sufficiency in *communications equipment*, but it probably suffers from some technological deficiencies. Armscor produces frequency-hopping radios and a mobile VHF radio-telephone tactical command system. [redacted]

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armaments. South Africa's dependence on foreign technology generally increases proportionally with the complexity of the weapons system. Although most foreign technology was acquired in the 1970s, we believe some foreign countries secretly continue to assist Pretoria in arms manufacture. [redacted]

Although its production of *artillery systems* is limited, Armscor manufactures two of the best howitzers in the world, the towed G-5 and the self-propelled G-6, both battle tested in Angola. Although these long-range 155-mm howitzers are often highlighted in Armscor's publicity campaign extolling South Africa's purported military self-sufficiency, both systems have benefited from foreign assistance. The resemblance of the G-5 to the Belgian GC-45—developed in 1975—and to the Austrian GHN-45, produced in 1979, is far from coincidental.¹ Moreover, South

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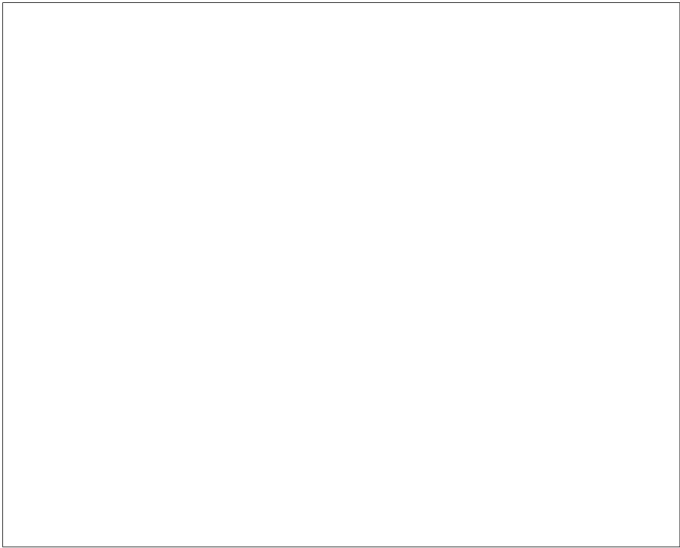
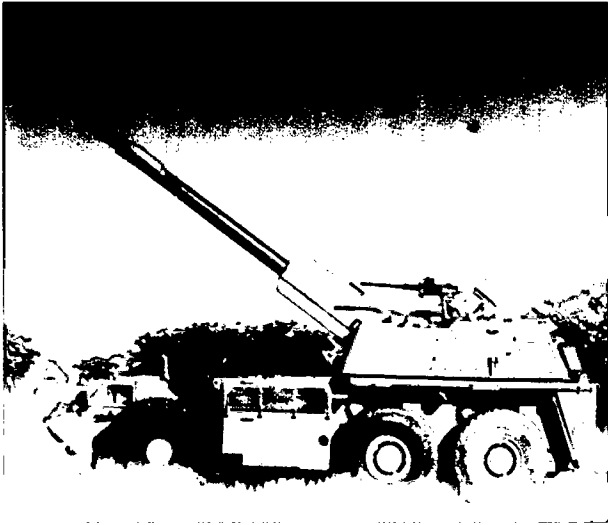
South Africa is virtually self-sufficient in the manufacture of *small arms and ammunition* for its ground forces. Armscor produces several models of handguns, rifles, and machineguns. Nearly all weapons are copies of foreign systems, modified to fit South Africa's needs. Armscor produces a 5.56-mm assault rifle and light machinegun, the R-4 and R-5, which are slightly modified copies of the Israeli Galil assault rifle, and a modified version of the Israeli Uzi sub-machinegun. Press reporting indicates that Armscor has recently produced an indigenous 7.62-mm general purpose machinegun, the SS-77. The gun reportedly combines the best features of the Soviet PKM, the Belgian FN MAG 58, and the British Bren. [redacted]

¹ The Belgian GC-45 was developed beginning in 1975 and produced in 1977 as a private venture by SRC International of Belgium, a company established by the now defunct Space Research Corporation of Canada, and PRB of Belgium [redacted]

The Austrian GHN-45, also introduced in 1979, is an improved version of the GC-45 produced by Voest-Alpine of Austria. [redacted] (b)(3)

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Figure 4. South African G-6 155-mm and 45-caliber gun-howitzer system

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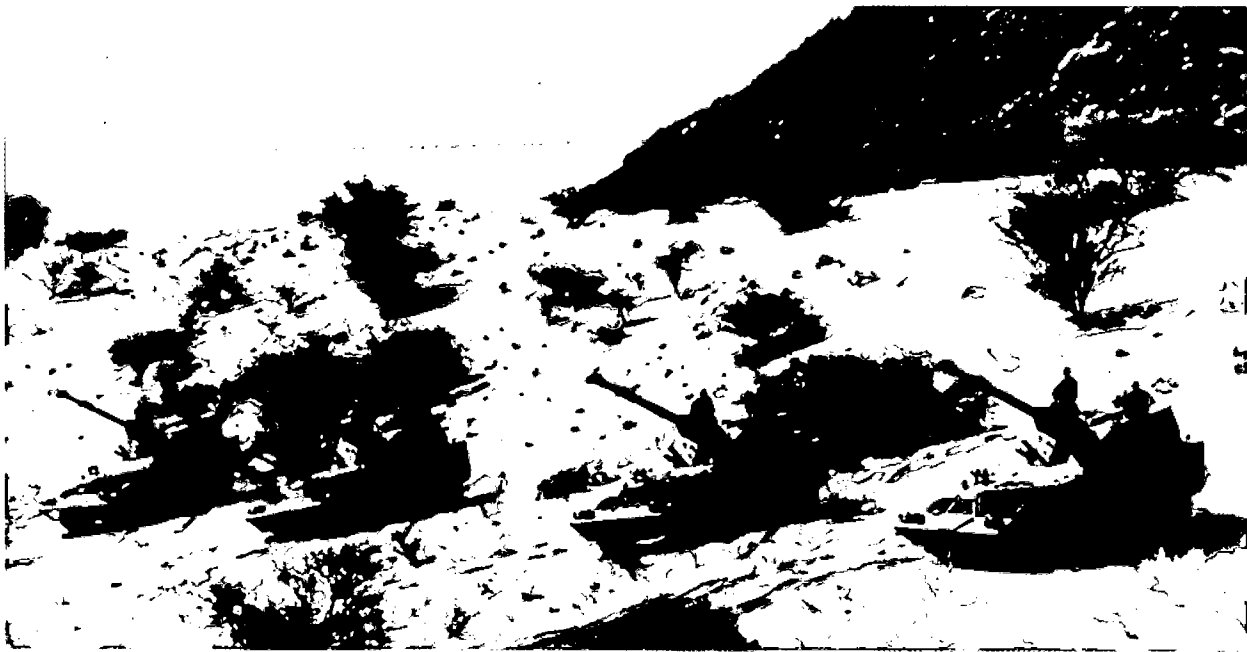


Figure 5. South African G-6 155-mm gun-howitzer battery

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Africa has had difficulty fabricating the sophisticated G-6 weapons systems.

accelerate the production of the G-6, given its extensive and successful use during South Africa's 1987-88 interventions in Angola.

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[Redacted] We believe that the South Africans may now have decided to

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(b)(3) *Figure 7. South African Ratel armored personnel carrier* [redacted]

Armcor produces a full range of *light armored vehicles*, although most are copies of foreign designs. In 1976, for example, the Ratel infantry fighting vehicle—one of the most frequently used vehicles in the SADF—was introduced by Armcor after about four years of development. The Ratel bears a striking resemblance to the Belgian SIBMAS armored personnel carrier produced in 1975 by a private Belgian firm. The South Africans have also modified a West German design for an all-terrain military truck to produce armored, mine-resistant vehicles and personnel carriers, [redacted]

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76-mm gun copied from an Italian design, a 7.62-mm coaxial machinegun, and a second anti-aircraft machinegun. Armcor claims that the armor piercing rounds of the 76-mm gun can penetrate Soviet T54/55 and even T/62 tanks from all angles. [redacted]

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Armcor's *tank production* has consisted of modifying and upgrading its fleet of 250 British Centurions, many of which were acquired clandestinely during the 1970s. This modification program was assisted by the Israelis, according to press reports, and included the installation of new engines, transmissions, fire-control systems, and a stabilized 105-mm gun. [redacted]

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In October 1988, Armcor unveiled a new eight-wheeled armored fighting vehicle, the AFV-76 Rooikat armored car. Armament on the Rooikat includes a

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Armcor Subsidiaries and Related Companies**Subsidiaries**

<i>Atlas Aircraft</i>	<i>Aircraft manufacture and maintenance</i>
<i>Telecast</i>	<i>High-tech metal alloys</i>
<i>Kentron</i>	<i>Guided weapons systems</i>
<i>Eloptro</i>	<i>Optical equipment</i>
<i>Lyttelton Engineering</i>	<i>Small arms and artillery</i>
<i>Naschem</i>	<i>Large-caliber ammunition</i>
<i>Pretoria Metal Pressings</i>	<i>Small-caliber ammunition</i>
<i>Somchem</i>	<i>Propellant, explosives</i>
<i>Swartklip</i>	<i>Small-caliber ammunition</i>
<i>Musgrave</i>	<i>Commercial rifle, pistol</i>
<i>Infoplan</i>	<i>Computer services</i>
<i>Houteque</i>	<i>Missile components</i>

Private Sector

<i>Benoni Tank Facility</i>	<i>Tank modification</i>
<i>Sandock Austral</i>	<i>Armored vehicles and naval vessels</i>
<i>Magnis Truck Corp.</i>	<i>Military vehicles</i>
<i>TFM</i>	<i>Police vehicles</i>
<i>Allied Technologies</i>	<i>Electronic components</i>
<i>Grinaker Electronics</i>	<i>Communications systems</i>
<i>Reunert Technology</i>	<i>Electronic components</i>
<i>Marconi South Africa</i>	<i>Electronics</i>
<i>Siemens (South African subsidiary)</i>	<i>Electronics</i>
<i>Plessey South Africa</i>	<i>Electronics</i>
<i>Liebenberg and Stander</i>	<i>Shipbuilding</i>
<i>Ho-Kwa, Limited</i>	<i>Missile guidance systems</i>
<i>ESD, Limited</i>	<i>Communications systems</i>
<i>Erikson-Ford</i>	<i>Mine-proof vehicles</i>
<i>Fuchs</i>	<i>Communications systems</i>
<i>Barlow Rand</i>	<i>Armored vehicles</i>
<i>Ermetek</i>	<i>Tanks</i>
<i>OMC</i>	<i>Tanks</i>

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Figure 9. Modified British Centurion tank

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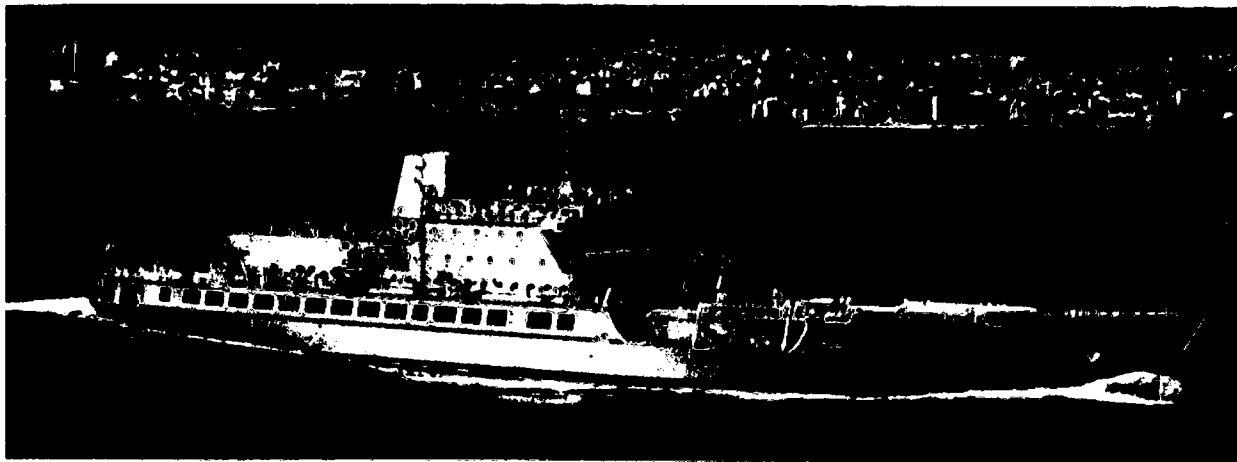


Figure 10. South African-built SAS Drakensberg ship [redacted]

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[redacted] the upgraded Centurions—dubbed the Oliphant—were effective in combat in Angola, although they were a logistic headache because of their high fuel consumption and the need to replace the tracks every 500 kilometers. [redacted]

present, however, the only aircraft completely produced in South Africa is the C4M-Kudu, a transport aircraft based on an Italian Aermacchi model. [redacted]

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South Africa's private *shipbuilding industry*, which until the early 1960s had concentrated on repair, has for the most part replaced Pretoria's previous dependence on foreign military ship suppliers, the United Kingdom, and France. Armscor subsidiaries are building the Minister or Mod-class guided-missile patrol boat under Israeli license. Domestic production started in 1977, and by 1986 the Navy had launched the sixth boat built in South Africa. The high water mark for South Africa's shipbuilding industry occurred in 1986 with the launching of the 12,500-metric-ton replenishment ship, SAS Drakensberg, the largest ship ever constructed in South Africa. [redacted]

Armscor has concentrated on modernizing existing aircraft, most notably the Mirage III. This fighter is being transformed into the Cheetah by refitting it with new wings and canards, flight stabilization equipment, advanced avionics, refueling equipment, and a computerized weapons delivery system. To date, about 20 Cheetahs have been placed in the South African inventory, and Pretoria is in the market for [redacted]

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[redacted] can Navy hopes that the experience gained in construction of the Drakensberg will lead eventually to the building of corvettes and frigates. [redacted]

Cheetah squadron that will eventually consist of 24 aircraft; at least 10 other Cheetahs will be used as trainers. [redacted]

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The Cheetah has been one of the most highly publicized Armscor programs, intended to underscore South Africa's technological prowess. [redacted] foreign assistance has been an important element of the program. [redacted]

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The production of *modern aircraft* is one of Armscor's top priorities. During the 1960s and 1970s, the South Africans manufactured several aircraft—including the Italian-designed Impala and the French Mirage multipurpose fighter and attack aircraft. At

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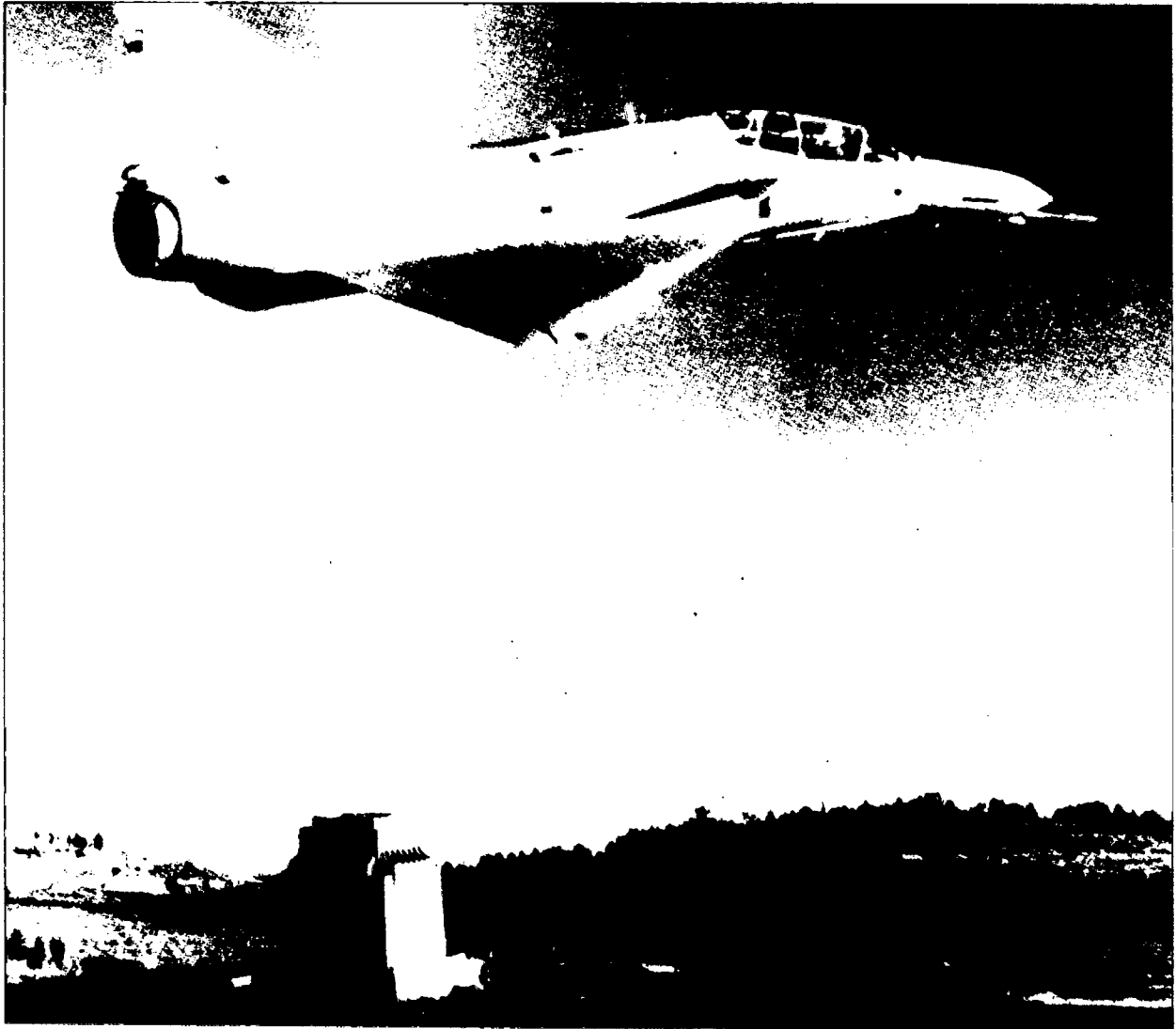


Figure 11. South African-modified "Cheetah" Mirage III aircraft

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² The similarities between the Cheetah and the Israeli Kfir, also a modified Mirage III, have been widely noted in the press. The differences are significant enough, however, that casual observation—even at a distance—can distinguish the two aircraft, which would make it difficult for the South Africans to disguise Kfirs as Cheetahs. Israel, however, is also producing a second Mirage III modification called the Nammer. According to "Jane's All the World's Aircraft," the Nammer is virtually indistinguishable from the Cheetah. [Redacted]

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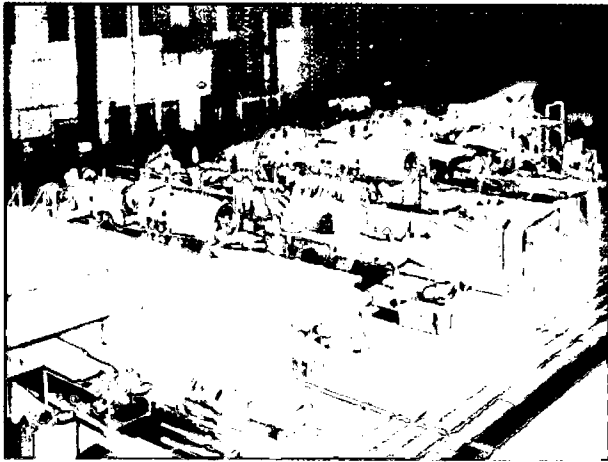


Figure 12. Conversion of Mirage III aircraft to Cheetah

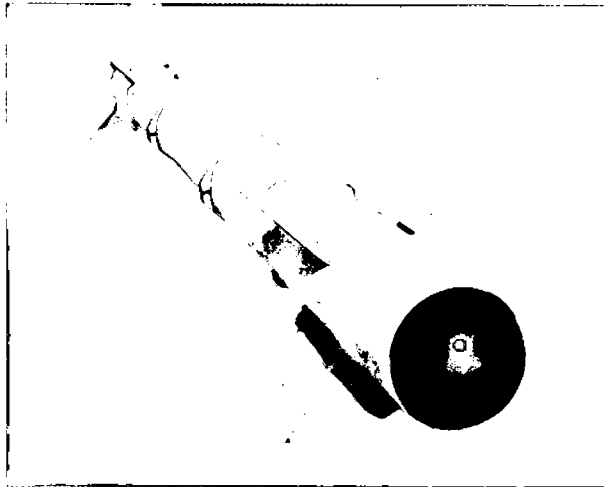


Figure 13. Kukri heat-seeking air-to-air missile

South African *missile production* has been limited to the copying and modification of foreign systems. South Africa's main surface-to-air missile, the Cactus, is a copy of a French design. The principal air-to-air missile in the SADF inventory is the Kukri V-3, which is made in South Africa and shares design features with the US Sidewinder and French Matra. In 1980 the South African Navy introduced a new naval missile, the Skorpion, which it claimed was indigenously designed and produced. Both the container-launcher and the missile are identical, however, to the Israeli Gabriel system.

Arms Exports

The need to maintain efficient levels of production and to help offset the growing cost of research and development has put Armscor in the export business. It began exporting its products in 1982, following a brief but highly publicized appearance at an armaments exhibition in Athens. In 1987, Armscor had export revenues of nearly \$1 billion on sales. Armscor today is South Africa's leading exporter of manufactured goods.

Armscor's subsidiary Kentron has produced a new antitank missile based on the US TOW missile. Unlike the TOW, the South African ZT-3 Masala uses a modulated laser guidance system rather than the original wire guidance system that did not work well in the bush conditions of southern Africa. The new missile reportedly was deployed in Angola, launched from both helicopter and armored personnel carriers. The ZT-3 bears a close resemblance to the Israeli MAPATS antitank missile, which is also a modified TOW with a laser guidance system.

Most of Armscor's exports involve ammunition, spare parts, training, and maintenance contracts rather than new equipment. Competition from other exporters and buyers' political sensitivities concerning association with South Africa have limited sales of equipment, although Armscor has made large equipment sales to Iran, Iraq, and Morocco.

In addition, South Africa's reliance on certain foreign governments for its own arms technology has led Armscor to be less aggressive in competing against some arms exporters, particularly Israel.

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Facing New Challenges

Despite its many accomplishments, Armscor faces new challenges in the 1990s that will test its capabilities. Armscor's rapid development and expansion over the past two decades gave South Africa self-sufficiency in the weapons, ammunition, and supplies needed to maintain internal security and a military edge over most of its weaker neighbors. Over the past several years, however, South African military planners have been reassessing their needs—a process almost certainly accelerated by recent regional military developments. Soviet deliveries of modern military equipment to Angola, Cuba's deployment last year of well-equipped forces near the Namibian border, and the Zimbabwean Government's interest in obtaining high-technology Soviet aircraft, have highlighted South Africa's serious deficiencies in combat aircraft, jet engines, radars, and electronic warfare equipment. For South Africa to possess a credible deterrent and to guarantee military superiority over its neighbors, it must now have aircraft and antiaircraft missiles capable of dealing with Soviet Mi-24 helicopters and MiG-23 or possibly MiG-29 aircraft; armor and antitank weapons capable of defeating Soviet T-64 tanks; and electronic warfare equipment capable of dealing with a variety of Soviet SAM systems. [redacted]

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Armscor has adopted a twofold approach to these new challenges. It is upgrading further South Africa's existing major air, ground, and naval systems, while also trying to develop and produce new weapons systems—particularly aircraft and missiles—that in the past required foreign technical and material assistance. Much of Armscor's modernization is designed to achieve the "quick fix" and thus depends upon the acquisition of modern technology—such as jet engines—from foreign suppliers willing to circumvent the UN arms embargo. Although these upgrades would not dramatically improve the capability of existing weapons, they would provide Armscor with additional time for research and development of new weapons systems. [redacted]

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Upgrading the Inventory

The most urgent modification programs involve fixed-wing aircraft. The second phase of the Cheetah program, scheduled to be completed within five

years, is now under way and involves the refitting of the aircraft with new engines. With its current French-built ATAR 9C or ATAR 9K-50 engine, the Cheetah is underpowered compared to the Angolan and Cuban-piloted MiG-23s, a fact that led the South African Air Force (SAAF) to withhold Cheetahs from action in Angola.³ Armscor, however, does not yet have the expertise or capability to build jet engines and instead is seeking to obtain them overseas. [redacted]

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South Africa is also modifying its fleet of approximately 45 Mirage F.1s. The F.1 is the most advanced aircraft in the South African inventory and at present surpasses the Cheetah in performance. Although less ambitious than the planned Cheetah modification, the F.1 program, which reportedly involves new tracking radar and electronic countermeasures equipment, is probably also benefiting from outside assistance. [redacted]

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Despite the recent introduction of a wheeled armored vehicle claimed to be capable of destroying late model Soviet-built tanks, Armscor is reportedly also upgrading further the SADF's fleet of some 250 Oliphant tanks. [redacted] Oliphants are to be rebuilt to a new "super" specification. The changes include addition of an image intensification and laser range-finding sight for the main 105-mm gun, new spaced armor on the turret front and sides, composite armor on the glacis plate, and a new transmission to improve turning capacity. [redacted]

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³ The MiG-23 weighs approximately 35,000 pounds and is powered by a Tumansky R29-B turbojet, which generates 27,500 pounds of thrust. The Mirage III/Cheetah weighs approximately 30,000 pounds and is powered by an ATAR 9C turbojet, which generates 13,670 pounds of thrust or an ATAR 9K-50 engine, which generates 15,900 pounds of thrust. Although speed is not always critical in aerial combat, [redacted]

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several hard turns, the South African aircraft cannot maneuver into launch position for their air-to-air missiles. Moreover, Angolan and Cuban MiGs now carry modern Soviet missiles with all-aspect capability. One South African Mirage F.1 was badly damaged by one of these missiles during an encounter in early 1988. [redacted]

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(b)(1) With priority given to the air and armor forces, *naval* modernization has slipped to the bottom of the list of priorities. South African Navy commanders, however, are likely to argue that Namibian independence will increase the relative importance of naval forces to patrol coastal waters off the South African exclave of Walvis Bay and to replace partially land-based staging facilities in Namibia, especially in the Caprivi Zipfel. The Navy already is refurbishing its three 1970s-vintage French-built, Daphne-class submarines. [redacted] press reporting, the upgrading includes improved fire-control, navigation, electrical, and mechanical systems. The first of the three submarines to be modified is now undergoing sea trials. According to press reports, work will begin soon on modernizing the two remaining submarines, which are expected to remain in service beyond the turn of the century. [redacted]

New Programs

(b)(1) Much of Armscor's research and development work is devoted to the development of new aircraft and missile systems, with a secondary emphasis on armor. The development of a new South African *fighter* aircraft, however, would be a long, arduous, and probably uncertain process. Atlas Aircraft has assigned a full-time design bureau to the effort and has allocated the necessary resources for the manufacture of a small twin-engine fighter, [redacted] [redacted] Armscor officials are concerned about the costs of producing a twin-engine aircraft, noting that it may eventually evolve into a single-engine plane. Like many of South Africa's other major weapons systems, the new aircraft will probably be a copy of an existing aircraft design. Pretoria has been particularly interested in the defunct Israeli Lavi program [redacted]

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(b)(3) The biggest obstacle to Armscor's plans will be an engine for its new fighter; even the Lavi was to be powered by a US-designed engine. Pretoria claims it will produce its own engine, but to date only five nations—the United States, the USSR, the United Kingdom, France, and China—have successfully manufactured high-performance jet engines, and their

governments would not want to be accused of violating the UN arms embargo. Other countries that have produced combat aircraft—such as Sweden, Italy, and Brazil—have used foreign engines because of the high cost and technological demands of establishing an independent production capability. Recognizing that indigenous development and production may prove to be prohibitively expensive, we suspect that Armscor is attempting to obtain new engines or engine technology clandestinely. Armscor may attempt to develop a limited production capability for such foreign-designed engines if only to ensure a reliable supply of spare parts. [redacted]

Armscor is also intent on producing its own *helicopters*; those now in the South African inventory are of foreign manufacture. [redacted] [redacted] more research and development attention has been given to the design and manufacture of an indigenous attack helicopter than

[redacted] improved to the point where it may soon be able to manufacture attack helicopters, although production will probably still depend on the need to import a wide variety of parts. Armscor last year unveiled two new prototype attack helicopters: the XTP-1, a modified Puma 330, and the Alpha-XH1, a modified Alouette III. [redacted] Armscor officials claimed that both helicopters were intended for demonstration and testing only. [redacted]

[redacted] Armscor expects *missiles* to be a major component of its force modernization program. South Africa's most pressing need is for advanced mobile surface-to-air systems and effective air-to-air missiles. [redacted]

[redacted] fully inadequate." The SAAF's need for modern systems was demonstrated in July 1988 when Angolan MiG-21s flew undetected to the Calueque Dam area in southern Angola, bombed the dam, and killed South African soldiers. New air-to-air missiles would

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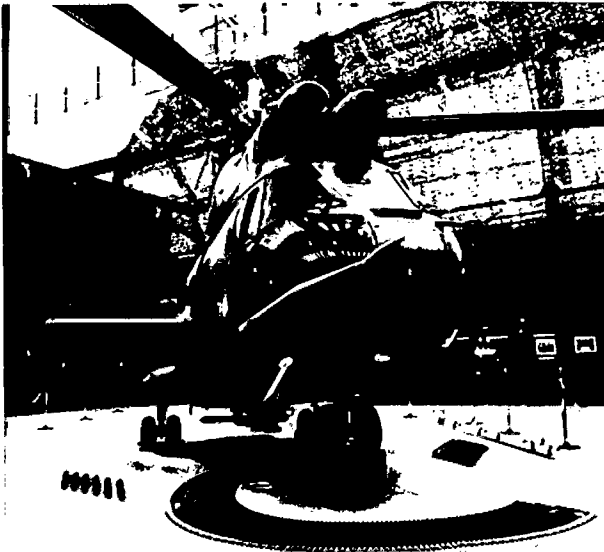


Figure 14. South African-modified "Alpha-XH1" Alouette III helicopter

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be necessary to complement any new fighter aircraft, which otherwise would still be at a disadvantage in air battles.

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In reaction to the augmentation of Cuban forces in 1988 and the resulting shift in the military balance against South Africa in Angola, Armscor has attached a higher priority to enhancing its intermediate range surface-to-surface missile capability.

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SAAF officials want to have a missile with at least a 500-kilometer range. Given the breadth of military cooperation between South Africa and Israel in the early 1980s, we consider it highly likely that at least some less advanced technology derived from Israel's Jericho ballistic missile was provided to Pretoria.

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Despite South Africa's need for a number of new missile systems, Armscor's prospects for successfully producing them are not promising. South Africa has a relatively sophisticated chemical industry, but it has not been able to manufacture the solid-fuel propellants that long-range missiles require.⁴ Furthermore, South

⁴ The US Embassy reports there have been rumors that the South African Airways 747 that crashed off Mauritius in November 1987 went down because of a fire in the cargo hold caused by improperly stored chemicals. According to Embassy sources, the chemical involved was ammonium perchlorate, the main ingredient for solid-fuel propellants.

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Africa does not have an indigenous electronics industry that can engineer the increasingly sophisticated microelectronic components required by missile guidance systems. The types of missiles that South Africa needs most—antiradiation air-to-surface missiles to use against Angolan SAM sites and surface-to-surface missiles to use against airfields—require the most sophisticated guidance systems. Foreign assistance may not be available for these key components because many of the West's most sophisticated missile systems contain US technology produced under license. Few countries, including Israel, are likely to risk losing access to US technology by selling the most advanced systems to Pretoria.

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Despite the apparent satisfactory performance of South African tanks deployed in Angola, Pretoria reportedly is engaged in at least one tank development project; Armscor has nearly completed the prototype of a new main battle tank. The prototype is large, in the 60-ton class, has a glacis plate made of composite armor, and also has unusually high ground clearance. Armscor's tank project may be receiving foreign assistance.

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Paying the Piper

South African weapons development has suffered consistently from a shortage of skilled personnel at all levels. Armscor officials identified a shortage of trained engineers as one of their biggest problems, the system of unequal education for blacks has produced a labor force of mostly unskilled or semiskilled workers. Government figures indicate that only 9 percent of South Africa's work force is skilled compared to an average of 33 percent in other industrialized countries. South Africa historically has addressed the shortfall in skilled labor through immigration, but in times of heightened racial conflict it has experienced a net emigration of engineers, professionals, and technical workers. The skilled labor shortage, in our view, will force the defense industry to pay a hefty premium for skilled expatriate engineers and other professionals.

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South African Defense Spending

South Africa's official budget allocation to defense in fiscal year 1987/88 was \$3.3 billion, up \$780 million or 10 percent in real terms from the previous year.^a The defense allocation was nearly 6 percent of GDP and over 14 percent of total South African Government spending for the year. Official defense spending as a portion of GDP is roughly equivalent to that of the United States, 5 to 6 percent. The official budget allocation, however, represents only a portion of actual defense spending in South Africa.

Industrial Research and various university institutes and departments that conduct military research. We believe that appropriations for these items that fall outside the official South African Defense Force (SADF) budget probably added an additional \$1.4 billion to defense spending in 1987/88.

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In our judgment, the total cost of all defense-related spending in South Africa is probably 50 percent higher than the public defense budget. As in other highly militarized states, many defense-related activities occur outside the formal defense sector, while others are simply disguised.

The blurry distinction between the public and private sectors in South Africa and the proliferation of government organizations as a result of the homeland policy also provides the government ample opportunity to hide defense-related expenditures. Many of the companies producing military equipment are state-owned or -controlled companies and receive annual subsidies from the government that are not included as part of the official defense budget. In addition, revenues from military exports are used to supplement the budgets of the various defense contractors. In fiscal year 1986/87, South African military exports were estimated to amount to nearly \$1 billion.

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The budgets of government departments other than defense are also used to disguise funds earmarked for defense-related purposes. For example, funds for military intelligence are channeled through the Secret Services Account, which was reported in press accounts to be about \$100 million in 1987/88; the Department of Public Works pays for the construction of military bases, which press reports suggest cost \$160 million in 1987/88. Other departments that provide military-related services include the Department of Community Development, which is responsible for housing military personnel; the Health Department, which underwrites some military medical expenditures; and the Council for Scientific and

Other defense expenditures are hidden in the budgets of the so-called independent homelands of Ciskei, Transkei, Bophuthatswana, and Venda, which have their own armies that perform some functions that would otherwise fall to the SADF. As nominally separate political entities, the homelands have their own budgets and technically raise their own revenues. However, the impoverished homelands actually rely on subsidies subsumed under the Foreign Affairs component of the South African budget. According to Foreign Minister Pik Botha, Pretoria provided nearly \$1.5 billion in subsidy payments to the independent homelands in 1987/88. We estimate that nearly \$280 million was used for military purposes. Similarly, the South African Police, which are independent from the SADF but have extensive paramilitary capability, received a separate allocation of \$750 million in the 1987/88 budget.

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^a The fiscal year in South Africa begins on 1 April

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The pressing need for new aircraft, missiles, and armor will require an arms production effort that will result in an unprecedented use of South Africa's industrial capacity. Sophisticated weapons systems are usually manufactured from hundreds of different kinds of industrial metals and materials. Although South Africa appears to have the appropriate diversity within its manufacturing sector to support arms production, most of the manufacturing capabilities are geared to producing mining equipment and consumer goods. The reliance of Armscor on private suppliers that are not wholly dedicated to producing armaments, in our view, will markedly boost the production costs of South Africa's defense industries. [redacted]

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The relatively small size of the manufacturing sector is probably the critical factor that will push up production costs significantly and press Armscor to continue its search for outside suppliers of advanced parts and equipment.⁵ Although South Africa's manufacturers may have the know-how to produce the components, the scale of the domestic market makes the costs of producing a small number of sophisticated weapons extremely high. Armscor officials publicly admit as much when they say that imported parts are still used because of their lower cost. [redacted]

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South Africa's defense industry will increasingly have to compete with other government budget items for scarce resources. Because of its high-priority, spending on defense to date has not suffered any significant cuts. However, South Africa's ability to develop and complete expensive projects such as a new fighter aircraft, which are always subject to cost overruns, may be limited for financial reasons during the next few years. This would be particularly likely if the economy continues to grow only modestly as a result of stagnant export revenues, due in part to sanctions. [redacted]

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⁵ South Africa's manufacturing sector is much smaller than those of other weapons-producing nations. Manufacturing output is \$200 billion in West Germany, \$120 billion in France, \$100 billion in the United Kingdom, \$90 billion in Italy, \$30 billion in South Korea, but only \$13 billion in South Africa. (All figures are in 1986 US dollars.) [redacted]

(b)(3)

Outlook and Implications

Armscor's development over the past 20 years has given Pretoria arms self-sufficiency only in a limited sense. South Africa has the capability to produce the weapons, ammunition, and equipment needed to maintain internal security and to fight a guerrilla war directed against South Africa or to support one against most of its neighbors. The South African military, however, clearly does not have the weaponry to match a sophisticated and well-armed opponent. Pretoria often boasts that its well-trained personnel can compensate for deficiency in military equipment. Recent events in Angola, however, suggest that, unless South Africa is threatened directly, Pretoria probably would not be willing to suffer the political costs associated with heavy white casualties. As a result, we believe that Armscor will continue to try to develop advanced weapons systems that would allow Pretoria to maintain a military edge while minimizing combat casualties. [redacted]

(b)(3)

We believe that South Africa's defense industry will be hard pressed to produce advanced aircraft, missiles, armor, and electronics systems. Few countries other than the United States and the USSR have been able to build successfully the range of weapons systems South Africa needs. Armscor may be able to jumpstart the process by buying, borrowing, or stealing the plans for an advanced combat aircraft or missile system, but it still will have to manufacture components—such as jet engines or electronic guidance systems—that it has never successfully produced and may not be able to finance. [redacted]

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We therefore expect Pretoria—despite its desire for self-reliance—to redouble efforts to circumvent the UN arms embargo and obtain foreign assistance for its defense industry. South Africa will almost certainly succeed in acquiring some material and technology from abroad. [redacted]

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(b)(1) [redacted] Armscor and Israel's defense industries continue to maintain a well-established relationship. We believe Armscor will also probably find some other willing partners, as the potential loss of lucrative markets in the Persian Gulf encourages arms manufacturers in other countries to look for new customers. South Africa's need for modern, sophisticated weapons and equipment, willingness to pay premium prices, and ability to operate discreetly could make it an attractive market for some arms dealers. [redacted]

to come. South African military planners could eventually find their options limited, however, by a neighbor's acquisition of significant advanced weaponry, particularly from the Soviets. Moreover, the effort to maintain military superiority will carry economic opportunity costs, particularly if—as seems likely—Pretoria continues to fund the defense budget at the expense of socioeconomic programs that are intended to defuse the country's racial crisis. [redacted]

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(b)(3) Nevertheless, we doubt that foreign assistance will be sufficient for South Africa to acquire, develop, or produce state-of-the-art military equipment. Even under the best of circumstances, Pretoria will almost certainly remain a step behind in military technology, in large part because those few countries capable of providing highly advanced equipment will be deterred by the UN arms embargo and the political risks of dealing with a pariah state. Wholly indigenous production of a new generation of fighter aircraft, for example, will almost certainly exceed Armscor's capabilities. [redacted]

The United States, in our judgment, will have little direct influence over South Africa's weapons development efforts. Given Washington's compliance with the UN arms embargo, the South Africans are unlikely to ask for direct US military assistance, except in the most dire circumstances, because of Pretoria's expectation that the United States would demand far-reaching racial reforms in return. In our view, any significant leverage that the United States may have over South Africa's weapons projects would stem from US influence over those allies and other arms exporters who might supply South Africa with technology, equipment, tools, and parts. [redacted]

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We believe that Pretoria's weapons development program will enable South Africa to maintain relative superiority over most of its neighbors for some years

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