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C O M P U T E R I Z I N G A P A R T H E I D

export of computer hardware

to South Africa

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Foreword

This report on the role of computers in South Africa is to be welcomed since it addresses one of the most serious gaps in the implementation of the international arms embargo against South Africa.

It is precisely because the international community recognised the strategic importance of computers in enforcing internal repression as well as its crucial role in the apartheid war machine that several decisions were taken at various levels by the United Nations, the European Community, the Commonwealth and others to restrict and end its export to South Africa.

One of the unfortunate features of sanctions against South Africa is that most of them have been prevented from being adopted as mandatory decosions of the United Nations Security Council because of the determined opposition of the western veto countries - Britain, the United States and France. When these and other governments are asked to strictly enforce such non-mandatory but agreed sanctions they are quick to respond by claiming that they are not "binding" and only "voluntary". This makes a mockery of solemn decisions, presumably made after careful consideration and with genuine intent, by concerned governments. When a government supports a decision and votes in favour of it there should be the expectation that it will carry it out - there is no reason why a joint agreement made voluntarily should not be binding. Governements should therefore be held to their commitments.

If the computer sanctions had been implementd comprehensively it would have seriously weakened the South African military, security and police apparatus as well as the overall apartheid economy. However, as with so much else, those governments with the power to end such collaboration have been among the most reluctant to adopt effective measures.

At the same time public action to promote such measures has been hampered by the absence of adequate information. Some of the

available information has been compiled for this report, prepared by the Holland Committee on Southern Africa, and it is to be hoped that this publication will stimulate further research and action on this subject.

This publication provides information about the need to enforce computer sanctions against South Africa more strictly and to make them comprehensive.

Abdul S. Minty

Director
World Campaign against Military and
Nuclear Collaboration with South Africa

Oslo, 10 May 1990

Summary and conclusion

Computers are indispensable to any modern society. The apartheid regime in South Africa is not only dependent on modern computers for its economy but also for the application of racial segregation, and especially for the armed forces and the police. For that reason computer sanctions are an important part of international sanctions against South Africa.

In this publication more information is given about the dependence of South Africa on collaboration with the outside world in the field of computers, especially for military purposes (chapter II). An overview is given of the ties between different countries and South Africa in this field, and the sanctions measures taken by these countries (chapter III). Finally attention is given to the ties of the various western computer firms with South Africa (chapter IV).

The South African army and police and the South African arms industry are to a large extent dependent on foreign computer equipment and technology. In orde to make the country less sensitive to foreign sanctions, the South African government has promoted the development of a computer industry of its own. But also this industry is not self-sufficient. It strongly depends on foreign technology as to equipment, licences, components, know-how, manpower and scientific contacts.

As a considerable part of private industry in South Africa works for the army and the arms industry, computer sanctions will only be effective if they are applied against the country as a whole, and not just against the armement industry, the army and police. That a computer boycott against South Africa can be effective is clear from the practice of the so-called COCOM embargo of the western nations against the Warsaw Pact countries.

Given the great military importance of high tech computer equipment and technology, a computer embargo against South Africa should be seen as a logical next step in addition to the arms embargo of the United Nations against that country. But the

mandatory UN arms embargo of 1977 limits itself to computers for direct military use. For other purposes most western nations still export their computers and their computer technology to South Africa. Of all the countries that have a computer exporting industry only Australia, Canada, Denmark, Finland, Norway and Sweden have imposed a total boycott.

Most of the large manufacturers of computer equipment in West Germany, Great Britain, Italy, France, the Netherlands, the United States, Japan, Taiwan, South Korea and Israel have ties with South Africa. All these countries are important suppliers of computer equipment to South Africa.

Computer firms can be forced to break of their relations with South Africa by boycotting their products. In this report details are given about the ties with South Africa of 69 important computer manufacturers (see table V).

All Data Australia (from Australia), Dansk Data (from Denmark), Nokia (from Finland) and Norsk Data (from Norway) can be regarded as alternative suppliers of computer equipment, instead of companies that maintain ties with South Africa.

Chapter II. South Africa's use of foreign computer equipment

II.1. Introduction

From the beginning, the South African government has understood the crucial importance of computers for a smooth functioning of the apartheid system. It needs computers for its policy of racial segregation, for its economy, its army and its police.

Since the 1950's, foreign multinationals like Plessey, Racal, General Equipment, Marconi, Decca, EMI, ITT, Sperry (Unisys), IBM, Siemens and AEG have been central to the development of the South African computer industry.*[1] They therefore played a crucial role in the build-up and day to day functioning of apartheid. It is only since the beginning of the 1980's that South Africa started a drive towards indigenous production in order to become less dependent on foreign companies.

This chapter examines to what extent South-Africa has been successful in reducing its foreign dependence. First we present the recent efforts of the South African government to promote the development of a national computer industry. Next, we investigate to what extent this industry and the South African armaments industry are still dependent on foreign countries for equipment, licences, components, know-how, manpower and scientific contacts. The chapter closes with two paragraphs on the use of foreign computer equipment by the South African army and police.

II.2. South Africa's computer industry: Government policy

"Integrated circuits form part of all sophisticated weapons using electronic systems. A local manufacturer of integrated circuits will be invaluable from the point of view of defense strategy". Those were the words of Defence Minister Botha at the opening

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[1] Landgren, 1989, p.136.

ceremony of a South African factory manufacturing integrated circuits for electronic weapons in 1976.*[2] Two years later a leading authority on telecommunications in South Africa stated: "I firmly believe that the ability to apply micro-electronic techniques over a wide spectrum of applications will determine whether South Africa remains the leader in Africa. And I'm not merely talking about the advance of telecommunications and industry and commerce - I'm talking about defence. For the mastery of micro-electronic techniques is the key to effective military strategy".*[3]

In the 1980's the South African government has adopted a policy to reduce dependence on imports of electronic equipment with strategic value, and to stimulate the manufacture of high-technology products with export potential. To a large extent this policy can be explained by South African fears for foreign sanctions which could cut South Africa off from foreign supplies.

Fear for sanctions

In 1989 an investigation of 120 hardware user establishments in the Pretoria-Witwatersrand-Vereeniging-area showed that most end users felt that the threat of sanctions or disinvesment was a concern in terms of product availability and 93 % of this end-user segment identified products from the United States as being the most vulnerable.*[4]

Many users have been laying in stocks in case there should be difficulty in obtaining equipment in the future. As a result there is a large amount of equipment that is unproductive.*[5]

About the results of a total electronics boycott against South Africa the chairman of the advice body of the South African government for electronics, Carel van der Merwe, in 1989 said: "if there were a total boycott (..) we would most certainly have

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[2] Tuomi and Vayrynen, 1982, p.168.
Apartheid and the British Electronics Worker, AAM, United Kingdom, p.2, cited in: The Philips Connection, 1980, p.11.

[3] Postmaster-General Louis Rive in: Financial Mail Supplement, Telecommunications Survey 1978, p.28, cited in: The Philips Connection, 1980, p.11.

[4] Dataweek 27-1-1989 p.6.

[5] Financial Mail 14-7-1989 p.89.
See also: Peirson, S. Tribune 23-7-1989.

a problem and we would probably not be able to survive after a number of years".*6

In 1989 the president of the Computer Society of South Africa, Keith Mattison, said while the industry could cope with the sanctioning of equipment by standardizing and manufacturing locally, the crunch would come if countries stopped selling technology - software and books - to South Africa. "Most companies are taking the precaution of buying locally but in the long term we can't beat sanctions - they'll kill us", he said.*7

A striking example of the dependency of the South African armaments industry on foreign investments is the Protection of Business Act of 1978. This Act prohibits foreign subsidiaries from complying with orders or instructions from their overseas head offices without prior permission from the South African government. Thus, after 1978, an order from abroad to a company in South Africa not to sell its products to the military could only be complied with after permission from the South African Government.*8

The extremely low tempo at which computer sanctions against South Africa have been effected up until now has given South Africa ample time to prepare herself for sanctions. The South African government has, for example, drawn up a plan to rationalise state computing resources if South Africa were totally cut off by sanctions. All computer users in the security apparatus, as well as in departments dealing matters like tax and identity books, have been graded on a three tier scale. This determines "what technology you would get in terms of where you stood on a priority list".*9

Stimulating state policy

In 1984, the South African government appointed a special committee to carry out government strategy to support indigenous electronics development. The committee was made up of, amongst

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6 Computer Mail (Financial Mail) 31-1-1986.
7 Knowler, N.Mercury 11-5-1989.
8 Landgren, 1989, p.234.
9 Dobson, in: Southscan vol 4 no 40, 27-10-1989 p.306.

others, the Council for Scientific and Industrial Research (South Africa's national research institite), the state-owned arms manufacturer Armscor and the Nuclear Corporation. Its strategy was two-pronged: firstly, state buying power should be mobilised to increase the local content of electronic products, and, secondly, state aid should be provided for research and development of electronic systems.*10

State buying power

In 1989 Economic Affairs & Technology Minister Steyn announced an incentive scheme that provides for the allocation of 40 million Rand a year for the partial funding of electronics development projects with export-potential or import replacement potential. Companies which apply successfully for the incentives will have up to 50 percent of the cost of a specific project met by the State.*11

In the handing out of contracts to companies responding to State tenders, the government gives preference to manufacturers which use locally designed or manufactured equipment.*12 The government levies a 5 percent penalty against imports when evaluating tenders.

In 1986 the South African Government (including parastatals) absorbed 42 percent of all South African computer sales. The State is the largest consumer of electronics products, and accounted for about 40 percent of the industry's turnover in 1989.*13

It is also clear that the state's repressive arm, the military, is among the largest consumers of the rapidly growing electronics industry. In 1981 it was estimated that 250 million dollars a year was spent by the South African Defence Force (SADF) on electronic equipment in weaponry, while the South African electronic industry as such was valued at merely 150 million dollars a year.*14

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10 Landgren, 1989, p.137.
11 Financial Mail 7-7-1989 p.98.
12 Financial Mail 12-5-1989 p.91. E.g.: The South African Transport Services give preference to suppliers who can provide terminals with 25 % local content (Market Report, 1987).
13 Market Report, 1987, p.4 ; Financial Mail 12-5-1989 p.91.
14 Financial Mail 13-2-1981, cited in: Landgren, 1989, p.136.

The apartheid regime's stimulating policy has resulted in substantial investment in the local production of military electronics systems, telecommunications equipment and TV sets.*12

South Africa's research effort: the role of CSIR

In the build-up and stimulation of the electronics sector by the apartheid-regime, the South African Council for Scientific and Industrial Research (CSIR) plays a strategic role. The CSIR is "South Africa's leading source of comprehensive scientific and technological expertise". The CSIR concentrates on twelve selected areas which are considered "critical" to South Africa. It has more than 4.000 employees, and more than two-thirds of its income comes from the South African government.*15

CSIR's annual report emphasises its "soft" and non-strategic applied research in areas as diverse as air pollution, housing, food science and cancer.*16 Given the regime's extensive restrictions on information regarding the military, it is not surprising that CSIR's research on dental care would receive more public attention than the organization's contributions to South Africa's military potential. Nonetheless, the CSIR is a major part of the military establishment, and together with the state-owned arms-producer Armscor, it makes up the backbone of Pretoria's military research and development effort. For example, in its 1988 White Paper on the organization and functions of the South African Police the South African government admitted that the expertise of the CSIR "is utilised to assist the SA Police in the development, inspection and acquisition of equipment".*17 *18

CSIR also does research on computers and micro-electronics. It has a Micro Electronics and Communications Technology Division.

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15 CSIR, Annual Report 1988, p.4,5,8,10,28.

16 CSIR, Annual Report 1987, p.11-13,20-22,26, Annual Report 1988, p.13,16,21,22, Technology Impact, 1989, p.10,15,16,25.

17 White Paper on the organisation and functions of the South African Police, Minister of Law and Order, 1988, p.68.

In 1981 two CSIR employees were awarded police medals for their military research (Automating, 1982, p.52). Recently the CSIR participated in the development of a rubber bullet machine, developed in cooperation with the South African Police (Davis and Leonard, 1989, p.3).

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In 1988 CSIR developed the first South African designed and processed high frequency semi-custom ECC chip.*[19]. In the same year, CSIR proudly announced it had developed the first South African super computer (see Table I on mainframes and super computers).

Specialisation in South Africa's computer industry

Computer industry officials speaking at the 1989 South African Computer Fair said that companies are developing "niche markets" locally and abroad. South Africa is seen as specializing in two areas: software applications and computerized armaments. *[20]

Software and computerized armements

Eight South African companies are known to export software.*[21] In the field of computerized armements the following examples are known: In 1982 South Africa produced a computerized digital air navigation simulator, and a year later a computerized mobile inventory system for spare parts allocation for military vehicles was introduced. By 1984 the South African arms producer Armscor advertised in overseas journals with airborne, ground-to-air, air/sea and maritime communications systems and a hand-held data entry terminal. Another system offered for export by Armscor is a computer controlled artillery fire control system, produced by the South African electronics company ESD and comprising a

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19 CSIR, Annual Report 1988, p.15.
20 Southern Africa Chronicle, July 3, 1989, p.3.
21 The Johannesburg softwarehouse Syspro exports its Integrated Management System for Production, Distribution and Accounting Control (IMPACT). Other South African exporters of software are: Pink Software (TurboCAD and TurboCash), SWF Systems ,Easy 2000 and Anglo American Electronics Laboratory (AAEL) (Financial Mail 20-2-1987 p.94, 20-1-1989 p.73, 5-5-1989 p.67, Computing SA 19-9-1988 p.14, Dataweek 7-10-1988 p.5), and Comcon (Tetrarch package) and SKOK Systems (SKOK CAD system). Altech, an affiliate of the South African electronics producer Altron, was in 1986 one of the contractors selected for Israel's digital telephone exchange network. (Financial Mail 20-6-1986 p. 119). Altron has 10 percent of its total turnover outside South Africa (Financial Mail 8-9-1989).

digital minicomputer.*[22]

Foreign expansion

A number of South African electronic and computer companies have successfully expanded abroad.

Investments overseas yield much-needed foreign exchange for South African companies and help them to counter Pretoria's diplomatic and economic isolation.*[23] The South African authorities probably regard at least some of the capital outflow by South African companies with benevolent eye, particularly if expansion overseas offers possibilities for evasion of sanctions.*[24] Pretoria is well aware that South Africa is very vulnerable to highly selective or targeted sanctions.*[25] South African companies have a large number of subsidiaries in Great Britain.*[26] Via a British subsidiary Altech, an affiliate of the South African electronics producer Altron, acquired four British companies in the high-tech sector.*[27] Via another British subsidiary Altron has investments in the United States, the United Kingdom and some other European country.*[28] Altrons subsidiary Fintech has subsidiaries in the United Kingdom, Switzerland and Zimbabwe.*[29] Other foreign investments by South

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[22] International Defence Review, Dec. 1984, p.1811, cited in: Landgren, 1989, p.139 ; Landgren, 1989, p.144.

[23] Smith and Jenkins, South dec. 1988 , p.25.

[24] Lipton, Sanctions and South Africa, Economist Intelligence Unit Special Report No. 1119, 1987, p.91.

[25] Bolton, 1988, p.3/4.

[26] Bolton, 1988, p.1.

[27] This British subsidiary of Altech is Peek Holdings. Via Peek Holdings Altech owns the following British subsidiaries: Sarasota Technology, manufacturers of electrical instruments and sensing devices including nightsights, Husky Computers, Polysonic, and Dubillier, manufacturer of RF components (Bolton, 1988, p.18/19).

[28] This British subsidiary of Altron is Telemetrix, manufacturer of computer graphic monitors. Via Telemetrix Altron has the following foreign investments: In the United States: GTI, a electronics components group, and Esco, a components distributor. In the United Kingdom: the semi-conductor division of Plessey. In Norway: Rasterex, a graphics equipment supplier. In an unknown European country: Components Trading and Carhena Finance (Computing 12-9-1988 p.3, Engineering 16-9-1988 p.3, Financial Mail 8-9-1989, Financial Times 6-5-1988). Another subsidiary of Altech is Calvert Holding in the United States (ICFTU, June 1989).

[29] Litemaster (ICFTU, June 1989)

African computer companies are in Israel, the United States, West-Germany, Swaziland, Zambia, the United Kingdom, Panama and Portugal.*30

II.3. South Africa's computer industry: dependence from abroad

An assembly industry, dependent on imports

As recent as 1988, senior general manager of the Industrial Development Corporation, van der Merwe, judged the South African electronics industry as follows "We could never make the large variety of components required to keep our sophisticated system going. (..) Our local electronics industry is a labour intensive assembly industry based on imported components and technical licence agreements (more often than not limiting if not prohibiting exports)".*31

South Africa's dependence on imports is illustrated by trade statistics as well.

According to South Africa's Minister of Technology, South Africa imported 2,8 billion Rands of electronic goods in 1986, being the sixth largest net importer in the Western World. It imported 45 percent of its requirements of these products, which accounted for no less than 11 percent of its total imports.*32

The South African exports of electronic goods amounted to 153 million Rand in 1986, which is only 0,6 % of its foreign exchange earnings. The biggest and fastest growing electronics sector -

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30 Fed Electronik in West Germany by Federale Volksbelegging BPK; Telettra in Swaziland by Reunert; and Hotline in Panama by Punchline (Mc Gregor 1988). Sucaro Investments in Jersey by Reunert; Tedelex in the United Kingdom, Zambia and Israel and Systema in the United Kingdom by Television and Electrical (ICFTU, June 1989). Atir in Israel and Salton in the United States by Bromain (Landgren, 1989, p.138). Allyson Lawless, a South African supplier of technical software has opened a office in Portugal (Computing 11-10-1988 p.88).
PC Support, a services company in the South African business computer sector, has a British joint-venture with Kalamazoo Plc of the United Kingdom: Computer Support Ltd (Financial Mail 27-6-1986).

31 Engineering 5-8-1988 p.28.

32 South Africa imported for 2,8 billion Rand of electronic goods in 1986. South Africa's Minister of Economic Affairs & Technology, cited in: Dataweek 29-7-1988 p.1.

the computer industry - is the largest spender of foreign exchange and has been the least successful in generating export revenues.*[33]

South Africa's dependence on foreign skills and knowledge

There can be little doubt that one of the major headaches for the South African data processing industry is an acute shortage of skilled staff.*[34] The president of the South African Institute of Electrical Engineers even warned that a serious manpower shortage is causing the local electrical and electronics industry to decline to third world status.*[35] South African recruitment agencies make big efforts to attract foreign staff for the South African computer industry. They seem to look mainly for employees from the United States, the United Kingdom and Australia.*[36] As a result of this foreign recruitment some South African computer factories depend on key personnel from abroad.*[37] Moreover, many South African computer companies are dependent of foreign multinationals for know-how about new developments. Companies like Amdahl, Control Data, NCR and Philips regularly organize courses, either in or outside South-Africa, to transfer knowledge about their most recent products to the South African market.*[38]

Technological information is also obtained through international databanks. In 1988 South Africa linked up with such a databank, providing data on newly registered patents, a useful source of technical information.*[39] CSIR's South African Information Technology Information System (SATIS) carried out 800 overseas on-line data base researches in 1988.*[40]

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33 Dataweek 29-7-1988 p.1 ; Financial Mail 12-5-1989 p.91.
34 Computing 11-10-1988 p.4.
35 Engineering 17-3-1989 p.3.
36 South African recruitment agencies like: CPL Computer Personnel, OnLine and Tingley Management Selection (Computing 18-7-1988 p.6, 17-10-1988 p.32, 23-1-1989 p.5).
37 E.g.: The Southafrican microcomputer factory of the Taiwanese Shen Group is not only staffed with local employees, but also with key personnel from Taiwan (Cox, Computing 13-2-1989 p.9).
38 Computing 18-7-1988, 28-3-1989 p.13, 8-5-1989 p.33 ; Emeny, Suppl. Dataweek 4-11-1988 p.3.
39 Engineering 16-9-1988 p.38.
40 CSIR, Annual Report 1988, p.14.

With its overseas offices in Washington, London, Bonn and Paris and its membership of the International Council of Scientific Union (ICSU) CSIR is dependent on international contacts too. In 1987 25 South African scientists attended ICSU meetings abroad and more than 24 foreign scientists and engineers were working for the CSIR in South Africa.*[41]

Lack of confidence

South Africa's dependence on foreign computer products, technology and skilled staff is aggravated by the fact that South Africans find it difficult to trust their own products.
A survey conducted in 1988 by a South African organisation for market research revealed that only 56 percent of the South African computer users said they would consider buying locally manufactured mini-computers, and that 75 % would consider buying locally manufactured personel computers. A year later research amongst 120 hardware user establishments in the Pretoria-Witwatersrand-Vereeniging-area showed that 50 percent of the personal computer end users canvassed were of the opinion that a "locally manufactured" label on a personal computer lacked credibility. In 1988 it was reported that in South Africa assembled personel computers have an "out of box" failure rate of 41 percent.*[42] All this has resulted in a situation that local products are still not really wanted: they accounted for less than 5% of computer-equipment sales in South Africa in 1988.*[43]

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[41] CSIR Annual Report 1987, p.28. More than half of the 37 CSIR executives and directors have studied at universities outside South-Africa, mostly in the United Kingdom or the United States (CSIR Annual Report 1987, p.8-31).

[42] Dataweek 27-1-1989 p.6 ; Business Marketing Intelligence, cited in: Financial Mail 8-7-1988 p.78 ; Computing 17-10-1988.

[43] Financial Mail 9-2-1990.

Table I. South Africa's foreign dependence per product

South Africa's dependence on foreign computer components can be illustrated through a product by product analysis:

Micro-chips and integrated circuits

South Africa is not able to compete with the large volume of chips being produced by the Japanese and American manufacturers, and can only compete in specialised niche markets.*[44]

Nonetheless, South Africa has a micro-chip producer: the South African Micro Electronics Systems company (SAMES). SAMES originally started as a joint venture between the state-owned Industrial Development Corporation (IDC) and the West German company Siemens *[45].

Since 1980 SAMES produces integrated circuits for telecommunications. Four years later, SAMES was capable of producing 20 seperate designs of integrated circuits, and more recently, SAMES enabled the local design and manufacture of electronic circuits on silicon chips.*[46]

Notwithstanding these efforts, South Africa's dependence remains. SAMES' 20 designs of integrated circuits made up but a very small part of the 30.000 seperate designs of integrated circuits in use in 1984. And in 1985 SAMES and IDC manufactured but 25 of the more than 2000 types of chips used in South Africa.*[47]

Semi-conductors

The Industrial Development Corporation produces semi-conductors locally. But according to the vice-president of the American company Motorola " ... the use in South Africa of locally made semiconductors in locally assembled electronics is below world

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[44] Business Marketing Intelligence, cited in: Peirson, S Tribune (SA) 23-7-1989. Financial Mail 24-6-1988 p.92.

[45] International Focus on Transnational Corporations in South Africa and Namibia, Division for Economic and Social Information of the United Nations Department of Public Information, Sept. 1985.

[46] Financial Mail 12-5-1989 p.91 ; Mitteilungen, 1984 ; Dataweek 21-4-1989 (23-3-1989?).

[47] Mitteilungen, 1984 ; Financial Mail 21-6-1985.

average".*48

Micro-processors

The American electronics companies Intel and Motorola supply most of the micro-processors employed by South African companies.*49

Disk drives

About 85 percent of the disk drives installed in personal computers in South Africa are made by Seagate (from the United States).*50 All mini and mainframe drives are imported. Unisys has a repair facility at Midrand.

Personal and mini-computers

South Africa has its own producers of personal computers, e.g. Oscar, Tedelex and TSM. Low-tech p.c's are quite easy to make, but still, most components must be imported from the Far East (Taiwan, South Korea).

South Africa also has the capacity to make minicomputers and intelligent terminals. By 1981 al least three South African companies were able to produce them: CDS, ESD and TSM.*51

But generally speaking, South Africans put more trust in foreign than in locally designed p.c.'s and minicomputers.

Mainframes and supercomputers

Super computers are more powerful than mainframes and are used, amongst others, by big multinational companies like Royal Dutch Shell. In 1988 South Africa's Council for Scientific and Industrial Research (CSIR) announced it had developed the first South African super-computer. A year later CSIR's venture arm,

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48 Financial Mail 7-8-1984.

49 Close to 90 percent of the microprocessors, according to Electronics and Instrumentation, Nov. 1979, cited in: Sisulu, 1985, p.70 ; See also e.g.: Cox, Computing 3-10-1988 p.3 on Sequel, and: Cox, Computing 13-2-1989 p.9 on Prowtech.

50 Financial Mail 2-6-1989.

51 Simon, Financial Times 26-5-1981 p.XII, cited in: Landgren, 1989, p.139. The Southafrican companies Oscar, Tedelex and TSM (ISM and Barlow) produce personal computers; CDS, ESD and TSM produce minicomputers (o.a. brand names Encore and Quantum) (Dataweek 27-7-1988 p.68; annual report 1987 Gencor Group; Financial Mail 21-4-1989, 28-4-1989 p.93, 8-7-1988 p.78 ; Landgren, 1989, p.144).

Technifin, and the South African computer company Altech, teamed up to take this computer into production.*[52] However, at the core of the CSIR's MC2 supercomputer is a microprocessor developed by Inmos from the United Kingdom.*[53]
In the same year the South African computer company TSM announced the development of South Africa's first IBM-compatible mainframe.*[54] This mainframe, the MF100, is the result of a joint development project between the South African computer company TSM and an unnamed international company. Users of the local mainframe will still need to acquire a licence for the operating system from local IBM-distributor ISM. According to the managing director of TSM the MF100 has a local content of 50 percent (by value). *[55] However, in 1990 TSM decided to put the production of the MF100 on ice "to ensure long-term manufacturing viability".*[56] In other words: risks were too high at that moment.

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52 This Southafrican computer is called the Massively Concurrent Computer (MC2). The machine comprises a series of inter-linked printed circuit boards each of which carries a Transputer microprocessor (Financial Mail 26-5-1989 p.85).

53 Financial Mail 16-6-1989 p.79.

54 the IBM 370 compatible MF 100 ; Financial Mail 16-6-1989 p.79.

55 Financial Mail 26-5-1989 p.85 , 16-6-1989 p.79.

56 Financial Mail 9-2-1990.

II.4. The use of foreign computer technology by the South African armaments industry

In South Africa, production for civilian purposes and production for military purposes are strongly interwoven. In 1985, about 70% of the value of South African military products, was produced by the South African private sector. Up to 3000 companies, amongst which many national and foreign manufacturers of electronics and computers, are believed to be sub-contracting to Armscor, and 400 of those are more or less dependent on the contracts with Armscor.*57

Foreign licenses and components for South Africa's arms industry

The possibility of acquiring licences from overseas is the single most important explanation of how South Africa was able to build its military industry. Without access to foreign technology, the list of weapons produced would be very short. The second most important source of military technology to date has been the multinational companies operating in South Africa, which provide components and material for Armscor industries particularly crucial to the electronics industry. Foreign corporate investment has been an important source of capital, equipment and technical know-how for the South African arms industry.*58

The following examples concern the acquisition of foreign technology in the sector of military electronics: The factory producing the radio compass for the Impala jet fighter was set up by General Electric subsidiary Marconi (from the United Kingdom) in 1967.*59 Plessey was responsible for the development of a tellurometer needed in South Africa missile production and in 1976 participated in the establishment of a new factory manufacturing integrated circuits for electronic weapons.*60 Most of

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57 Evans, Weekly Mail 2-2-1990 C64 ; South African Department of Foreign Affairs, South African Yearbook 1985, p.322, and Ostrowsky, South Africa's Military Build-up, March 1983, p.5, both cited in: van Basten and Enthoven, Armscor en Apartheid, August 1986, p.58.

58 Landgren, 1989, p.232-234.

59 Landgren, 1989, p.68.

60 Tuomi and Vayrynen, 1982, p.168.

the components used in Grinels frequency hopping manpack radio are of foreign origin.*[61] Tactels high frequency hopping radios are based on technology from the French firm Thomson CSF. For the development of the Cactus all-weather mobile air defence SAM system South Africa was dependent on Thomson CSF also. The electronic components and guidance systems for the Skerpioen ship-to-ship missile are produced under licence from the Israeli firm Tadiran Electronics (a subsidiary of Koor Industries). Eloptro's production of night-vision equipment is based on an Israeli licence or on ITT technology. Trivetts-UEC naval communications has drawn on French technology. The Know-how for Kentron's helmet sighting system (linked to the weapon aiming computer for the Kukri missile) might be of Israeli origin.*[62] A research project in 1983 showed that Philips in South-Africa has a great number of components for electronics warfare machinery (ECM) and other military applications for sale.*[63] And since 1986 Philips has been accused of selling VMF-buses for guided weapons in South-Africa.*[64]

Technology supplied by foreign corporations has also been central to the development of South Africa's nuclear programme.*[65] Several of the foreign corporations involved are large producers of computers or computercomponents. The two Koeberg reactors, construction of which started in 1976, were built with French money, after a design of the American corporation Westinghouse. Alsthom (Societe Generale d'Electricite) from France, and Hitachi, Mitsubishi and Toshiba from Japan were among the suppliers of parts.*[66] Alsthom stil does repair work for the nuclear plants.*[67]

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[61] Statement Conrad, 13-9-1985, United Nations Public Hearing on the activities of transnational corporations in South Africa and Namibia, cited in: Sisulu, 1985, p.72.

[62] Landgren, 1989, p.106-108,139,141-143,145.

[63] Pulse (SA) Jan. 1982 ; Electronics and Instrumentation (SA) March 1982 ; Dataweek (SA) 25-6-1982 / 3-9-1982 ; all cited in: Nederland en de bewapening van Zuid-Afrika, 1983, p.24/26.

[64] Kagie, Vrij Nederland (Neth) 15-11-1986.

[65] Childs, United Nations Centre against Apartheid, Notes and Documents, 6/84, cited in: Sisulu, 1985, p.21.

[66] Landgren, 1989, p.161.

[67] Daily Dispatch 26-9-1989, cited in: ANC Newsbriefing 1-10-1989.

Foreign computer equipment for South Africa's arms industry

The Southafrican armaments-industry is not only dependent on foreign licences and components, but also on foreign computer equipment for its production process. Thirteen companies involved in South African military productions have been identified as using American computer equipment:

Table II. U.S. hardware at companies involved in South African military production in the 1980's

Company	Area of expertise *68	US hardware installed*69
AECI	Explosives, like microchip-controlled expert explosives and teargas	DEC IBM
Atlantis Diesel Engine	Engines for military vehicles	Unisys
Atlas Aircraft	Military aircraft	Sperry (Unisys)
Barlows Electr.		Hewlett P.
ESD	Specialized electronics, such as AS-80 computer-controlled fire control system	DEC IBM
Fuchs	Components for self-propelled rockets	Data Gen. Hewlett P.
Grinel	Military communications, suchs as TR178 frequency hopping manpack radios	Hewlett P.
Infoplan	Computer services for military purposes	IBM Mohawk
Koeberg	Nuclear plant	Westingh.
Leyland S.Afr.	Military jeeps	IBM
Marconi S.Afr. (Barlows)	Military electronics	NCR
Sandock/Austral	Naval strike craft and armored vehicles for police and military use	Burroughs (Unisys)
Trivetts/UEC	Naval communications, such as computer-aided target-motion analysis	DEC

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68 Landgren, 1989, p.50,53,55,65-78,84,85,88,98-100,117, 119,128,142-144,160,161 ; Automating, 1982, p.55, and Engineering 5-8-1988 p.7 (on AECI) ; Sisulu, 1985, p.71/72 (on Grinel).

69 Computing 12-9-1988 p.2 (on EACI-DEC) ; ISM Inform July 1988, in: Computing, July 1988 (on AECI-IBM) ; Davis and Leonard, 1989, p.3 (on Atlas Diesel-Unisys).
Africa News 7-12-1981, Boston Globe 28-2-1982, IBM correspondence to AFSC 13-2-1981 (on Atlas Aircraft-Unisys and Infoplan-IBM), South African Computer Users Handbook 1980/1981 (on AECI-IBM, Barlows Electronics, Infoplan-Mohawk, Leyland and Marconi), all cited in: Automating, 1982, p.45,52,55.
South African Computer Users Handbook 1986, cited in: Conrad, 1987, p.6 (on ESD, Fuchs, Grinel, Sandock and Trivetts).
Survey of Race Relations in South Africa 1983, Johannesburg, 1984, p.110 (on Koeberg).

Foreign computers for South Africa's military research

South Africa's civilian and military research institute, the CSIR, is dependent on foreign computer equipment. CSIR's Centre for Advanced Computing and Decision Support operates CSIR's five mainframes *70 , which are vital for much of CSIR's military research. The core of the CSIR's scientific/numeric system is made up of IBM 3090 equipment. Furthermore, the CSIR does its research with computers manufactured by Amdahl, Control Data Corporation, Digital Equipment, Hewlett Packard, IBM and Motorola.*71

Transfer of foreign computer skills to South Africa's military sector

Technological knowledge about military electronics is obtained from foreign countries via scientific exchanges, training courses, etc. For example, IBM has supplied Infoplan, an army institute writing military computer programmes, with training and technological data.*72 Sometimes scientific and training contact are not only used to obtain technical information, but for the smuggling of arms as well.*73

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70 CSIR, Annual Report 1987, p.29. CSIR's Centre for Advanced Computing and Decision Support incorporates CSIR's former Centre for Computing Services (CCS) and National Research Institute for Mathematical Sciences (NRIMS). In 1979 the NRIMS designed a sophisticated system for fingerprint storage and worked on a military contract for Infoplan concerning target acquisition (Automating, 1982, p.103).

71 Davis and Leonard, 1989, p.3 (on Control Data) ; Automating, 1982, p.103-107 (on DEC, IBM and Motorola) ; Houser, Relations between the United States and South Africa, United Nations Centre against Apartheid, Notes and Documents, 11/84, Aug. 1984, p.12 (on Amdahl) ; Computing 19-9-1988 p.3 (on Hewlett Packard).

72 Automating, 1982, p.45. In 1984 an employee of the South African National Institute for Defence Research visited Britain to undertake research at the Royal Radar Establishment, and a colonel in the South African police visited Marconi and the Essex police (How Britain Arms Apartheid, 1985, p.24).

73 E.g.: In 1984 a South African professor of electronics of Stellenbosch University was arrested in the United Kingdom an arms smuggling case. He was closely associated with Pretoria's missile development programme and had visited a defence research project at the University of Sheffield and a Marconi factory to discuss infra-red guidance systems (Palister and Norton-Taylor, Guardian (UK) 17-12-1988 B59).

II.5. The use of foreign computer equipment by the police

Computers for racial classification

The Population Registration Act of 1950 remains the cornerstone of apartheid. Every citizen must be classified into a racial group: black, coloured, Indian or white.*[74] The Population Registration is kept by the Department of Home Affairs. The Department has about 100 offices and controlling stations spread throughout the country.*[75] Of each South African citizen the Department keeps a record of name, sex, date of birth, civil state, adress, driving license, fingerprints, and "racial classification".

As far back as 1974 it was reported that the South African authorities were interested in importing a computer from the United States capable of transmitting fingerprints, which could make it possible for a person caught without documents in any part of the country to be identified in less than 30 minutes.*[76]

In 1972 the Department of Home Affairs introduced a computerized Population Register. By 1987 already 27 regional and district offices of the department had been linked with the mainframe and 45 offices were to follow soon. In 1982 the Department of Home Affairs used two IBM Model 370/158 mainframe computers to store its Population Register. Until 1986 all personal records and fingerprints of the black population were kept by the Plural Affairs Department, which used an ICL computer for this.

In 1987 the department of Home Affairs had 18,9 million sets of fingerprints on record. The South African police uses the recorded fingerprints very often. During 1987 in 179.285 cases fingerprints were examined and 13.024 identifications were made. A total of 848.949 persons were checked by means of display screens.*[77]

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[74] Marcus, The South African legal system and the judiciary, June 1989.

[75] State Departments of Southern Africa 1986/87, Randburg, 1986, p.102-104.

[76] Davies, African Workers and Apartheid, IDAF, March 1978, cited in: Sisulu, 1985, p.29.

[77] Department of Home Affairs, Report 1-7-1986 to 31-12-1987, Pretoria, March 1988, p.7,15-17 ; Automating, 1982, p.15,17 (on IBM and ICL) ; Annual Report of the Commissioner of the South African Police for the period 1 July 1986 to 31

Other foreign hardware

Details about the police are closely held, but it appears that South Africa's police have had access to imported hardware for several years. According to the American publication "Automating Apartheid"(1982), a South African ex-intelligence agent acknowledged that the National Intelligence Service (NIS - which was known as BOSS) maintains a top-secret computer facility with extensive files on government opponents.*[78] According to a press report in 1980, the intelligence service collects and stores information from a number of sources, including mail covers, telephone taps, informants and agents. The computer, said one article, "is the heartbeat of the organization. It provides any information stored within seconds, and often this information is called up for research or reference purposes."*[79] Bent on maintaining the strictest secrecy possible, the government has not disclosed the origin of its intelligence agency's hardware. But since South Africa relies exclusively on imports for its large computers, it is almost certain that the NIS system came from a foreign supplier.

Several firms have been implicated in supplying hardware for use by the South African Police in Pretoria. In 1974, two on-line terminals, made by Mohawk Data Science, were installed in the Pretoria headquarters as part of the police automated "criminal investigation" system, which used a British-made ICL (STC) unit for a central processor. Two years later the police upgraded their system with a more advanced ICL Series 2900 computer. In 1978 ICL exported two 2960 computers to the South African police. One of these exports was explained as "a general purpose computer which will replace existing ICL equipment used for internal police administration and to help trace stolen cars".*[80]

In 1979 it was revealed that Control Data Corporation (from the United States) had manufactured and supplied to ICL equipment for

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December 1987, p.24.

[78] Automating, 1982, p.28.

[79] Sunday Express 13-1-1980, cited in: Automating, 1982, p.28.

[80] Management Dec. 1978 , Computing (UK) 17-8-1978 , both cited in: Automating, 1982, p.29. How Britain Arms Apartheid, 1985, p.17.

use in the computers destined for the South African police. Control Data is a close business partner of ICL and admitted that it sells "hundreds of disc drives" to ICL. ICL sold nine high-speed computers to the South African police, containing nine 9780 disc storage units sent by Control Data to its U.K.subsidiary, CDC Ltd, under a blanket export licence issued by the American Commerce Department. Once the units arrived in Britain, Control Data's subsidiary re-sold them to ICL, which incorperated them into the mainframes destined for the South African police. In 1982 the American Commerce Department announced that ICL and its South African subsidiary had been fined 15,000 dollar for re-exporting the American equipment to South Africa's police.*81

Pretoria's national police computer system was designed to be flexible. It can be upgraded and expanded at will by adding new programs and peripheral hardware. In the spring of 1980, for example, the police announced that the Criminal Bureau had launched a nationwide computerized suspect tracking system. Using remote terminal links, police operators at regional centers around the country have immediate access to a secret criminal data bank which stores details about anyone on the government's wanted list.*82 Within minutes after police round up suspects in a raid or stop them for questioning, computer operators can tell the line officer whether the detainees are wanted.

Other supplies to the South African police force by foreign computer giants concern software, communication equipment, and security equipment. According to an annual overview of the South African computer industry in 1980, IBM marketed a police software program in South Africa. The handbook listed IBM's "Law Enforcement System" in a series of software packages available in South Africa.*83

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81 St. Louis Post Dispatch 10-3-1979 (on Control Data) , Department of State, Cable to U.S. Embassy, London, 18-5-1979 , U.S. Commerce Department, Press release, 3-3-1982 , all cited in: Automating, 1982, p.29.

82 Servamus, South African Police, April 1980, p.17, cited in: Automating, 1982, p.30.

83 South African Computer Users Handbook, 1980, cited in: Automating, 1982, p.32.

In 1988, the Italian computer company Olivetti was mentioned as writing a programme for a central information register for army and police, that can be used for screening people.*[84]

Computerized security systems on the mines

In 1980 in more than 25 mines a so-called "Labor Information System" was installed. A microprocessor made by an American electronics manufacturer functions as the electronic brain of this network. The system reads workers electronically encoded identity cards and "provides full information on every worker, from his ethnic group to his merit rating, and keeps tabs on where every worker is at any time", according to the Financial Mail.*[85] The labour surveillance network will, in case of strikes, be an important source of information for the security services of the South African mining corporations co-operating with the South African police.

Security systems

A nationwide poll conducted in 1986 showed that in South Africa 51 percent of the white households have a fire-arm. The security industry has increased drastically, often with the help of foreign equipment. In 1986 about 80 percent of the alarm components used in South Africa, were imported.*[86] Various producers of computer equipment are also active in the South African security industry.

In 1981 Sharp advertised its security systems in South Africa.*[87] In 1982 Philips in the South African press announced a cathode tube amplifier for use in Philips television cameras for security purposes. The tube is based on a military cathode amplifier that is used in sights and nightviewers.*[88]

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[84] Zuid-Afrika, Olivetti en de Katholieke Universiteit Brabant, Tilburg (Neth), 1988, p.9.

[85] Financial Mail 11-7-1980 p.132, cited in: Automating, 1982, p.36.

[86] Security Survey, Financial Mail 10-10-1986, p.14/18.

[87] Sunday Times 29-3-1981, cited in: Frederikse, South Africa, A Different Kind of War, 1986, p.44.

[88] Dataweek (SA) 12-2-1982 , XX1500: second generation performance, first generation costs, Philips-Elcoma, 1979 , Nieuws over onderdelen voor electronica, Philips, Eindhoven, mei 1982, no. 19 , all cited in: Nederland en de bewapening van

II.6. The use of foreign computer equipment by the army

Micro-electronics are a life-line to South Africa's defence. Without computers South Africa's army will be immobilized. According to a computer specialist of the South African Defence Force in 1976 "It is impossible to keep up with a lean mobile force unless you use a computer".*[95] The South African Minister of Defence wrote in 1987 that the South African Defence Force is one of the major users of data processing systems in South Africa. People, stores and funds are managed with the aid of advanced data processing systems.*[96]
Pretoria uses computers acquired from foreign suppliers to analyze battlefield data and guide weapons, to transport equipment - even to send call-up notices to draftees. According to a confidential source, the South African Defence Force (SADF) has six major computer centers.*[97]

SADF's computer links to government ministries

The data processing facilities that are at SADF's disposal are not only those owned by the military. SADF also frequently uses the computer facilities of other South African government services and ministeries. With regards to planning, for example, the SADF liaises with the Department of Home Affairs on border security, the Departments of Transport and Civil Aviation regarding harbours, transport, air space control, air safety and the national navigational system, the Department of Posts and Telecommunications on the use of radio and telecommunications, and the Department of Finance regarding the budget.*[98]

DISA

Using equipment from IBM and know-how from local specialists, the SADF has established a sophisticated military computer network

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[95] Jacobs, Paratus (SA) Jan. 1976 p.26 , cited in: Automating, 1982, p.41.
[96] Briefing on the organization and functions of the South African Defence Force and the Armaments Corporation of South Africa Ltd 1987, Minister of Defence, Cape Town, June 1987, p.32.
[97] Automating, 1982, p.41.
[98] White Paper on the Planning Process of the South African Defence Force 1989, Minister of Defence, Cape Town, April 1989, p.4.

According to the German weekly Der Spiegel (1985), the Siemens company has delivered a sophisticated video surveillance system named Telemat C which reacts automatically to all movement.*89 Chubb, a South African subsidiary of the British Company Racal, in 1987 advertised in the South African Defence Force Annual book with electronic alarm systems that use sound, light or infra-red. Chubb also supplies computer-based security management systems.*90

Foreign security-technology is used not only to keep property under surveillance, but also to keep track of persons. Siemens provides many X-ray machines to the private and public sectors for the checking of persons and their luggage.*91 In the beginning of the 1980's Philips South Africa offered fingerprint equipment for the checking of passes and an "Access Control System" which registers who enters through which entrance when.*92

In the mobile radio sector for government use, Philips is one of the dominating producers in South Africa. By the end of 1980 Philips South Africa started to sell a new transmitter/receiver for use on motorbikes by police, security services and other users. In the beginning of 1981 Philips telecommunications offered its SXA-equipment to the South African government, portable radio equipment which, in the past, had been supplied to local South African authorities and the Dutch Army.*93 At the end of 1988 Philips brought into the market a communications logging recorder "ideal for emergency services like police".*94

Zuid-Afrika, 1983.

89 Der Spiegel 19-8-1985, cited in: Sisulu, 1985, p.29.

90 the South African Defence Force Yearbook 1987, published on behalf of the SADF, Durban, p.50 ; IRRC, 1988, p.122.

91 Security Survey, Financial Mail 10-10-1986, p.10.

92 Dataweek 17-9-1982, cited in: Nederland en de bewapening van Zuid-Afrika, 1983, p.22 ; Nederland investeert, 1985, p.136 ; Kagie, Vrij Nederland (Neth) 15-11-1986.

93 Security and Protection of South Africa Dec. 1980, Dataweek 16-1-1981/23-10-1981, Engineering Week 12-11-1981, State Tender Bulletin (SA) 30-1-1981 , all cited in: Nederland en de bewapening van Zuid-Afrika, 1983, p.18/19.

94 Current (SA) Oct. 1988 p.9.

which is housed at the Directorate for Information Systems and Analysis (DISA). The DISA network is the military's first computerized command and control system. DISA technicians use IBM equipment for a range of applications and vital operations including research, simulation projects and military software development. A major application of the system, according to the military, is tactical battle planning. Sitting at an IBM video terminal, DISA operators can simulate actual combat conditions that might occur and factor in terrain and geography in order to anticipate problems in a planned military operation before they happen.

The DISA system is pivotal to South Africa's ability to mobilise for war. Its automated personnel data file with details on every member of the SADF enables commanders to hand-pick individuals for special assignments, based on their combat skills or training. Within minutes, DISA operators can provide military leaders with an analysis of every unit in the force, including its current strength, deployment, location, its requirements and problems.*99

Project Konvoor

In 1977, the SADF mounted an ambtious computerization effort, code-named Project Konvoor. Konvoor was managed by Log-On, set up by IBM staff working on a military project who split off in 1977. Log-Ons 12-million-Rand automated military logistics system apparently usedIBM equipment to supply ammunition and military supplies like communications gear, weapons and helicopters throughout the country. According to the chief of army logistics, Project Konvoor was expected to save the military 50 million Rand per year by streamlining operations. The last phase of the three-year computerization program was slated for completion in the summer of 1980. An official at IBM's international headquarters in the United States acknowledged that IBM South Africa had sold published technical manuals to Log-On since the 1978 embargo went

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99 Jacobs, Paratus (SA) Jan. 1976 p.26-28 , cited in: Automating, 1982, p.42.

into effect.*[100]

Naval surveillance

The surveillance centre known a "Project Advokaat" at Silvermine naval base, relies on computerized activities in monitoring naval movements around the coasts of South Africa. This sophisticated command-, control and communications centre (C3) was designed in the 1960's under the Simonstown agreement with the United Kingdom to protect Western shipping in the South Atlantic and the Indian Ocean.*[101] The surveillance centre, which is hardened to withstand attack with nuclear, chemical, biological and conventional weapons, enables the South Africans to keep a constant close watch on sea traffic in a vast area from North Africa to the South Pole and South America to the Bay of Bengal. NATO and the United States are apparently both linked to the Silvermine network. The complex is also linked to two regional backup headquarters - one in Durban and the other in Walvis Bay, Namibia.*[102] Several mutinational communications and electronics corporations, including AMP, the British General Electric Corporation and Siemens, were involved in setting up the centre and equipped it with modern computerized systems.*[103]

Given the advanced nature of the electronic apparatus installed at Silvermine, it is highly likely that the larger contractors and subcontractors involved in establishment of the system still provide some support services for Silvermine. Indeed, according to one researcher, ITT supplied Silvermine through STC, its former subsidiary in the United Kingdom. ITT/STC has also reportedly recruited and employed engineers and supervisory

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100 Paratus (SA) Aug. 1977 ; Purvis, Datamation June 1979 p.194cc ; IBM, Correspondence to the American Friends Service Committee, 13-2-1981 ; all cited in: Automating, 1982, p.42,43.

101 Sisulu, 1985, p.32 ; Landgren, 1989, p.147.

102 The Apartheid War Machine, IDAF, 1980, p.32 , Wall Street Journal (USA) 31-7-1975 p.26 , both cited in: Automating, 1982, p.48.

103 List of manufacturers indicated in Advokaat documents, undated memorandum, Washington Office on Africa, cited in: Automating, 1982, p.48 ; The Military and Nuclear Collaboration between the FRG and South Africa, Anti-Apartheid Movement of the FRG, p.36, cited in: Sisulu, 1985, p.32 ; Landgren, 1989, p.147.

personnel for the installation.*104

Computers for the air force

Computers have been built into the South African air force early warning system to make it more sophisticated and effective. The computers have been incorporated in the undergroud nerve center of the northern defence sector at Devon, in the satellite station at Ellisras, near the Botswana border as well as at Marieskop on the edge of the Transvaal Drakenburg escarpment commanding the Lowveld and the Mozambique border. The Static radar network at Marieskop is ideally situated for guiding South African air force jets on air raids over Mozambique and Zimbabwe. The system is backed up by a mobile radar unit, that is probably installed in the region of Northern Transvaal.

The two main suppliers of radar equipment to the South African Defence Force in violation of the mandatory UN arms embargo against South Africa are the British companies Plessey and Marconi. Since the 60's Marconi, a subsidiary of the British General Electric Company, has been involved in the installing of static radars with a range of 500 km along South Africa's Northern border.*105

In the fall of 1979 the United Kingdom's Foreign Office confirmed that Plessey was selling radar equipment to the South Africans. The Foreign Office also admitted that the Plessey radar system included computers made by the Digital Equipment Corporation (DEC), and that Plessey was training South African air force personnel on the US hardware. It appears that the DEC/Plessey radar hardware became a part of the military's mobile radar system to protect Pretoria's strike forces during deployment. In April 1981, Plessey sent a follow-up shipment of air defence equipment from the United Kingdom to South Africa.*106 It was claimed that this system, an AR3D unit, had "a genuine civil

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104 Vayrynen, "The role of transnational corporations in the military sector of South Africa", Journal of Southern Africa Affairs, April 1980, p.222 , cited in: Automating, 1982, p.48.

105 Resister No.34, Oct.1984, cited in: Sisulu, 1985, p.32 ; See on GEC also: Tuomi and Vayrynen, 1982, p.169.

106 Lord Carrington, Correspondence to Abdul Minty 3-9-1979; Daily Telegraph (UK) 3-8-1979 ; Guardian (UK) 5-9-1979 ; Abdul Minty, Cable to Secretary of State, 5-5-1981 ; all cited in: Automating, 1982, p.44.

application", but in Jane's Weapon Systems (1979-80) it was described as an "air-defence surveillance radar giving three-dimensional information on targets".*[107] In 1983 Marconi sold 5 million pounds worth of electronic equipment to update an S247 radar, again allegedly for civilian air traffic control. Two years later photographs said to be of this radar appeared in the official journal of the South African Defence Force with the caption: "A Marconi radar at Northern Air Defence Sector, Devon - an intricate part of the fighter control tracking system".*[108]

Satellites for military purposes?

In 1960 the NASA, the United States space agency, announced agreement with Souh Africa for the establishment of three satellite tracking stations. Two years later the United States installed a military space tracking station, which reverted to Pretoria when the US later withdrew. According to NASA, Pretoria and Washington concluded a Memorandum of Understanding in 1980, which permits the South Africans to establish a ground station to receive signals from the US civilian satellite, Landsat. The South African Landsat station went into operation in 1980.*[109] The station, based at Hartebeesthoek, is operated by the CSIR.*[110]

South Africa is linked up with INTELSAT, the international satellite communication organisation, through three microwave dishes at the Hartebeesthoek satellite tracking station, of which two have access to the INTELSAT Atlantic Ocean region satellite tracking station and one to the Indian Ocean system.

In 1979 the American General Electric Corporation openly promoted an advanced satellite-based communications network with explicity military and police applications inside South Africa. The network

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107 How Britain Arms Apartheid, 1985, p.15.

108 Observer (UK) 4-8-1985, cited in: Sanctions Handbook, 1987, p.271.

109 South Africa, Time Running Out, The Report of the Study Commission on US Policy Toward Southern Africa, Berkeley, Foreign Policy Study Foundation, 1981, p.347 ; NASA, Interview with the American Friends Service Committee, 13-3-1981 ; both cited in: Automating, 1982, p.47.

110 Automating, 1982, p.106 ; CSIR, Annual Report 1988, p.15.

was proposed for South Africa in a South African electronics journal by a GEC scientist from the United States. He explained that the proposed system uses a stationary satellite to link a command center on the ground with personnel using mobile radios. Ground operators can use the system for communications with aircraft, and for remote sensing. "Users include not only tanks, jeeps and trucks but even sensors located on a country's borders to observe clandestine foreign intrusion", noted the scientist. The heart of the GEC network is the satellite itself. South Africa has no launching facilities of its own and would have to rely on a NASA-launched satellite to serve as the hub of the system. According to the proposal the South African network could use either of two satellites available from GEC: a BSE or a Discus III, one of a series launched by NASA exclusively for military use.*[111]

Pretoria's interest in satellite based communications has clear military backgrounds. As noted above, Pretoria got hold of a U.S. military space tracking station in the 1960's. Afterwards, South Africa got interested in the manufacturing of a domestic satellite and set up an "interdepartmental" committee, which included the military, to investigate the question of a domestic communications satellite. A decision on the matter was to have been taken by the end of 1983. The recommendations of the committee, however, have not been made public.*[112] In 1985 the state owned broadcasting corporation signed a 4 million Rand contract with two American corporations to install a satellite based communications system.*[113] The Council for Scientific and Industrial Research ran an interdepartemental study in 1988/89 into satellite feasibility.

Computers for the railways

Although the South African Railways (SAR) are not under direct military control, its vital role in the war effort cannot be overlooked. The SAR is responsible for transporting large

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111 Braham (GEC-USA), Electronics and Instrumentation (SA), April 1979, p.49-52, cited in: Automating, 1982, p.45/47.
112 Sisulu, 1985, p.52,53.
113 Financial Mail 2-8-1985, cited in: Sisulu, 1985, p.52/53.

quantities of equipment - both civilian and military - to and from suppliers and users throughout the country. In order to monitor and manage the flow of cargo and the location of rail cars and locomotives, the SAR established a computerized tracking system based on two IBM processors linked to some 600 terminals at stations across the country. The computer can give the exact load, present location and destination of any freight in South Africa, around the clock. In addition to the central IBM units, the SAR rail control network employs a Nova minicomputer, made by Data General, and equipment from Westinghouse.*[114]

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[114] Electronics and Instrumentation (SA) Aug. 1978 p.7-9, cited in: Automating, 1982, p.43-44.

Chapter III. Computer sanctions against South Africa

III.1. Introduction

As modern computer technology is indispensable to modern armaments, a computer embargo would have been a logical extension of the United Nations arms embargo. But the mandatory arms embargo of the United Nations, accepted in November 1977, obliged all member states to "cease forthwith any provision to South Africa of arms and related materials of all types".*1 Nowhere in the resolution are computers mentioned explicitely.

Although this UN decision made direct sales of computers for military purposes impossible, an important loophole in the boycott is the so-called dual purpose items: equipment which has both a military and civilian use. In this respect the Western arms exporting countries treat South Africa differently from the Warsaw Pact countries. Items may be sold to South Africa as long as they have a possible civilian use. The same items may not be exported to Warsaw Pact countries if they have a possible military use, or even if they concern civilian technologies which strengthen a socialist state's strategic capacity.*2

In 1980 the Security Council committee charged with monitoring and strengthening the arms embargo proposed to the Security Council to decide that "states should prohibit the export to South Africa of dual-purpose items, i.e. items provided for civilian use but with the potential for diversion or conversion to military use. In particular, they should cease the supply of aircraft, aircraft engines, aircraft parts, electronic and telecommunications equipment and computers to South Africa". But as a result of opposition from the Western permanent members, the Security Council never properly discussed these recommendations. Instead of the proposed total ban on the sale of computers, the Security Council in July 1985 urged all states "to prohibit all sales of computer equipment that may be used by the South African army and police". In November 1986 it urged all member states "to

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1 Resolution 418, United Nations Security Council 4-11-1977.
2 Sanctions Handbook, 1987, p.270/306.

prohibit the export to South Africa of items which they have reason to believe are destined for the military and/or police forces of South Africa, have a military capacity, and are intended for military purposes, namely aircraft, aircraft engines, aircraft parts, electronic and telecommunications equipment, computers and four-wheel drive vehicles." *3 So the proposal not to sell computers to South Africa is only a recommendation and is not a binding embargo.

Thus classified as civilian material, computers and electronic equipment are still being exported to South Africa.*4 Once computers have been purchased by a civilian South African government body, it is difficult to determine whether they have subsequently been passed to the military or police. The American authorities have been conducting post-shipment checks in South Africa to ensure against possible diversions, but these checks do not cover every shipment nor guarantee non-violation of the terms of the export licence. The American General Accounting Office has observed that it is even possible for the military or police to use computer equipment remotely (by modem or off-site terminals) without detection by a post-shipment check.*5

That a computer boycott can be effective is shown by the technological embargo by the NATO countries against the Warsaw Pact countries. After a chapter on this so-called COCOM embargo the existing computer sanctions against South Africa by various countries will be discussed.

III.2. The COCOM-embargo

In 1949 the Coordinating Committee for Multilateral Export Controls (COCOM) was established, its aim being to prevent the transfer to the Warsaw Pact countries of technology which could be applied to military use. COCOM was founded by the NATO countries (except Iceland) and Japan, who all are still members

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3 Wallage and Faltas, 1988, p.5,6,9.
4 Landgren, 1989, p.192.
5 Commonwealth, 1988, p.13.

of COCOM.*[6] Austria, Finland, Ireland, Israel, Yugoslavia, Singapore and South Africa are affiliated with COCOM.*[7] The embargoed countries are the members of the Warsaw Pact plus Albania, China, Kampuchea, Mongolia and North Korea, and, to a lesser extent, China.*[8]

The COCOM regulations use three criteria to prohibit export of products: the first is whether the product is "principally used in peacetime for the development, production or use of arms"; the second is whether the product provides technology "of military significance"; and the third is whether the product is important "to the buyer's military capacity".*[9]

The primary activities of COCOM comprise the compilation of three lists of strategic goods: the International Industrial List which runs 173 pages and is extremely detailed, the nine page International Munitions List, and the International Atomic Energy List of seven pages.*[10] These lists are secret. They are converted by the national authorities of the COCOM member states into national lists. Most COCOM states have published their own national control lists modelled after the COCOM lists, requiring an export licence for all items mentioned in case of export to the Warsaw Pact countries.*[11] In principle a permit is not given, except in limited "exceptions" *[12] ,for example in the field of medicine.

In 1984 the list of banned computer equipment was extended. The following descriptions were added: superminis; computers with a greater porocessing speed, systems with certain special kinds of memories and all computer-aided design and computer-aided manufacturing (Cad Cam) applications. Also, the extension of systems already installed was prohibited: so, too, was aiding the

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[6] Roscam Abbing, Internationale Spectator (Neth) May 1987, p.242. The members of COCOM are: Belgium, Canada, Denmark, France, Great Britain, Greece, Japan, Luxembourg, the Netherlands, Norway, Portugal, Spain, Turkey, the United States and West Germany.

[7] Ministerie van Ekonomische Zaken, July 1987, p.VIII/IX.

[8] Wallage and Faltas, 1988, p.15.
Auerbach, Int. Herald Tribune (USA) 28-10-1988.

[9] Landgren, 1989, p.8.

[10] Wallage and Faltas, 1988, p.15/16.
Dirksen, Internationale Spectator (Neth) Oct.1986, p.613.

[11] Wallage and Faltas, 1988, p.17/18.

[12] Dirksen, Internationale Spectator (Neth) Oct.1986, p.613.

embargoed countries with the linking up of their computers to systems in non-communist countries. New items on the list were software and telecommunications apparatus.*[13]

Towards the end of 1987 there was some relaxation concerning small personal computers.*[14] Towards the end of 1988 an American government Advisory Body proposed a further relaxation: the lifting of export restrictions on all clones of the IBM PC-AT, regular personal computers, semi-conductor chips and other elementary computer material.*[15]

In order to ensure that exported goods are not sent to an embargoed destination, a complex system of export permits has been devised by COCOM. If the destination is a "western" country that is not a member of COCOM or a group of nine affiliated countries, a written guarantee that the goods will reach the proper destination in that country is needed before a permit is issued. The recipient of the goods is to furnish this declaration in the form of a government guaranteed End Use Statement to the COCOM board. A permit is also required for the export of COCOM goods from one NATO (COCOM) country to another, but in that case an End Use Statement is not necessary. *[16]

The judicial apparatuses of the various COCOM countries collaborate in tracing contraventions. Transgressors are tried nationally.*[17] Furthermore many American Embassies have Economic Defense Officers who are responsible for checking the export decisions.*[18]

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13 De Automatisering Gids (Neth) 29-8-1984 p.3.

14 Until 1987 a computer was not to be exported to the Warsaw Pact countries if the total speed of processing exceeded 2 million bits per second, if the memory for the user was greater than 1,1 million bit (144 KB), if the computer had more than one micro-processor, or if the microprocessor was more than 8 bit. (Ministerie van Economische Zaken, Netherlands, Uitvoer van strategische goederen 1987, July 1987, p.126, post 1565.H.2.c). Since the end of 1987 the limits are: a speed of 6,5 million bit per second, a memory of 6,2 million bit (756,8 KB), two microprocessors, or a micraprocessor of more than 16 bit. (Ministerie van Economische Zaken, Netherlands, Uitvoer van strategische goederen, Aanvulling december 1987, December 1987, p.25, post 1565.h.2.c).

15 Volkskrant (Neth) 13-12-1988.

16 Ministerie van Ekonomische Zaken, 1987, p.VIII/IX.

17 Dirksen, Internationale Spectator (Neth) Oct.1986 p.617 ; Computable (Neth) 8-3-1985.

18 Dirksen, Internationale Spectator (Neth) Oct.1986 p.616.

Especially the United States government is active in the monitoring and punishment of embargo breakers. The United States keeps a "blacklist" of Western companies suspected of breaking the embargo. Fines are the usual punishment, which may be extended to a total ban on business relations with the offender.*[19] Companies that are put on the "denial list" are banned from receiving any American COCOM-controlled goods.*[20] This is a very effective measure, because most technology goods contain at least some element of software, hardware or know-how that originates in the United States. Denial of a licence for American technology and access to American technology products could quickly put companies out of business. It is also important to note that under the American regulations companies can be held liable if products fall into undesirable hands through a customer subsequently selling the technology or part of it to someone else.*[21]

An example is the prosecution of a Dutch transgressor of the COCOM regulations who had exported computer equipment to Bulgaria. Although it was uncertain whether the equipment was meant for direct military use, the exporter was given a one-year jail sentence in 1985 by a Dutch court of law.*[22]

An example of an American case on the basis of the "denial list" concerns the American firm Digital Equipment. Digital Equipment's West German subsidiary had sold computer equipment to a firm that had previously been convicted because of illegally exporting US goods to the Soviet Union and who therefore had been put on the denial list. In 1984 Digital Equipment had to pay a 1.5. million dollars to settle American federal charges.*[23]

Fears of American reprisals, and endeavours at normalizing the understanding between Sweden and the United States resulted in the Swedish electronics company Ericsson deciding in 1984 not to deliver digital telephones to Warsaw Pact countries.*[24]

Thus, the American regulations do not only have consequences for the companies operating in the United States, but also apply to

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19 Landgren, 1989, p.8.
20 Kapstein and France, Business Weekly, 29-7-1985 p.65.
21 Fagan, Independent (UK) 25-4-1988.
22 Computable (Neth) 8-3-1985.
23 Taylor, Times ?? (UK) 6-9-1984.
24 De Automatisering Gids (Neth) 29-8-1984 p.3.

countries outside the United States. In 1987 the American Senate decided to impose a minimum two-year import ban on goods from the Japanese electronics company Toshiba because a subsidiary of Toshiba was delivering advanced submarine technology (parts for milling-machines and information about computer software) to the Soviet Union.*25

Little is made public concerning application of the COCOM embargo. For the most part it concerns transgressions of the embargo. In two of the above mentioned cases, despite the COCOM embargo, computer equipment did make it to the Eastern Block countries, but in general it can be said that COCOM regulations and the American technological sanctions prevent the transfer of technology to the Eastern Block.

Because of the vigilance of Western authorities in 1985 the Soviet Union had to pay incentives of 300 percent to 400 percent over the selling price of high-tech goods.*26

Furthermore the COCOM lists are not only used for the embargo against the Eastern Block, but also in connection with a number of other embargoes and pacts. The national export controls set up for the COCOM embargo are also being used to enforce the Non-Proliferation Treaty. The Munitions List drawn up by COCOM is used by several countries to monitor their exports of armaments and weapons technology to other countries. The European Community members of COCOM have apparently agreed, probably in the European Political Cooperation, to use the COCOM Munitions List as a definition of the items covered by the mandatory United Nations arms embargo against South Africa.*27

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25 Volkskrant (Neth) 2-7-1987/11-9-1987.
26 Kapstein and France, Business Week 29-7-1985 p.65.
27 Wallage and Faltas, 1988, p.2/17/18.

Table III:

MAIN EXPORTERS OF COMPUTER EQUIPMENT TO SOUTH AFRICA BY COUNTRY IN 1987

	OECD 86	OECD 87	EUR 87	EUR 88	UN 87	CW 86	CW 87
Germany FR	57.348	67.058	34.817	25.899	39.565	305	367
USA	125.744	129.234	-	-	39.341	256	252
UK	102.938	99.030	28.911	57.393	36.166	224	236
Japan	60.889	93.850	-	-	30.990	238	292
Italy	26.405	27.538	10.788	13.103	12.478	79	84
France	33.353	36.132	9.165	27.535	10.680	84	95
Belgium/Lux	10.345	10.438	7.608	783	8.831	22	22
Spain	6.830	9.214	5.412	11.030	6.257	11	16
Netherlands	25.603	20.709	4.436	4.998	5.276	50	57
Ireland	13.747	7.568	3.607	4.007	4.166	15	10
Hong Kong	-	-	-	-	3.568	15	29
Singapore	-	-	-	-	385	9	17
Taiwan	-	-	-	-	-	45	100
Korea South	-	-	-	-	-	-	-
Switzerland	3.124	6.665	-	-	-	57	55
Sweden **	5.997	3.323	-	-	-	17	11
Israel	-	-	-	-	-	10	8

OECD = Exports of office machines and automatic data processing equipment in 1986 (1000 US $). Source: Foreign Trade By Commodities, Exports 1986 ; OECD Department of Economics and Statistics ; Paris.
OECD 86 = Exports 1986 ; OECD 87 = Exports 1987.

EUR = Exports of automatic data processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, not elsewere specified or included (1000 ECU).
EUR 87 = Exports 1987. Sources: External Trade, Nimexe 1986 / Nimexe 1987, Export, J 84-85 ; Eurostat ; Luxembourg ; EUR 88 = Exports 1988. Source: Eurostat ; Luxembourg.

UN 87 = Exports of digital computers, digitl centrl processors, adp peripheral units and off-line data proc equip in 1987 (1000 US $). Source: Statistical Office of the United Nations Department of International Economic and Social Affairs ; New York.

CW = Exports of electrical and electronic products (million $). Source: United Nations statistical office, OECD and national trade reports. Cited in: Independent expert study on the evaluation of the application and impact of sanctions, Final report to the Commonwealth Committee of Foreign Ministers on Southern Africa , table 8.1. ; Commonwealth ; London ; april 1989.
CW 86 = Exports 1986 ; CW 87 = Exports 1987.

** In 1987 Sweden decided to ban all exports to South Africa.

Table IV. Producers of computerequipment that have investment or licence relations with South Africa, or whose products are for sale in South Africa in 1989

Subsidiaries in the 17 countries that are the main exporters of computer equipment to South Africa in 1987

	Bel	Can	Che	Deu	Fra	Esp	Gbr	Hkg	Ire	Isr	Ita	Jpn	Kor	Nld	Sin	Swe***	Tai	Usa
ALCATEL	x		x	x	x	x	x				x			X		x		x
AMDAHL	x	x	x	x	x		x	x	x		x			x	x			X
AMP	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	X
APPLE							x		x						x			X
ARTHUR ANDERSEN	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
AT&T	x	x	x	x	x	x	x	x	x		x	x	x	x	x		x	X
BROTHER	x	x	x	x	x		x		x			X	x	x			x	x
CANON	x	x	x	x	x	x		x			x	X		x	x	x	x	x
CASIO				x			x	x				X					x	x
CIE GEN D'ELECTR	x	x	x	x	X	x	x		x		x	x		x	x	x	x	x
COMPUTER SCIENCES	x	x	x	x			x							x				X
CONTROL DATA		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X
DATA GENERAL	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x		X
DIGITAL EQUIPMENT	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	X
EMERSON ELECTRIC	x	x	x	x	x	x	x				x	x		x	x	x		X
FUJI				x			x	x				X	x	x	x		x	x
FUJITSU		x		x	x	x	x	x	x		x	X	x	x	x	x	x	x
GEN ELECTR (USA)		x	x	x	x	x	x	x	x		x	x		x	x	x	x	X
GEN ELECTR (GBR)	x	x		x	x		X	x	x		x	x		x	x	x		x
GENERAL SIGNAL	x			x	x	x	x	x	x		x	x		x	x	x		X
GRUNDIG	x		x	X	x	x	x				x			x		x	x	
HEWLETT PACKARD	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	X
HITACHI	x	x	x	x	x	x	x	x			x	X		x	x	x	x	x
HONEYWELL	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	X
IBM	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X
INTEL	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	X
KOOR INDUSTRIES	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
KYOCERA				x				x				x						x
LUCKY GOLDSTAR				x			x	x				x	X		x			x
MATSUSHITA	x	x	x	x	x	x	x	x	x		x	X			x	x	x	x
MC DERMOTT	x	x		x	x		x	x				x		x	x	x		X
MC DONNEL D	x	x	x	x	x	x	x	x	x		x	x		x		x		X
MEMOREX	x	x	x	x	x	x	x	x	x		x	x		X	x	x	x	x
MITSUBISHI		x		x	x	x	x	x	x			X	x	x	x		x	x
MOTOROLA	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	X
MURATA		x		x	x		x	x			x	X			x		x	x
NAT SEMICOND		x		x	x		x	x	x	x		x	x	x	x			X
NCR	x	x	x	x	x	x	x	x				x		x	x	x	x	X
NEC		x		x	x		x	x	x		x	X		x	x		x	x
NIXDORF	x	x	x	X	x	x	x	x	x	x	x	x		x	x	x	x	x
OKI				x	x		x	x				X			x		x	x
OLIVETTI	x	x	x	x	x	x	x	x			X	x	x	x	x	x		x
OMRON TATEISI	x	x	x	x	x	x	x	x				X		x	x		x	x
PHILIPS	x	x	x	x	x	x	x	x	x		x	x	x	X	x	x	x	x
PLESSEY			x	x	x	x	X	x	x		x			x	x	x		x
PRIME	x	x	x	x	x		x	x	x		x	x		x	x	x		X
RACAL	x	x	x	x	x	x	X	x	x		x	x		x	x	x		x
RANK XEROX	x	x	x	x	x	x	x	x			x	x		x	x	x		X
RAYTHEON	x	x	x	x	x	x	x				x	x						X
SAMSUNG				x			x	x					X					x
SANYO		x	x	x		x	x	x			x	X	x		x		x	x
SEAGATE				x	x		x	x				x	x	x	x		x	X
SEIKO EPSON	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
SHARP	x	x	x	x		x	x					X	x		x	x	x	x
SIEMENS	x	x	x	X	x	x	x		x		x	x	x	x	x	x	x	x
SONY	x	x	x	x	x	x	x	x	x		x	X	x	x	x	x	x	x
SQUARE D		x		x	x	x	x	x	x		x	x		x	x			X
STC	x	x	x	x	x	x	X	x	x		x			x	x	x		x
SUN MICRO S	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
TATUNG							x	x				x			x		X	x
TEXAS INSTR				x	x		x				x	x		x	x		x	X
THOMSON	x			x	X	x	x	x			x	x	x	x	x	x		x
THORN EMI	x	x	x	x	x	x	X	x	x		x	x		x	x	x		x
TOSHIBA	x			x	x	x	x	x			x	X	x	x	x	x	x	x
TRW	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
UNISYS	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	X
WANG	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	X
WESTINGHOUSE	x	x	x	x	x	x	x		x		x	x		x	x	x		X
ZENITH	x	x		x	x		x	x	x							x	x	X

Sources: Who Owns Whom 1988 and Annual Reports 1988.
*** In 1987 Sweden decided to ban all exports to South Africa.

III.3. Computer sanctions against South Africa

In this section a country by country overview is given of the export of computer equipment and technology to South Africa, and of the current computer sanctions in the various exporting countries. For an overview of the exports to South Africa see table III.

III.3.a. The European Community and Switzerland

In September 1985 the EC countries and Spain and Portugal announced that they would cease exports to South Africa of computer equipment which was to be used by the police or the military. *28 This ban is therefore much more limited than the appeal by the Security Council in July 1985 urging all countries to prohibit "all sales of computer equipment that may be used by the South African army and police".*29

Until that date there were no restrictions on the export of computers. The only exception was in cases where the computers were part of a weapons system. The EC countries apparently agreed to use the COCOM Munitions List as a definition of items covered by the UN arms embargo against South Africa, and computer equipment does not fall under this list.

In October 1987 the European Parliament recommended using all the COCOM lists to define the scope of application of the UN arms embargo. That would mean a ban on the export of paramilitary and sensitive items to South Africa.*30 Also the goods on the International Munitions and the International Atomic Energy Lists of COCOM would come under the EC embargo. The EC Council of Ministers however did not accept this recommendation.

Denmark is the only EC country with more extensive computer sanctions: this country prohibited all equipment exports and services to South Africa. *31

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28 Rozenburg, 1986, p.55.
29 Wallage and Faltas, 1988, p.9.
30 Commonwealth, 1988, p.9.
31 Folketing 30-5-1986.

In 1987 the EC countries West Germany, Great Britain, Italy, France, Belgium (with Luxemburg), Spain, the Netherlands and Ireland were among the 13 biggest exporters of computer equipment to South Africa. Switzerland ranks twelfth on the list of the biggest exporters.
Various West German, British, Italian, French and Dutch manufacturers of computer equipment maintain close ties with South Africa. C.G.E. (Societe Generale d'Electricite), General Electric Company, Nixdorf, Olivetti, Philips, Plessey, Racal, Siemens, STC and Thorn EMI have subsidiaries in that country. All these corporations manufacture products of military importance in South Africa. It is not known whether Thomson has a subsidiary in South Africa, but this company has close links with the South African arms industry. Other firms with South African connections are Alcatel, Grundig and Memorex.
In 1987 the British Department of Trade and Industry even suggested in a brochure that the South African Council for Scientific and Industrial Research (CSIR) would be a suitable costumer for electronic equipment. *32
The large exports of computer equipment from Belgium, Spain, Ireland and Switzerland to South Africa could be attributed to the presence there of many of the 69 multinational manufacturers of computers or computer components who have investments or license relations with South Africa, or whose products are for sale in South Africa (see table IV).

III.3.b. The Commonwealth

In October 1985 the Commonwealth Heads of Government agreed in Nassau on a ban on the sale of computer equipment which could be used by the South African military, police or other security forces.*33 Great Britain did not adhere to this agreement.
In 1987 the Commonwealth countries Hong Kong and Singapore were listed among the 13 most important exporters of computer equipment to South Africa. Exports to that country from Hong Kong

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32 Market Report Computer Technology, 1987, p.5/6.
33 Sanctions Handbook, 1987, p.197.

and Singapore show a steep rise. Between 1986 and 1987 the export of these products from Hong Kong and Singapore to South Africa rose by 91% and 83% respectively.*[34] The large export of computer equipment from Hong Kong and Singapore to South Africa can be explained through the fact that about 40 multinational manufacturers of computers or computer components with investment or licence relations with South Africa, or whose products are for sale in South Africa, have subsidiaries in Hong Kong and Singapore. (see table IV)

The Commonwealth countries of Canada, Australia and New Zealand do not appear on the list of the 17 most important exporters of computer equipment to South Africa. In July 1985 Canada tightened its application of the UN arms embargo to include all sales of sensitive technology and goods (including computers) to the government of South Africa and its agencies. In September 1988 the Canadian government extended this ban to all private sector end-users in South Africa.*[35]

In December 1985 Australia banned the export to South Africa of all computer hardware, including central processing units and printed circuit board assemblies.*[36] In October 1985 New Zealand decided to ban the sale of all computer equipment to South Africa.*[37]

III.3.c. The United States

The United States has always been one of the biggest exporters of computer equipment to South Africa. It is estimated that the American companies IBM, Unisys, Hewlett Packard, NCR and Wang hold 40 % of the South African Computer market.*[38]

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[34] Independent Expert Study, 1989, table 8.1.

[35] Letter to Mr. Hanlon on Canada's implementation of sanctions, Canadian Department of External Affairs, 14-2-1989.

[36] Australian Policy on South Africa, Australian Government, March 1989, p.5.

[37] Letter Customs Head Office, New Zealand, 27-11-1985 ; South Africa: Sanctions: New Zealand Measures, Ministry of Foreign Affairs, Wellington, 19?.

[38] Richard Knight calculated the joint share of IBM, Burroughs (Unisys), Hewlett Packard, NCR and Wang in the South African computer market to be 40 percent in 1985. (Knight, 1986,

In September 1985 the United States banned all computer sales to the South African military, the police, the prison administration, the national security agencies, to apartheid enforcing agencies and to the South African weapons manufacturer Armscor. With this ban the United States followed, in a very limited way the recommendations of the Security Council, but the ban did go further than that of the European Community and Japan. In October 1986 this ban was made part of the American Anti Apartheid Act.

Although sales to Armscor are banned, the ban does not extend to other parastatals or private business in South Africa. Armscor contracts out very significant research and production to private industry.*[39] A 1985 study reported that some 1000 private sector companies handle up to 70% of the military production in South Africa. *[40] Not all American deliveries to the CSIR are banned. The American Anti-Apartheid Act differentiates between the weapons research activities of the CSIR, to which no deliveries are allowed, and the other activities of CSIR, which are not embargoed. Also, not all deliveries to the national government, to provincial or municipal institutions are banned. The Anti-Apartheid Act differentiates between "apartheid enforcing agencies" and other agencies. But with the entire structure of government in South Africa based on apartheid, such a distinction is not realistic.*[41] In addition, the existence of the government network GOVNET linking all their major computers means that remote access from any terminal to any processor is possible, i.e. the police could be accessing a computer nominally sold to the Health Department.

Despite these weak points, the American restrictions enacted in 1985 are not without effect. The American Chamber of Commerce estimated that the embargoed government bodies represent 30 to 40

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p.I). Investigations of the plans of the South African private sector for the acquisition of new Central Processing Units showed a 43 percent share for IBM, Burroughs (Unisys), Hewlett Packard, NCR and Wang in 1987 and 1988. (Market Report, 1987, p.2).

[39] Knight, 1986, p.2-4.

[40] South African Department of Foreign Affairs, South African Yearbook 1985, p.322, and Ostrowsky, South Africa's Military Build-up, March 1983, p.5, both cited in: van Basten and Enthoven, 1986, p.58.

[41] Knight, 1986, p.2-4.

percent of all computer sales. A spokesman of the South African distributor of Rank Xerox told a business publication that he expected to lose 15 percent of his sales.*[42] And when the two last remaining American computer companies, Hewlett Packard and NCR, sold their South African subsidiaries in 1989, a South African computer magazine commented that the American disinvestments "have distanced this country from the most technologically advanced nation on earth": "South Africa will face the constant danger of being out of step with the rest of the First World (..) Supply lines with South African firms left in the wake of disinvestment will become increasingly fragile."*[43]

Of the investigated American producers of computer equipment or components, McDermott is the only company with a subsidiary in South Africa. Through Olivetti in Italy AT&T owns a 22 percent share of Olivetti Africa in South Africa. 31 other manufacturers have license or other relations, or their products are marketed in South Africa.*[44] (See Table V)

Since 1985 the following American computer manufacturers have sold their South African subsidiaries: Amdahl, Control Data, Computer Sciences, Emerson Electric, General Electric, General Signal, Hewlett Packard, Honeywell, IBM, Mc Donnell Douglas, Motorola, NCR, Rank Xerox, Square D, Unisys and Westinghouse.*[45] However the products of these companies are still sold in South Africa, or they have license relations with South African companies.

III.3.d. Japan

In 1965 the Japanese Government banned any direct investment in South Africa.In 1985 the sale of computers to the army and the police in South Africa was banned.*[46] The Japanese implementation of the recommendations of the Security Council is

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42 Knight, 1986, p.2-4.
43 Computing 28-3-1989 p.4.
44 Who Owns Whom USA 1988.
45 IRRC 1989 I/II ; Computing 28-3-1989/10-4-1989.
46 Burgess, Washington Post (USA) 8-1-1987.

therefore as limited as that of the European Community.
Japan is one of the biggest exporters of computer equipment to South Africa. The products of the following Japanese manufacturers of computers and computer components are marketed in South Africa: Brother, Canon, Casio, Fuji, Fujitsu, Hitachi, Kyocera, Matsushita, Mitsubishi, Murata, NEC, Oki, Omron, Sanyo, Seiko Epson, Sharp, Sony and Toshiba.
According to a former counsellor at the American Commerce Department "Japan moved (in South Africa) into sectors the United States traditionnally dominated - mainframe computers, automated office equipment such as photocopiers and facsimile machines, chemicals and automobiles".*47 After much criticism the Japanese government in 1987 formally asked the members of 35 industrial associations in Japan not to "undermine" other countries' sanctions against South Africa by moving to fill any sales gap created.*48

III.3.e. Taiwan, South Korea and Israel

Taiwan, Israel and probably South Korea belong to the list of the 17 biggest exporters of computer equipment to South Africa. Moreover, the three countries are cooperating with South Africa in the international arms trade. Israel and Taiwan figure prominently as partners in military research and development with South Africa.*49
According to figures given by the Commonwealth Secretariat, Taiwan was in 1987 the fifth largest exporter of electrical and electronic products to South Africa. Taiwan was accused of profiting from the sanctions that other countries have imposed.*50 Taiwanese exports to South Africa are rising steeply. Expressed in dollars, the Taiwanese export of electrical and

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47 Prestowitz and Baker, Japan Times (Japan) 6-4-1988.
48 Burgess, Washington Post (USA) 8-1-1987.
49 Landgren, 1989, p.164,181,218,225.
Both Taiwan, South Korea and Israel appear among those nations which have publicly decorated senior Armscor executives and South African defence officials (the others being Argentina, Chile and Paraguay) (Landgren, 1989, p.181).
50 Financial Times (UK) 21-9-1988 U49.
S.A. Report (SA) 7-10-1988 V43.

electronical products to South Africa in 1987 increased by 306% compared with the average value of these exports from 1983 to 1985.*[51] South Africa is especially interested in Taiwanese investment in electronics and machine tools in South Africa.*[52] The products of the Taiwanese computer manufacturers Acer, Board, Longshine, Mitac, Mustek, Sampo, Shen, Tatung and TCI are marketed in South Africa.*[53] Moreover, Mitac, Mustek and Shen have subsidiaries in South Africa where, among other things personal computers are assembled.*[54]

South Korea is an important trading partner of South Africa,*[55] but it does not publish any figures relating to her exports of computer equipment to that country. The products of the South Korean computer manufacturers Lucky Goldstar and Samsung are sold in that country. In 1987 Lucky Goldstar even decided to expand its range of products in South Africa.*[56]

Israel ranks 15th on the list of the biggets exporters of electrical and electronic products to South Africa. A large percentage of the capital of the Israeli producer of electronics and computer components Koor Industries comes from South African banks and Koor Industries has investment in South Africa.*[57] According to a former employee of a South African computer firm, some Israeli software specialists work for sub-contractors to InfoPlan, a computer wing of Armscor, the Israeli computer community in Pretoria could number up to 100.*[58]

The exports of computer equipment to South Africa from Taiwan, South Korea and Israel can be partly attributed to the presence in these countries of subsidiaries of Control Data, IBM, Intel, Motorola and other multinational manufacturers of computers and

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51 Independent Expert Study, 1989, table 8.1.

52 Japan Times (Japan) 21-11-1987.

53 Computing 12-9-1988 p.9, 3-10-1988 p.3, 23-1-1989, 13-2-1989 p.9, 10-4-1989 p.6+8, 22-5-1989 p.20 ; Sunday Times (UK) 17-5-1987 K47 : Computer Mail 1989 Information Technology Yearbook.

54 Financial Mail 16-6-1989 p.79 ; Sunday Times 17-5-1987 K47 ; Computing 13-2-1989 p.9.

55 When one looks at the general exports to South Africa then South Korea is ranked 18th in the list of most important exporters to South Africa in 1987. (Independent Expert Study, 1989, Notes on trade statistics, table 6.1., table 8.1.).

56 Citizen (SA) 4-2-1987 D45.

57 Southscan (UK) 15-3-1989 F52.

58 Dobson, in: Southscan, vol 4 no 40, 27-10-1989, p.306.

computer components with ties to South Africa (see table IV).

III.3.f. The Nordic countries

In October 1985 the Nordic countries (Sweden, Denmark, Finland and Norway) announced a ban on the exports to South Africa of computer equipment that might be used by the South African military or police forces, and a ban on the transfer of patents and manufacturing licenses to South Africa. Finland and Norway banned the transfer of patents or production rights to South Africa, and Sweden introduced controls on the transfer of technology to South Africa.*59

All exports to South Africa were banned by Denmark in 1986 and by Norway, Sweden and Finland in 1987.*60

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59 Commonwealth, 1988, p.9/10.

60 Folketing 30-5-1986 ; Financial Times (UK) 2-10-1987 T45 ; S.A. Report (SA) 9-10-1987 U49 ; NRC-Handelsblad (Neth) 17-3-1987 ; Nordic Newsletter, bulletin of the Nordic Anti-Apartheid Movements, No 1/89, Jan.1989.

Chapter IV. Relations of computer manufacturers with South Africa

Worldwide there are thousands of manufacturers of computer equipment and components. For this study only the following manufacturers have been investigated on ties with South Africa:

- the 90 largest manufacturers of computer equipment and components in the world *[1] , and
- the manufacturers of computers and computer components that have their headquarters in a country which has prohibited the export of computer equipment to South Africa: All Data Australia (from Australia), Dansk Data (from Denmark), Ericsson (from Sweden), Nokia (from Finland) and Norsk Data (from Norway).

Of the 95 companies investigated, 69 maintain links with South Africa. They are companies from West Germany, Great Britain, Italy, France, the Netherlands, the United States, Japan, Taiwan, South Korea and Israel. (See Table V) The other 26 are not mentioned in Table V. As our research was only done on company name, and not on the product names, we cannot exclude the possibility of some of these 26 firms having links with South Africa.

The term "ties with South Africa" has been broadly defined in this study. Not only firms with investment, license and official distribution relations are included. Also included are manufacturers that have no such relations, but whose products are on sale in South Africa.
The American manufacturer Wang sold its South African subsidiary in 1978. The company also ended its licence and distribution

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[1] The 90 largest manufacturers of computer equipment and components refers to:
- the manufacturers that in 1988 had a worldwide information systems revenue in excess of 1,100 million dollar (Datamation 15-6-1989 p.11), and
- the manufacturers of computers and computer equipment that had in 1987/1988 a worldwide return in excess of 1,240 million dollar (The Fortune Directory of the biggest industrial corporations outside the US (in 1987), Computers and Electronics, Fortune 1-8-1988 p.D8-D25 ; The Fortune 500 largest US industrial corporations (in 1988), Computers and Electronics, Fortune 24-4-1989 p.196).

relations with the country, and ordered its distributors not to sell any products to South Africa.*[2] Still Wang is listed because its products are for sale in South Africa. Wang's products - not only second-hand but also new - reach the South African market via the used-products market. Although Wang instructed its distributors not to sell to South Africa, it has neglected to prosecute the distributors through whom the products reached South Africa (after reselling). As Wang cannot be exonerated of all responsibility it has been listed below.

In Table III the letters D, I, L, S, E and A have the following meaning:

D = Distribution agreement with mentioned firm in South Africa
I = Investment, name of the South African subsidiary
L = Licence agreement with South African company
S = Sales of the companies products through South African firm
E = Example of a large sale of the company's products to South Africa,
A = Suspected of ties with the South African armaments industry, army and/or police.

The information concerning the letters D, I, L, S and E almost always refers to 1988 or 1989. Information regarding the ties of computer companies with the South African armaments industry, police and army (category A) is hard to obtain. For that reason all firms whose ties with the military or the police were exposed between 1977 and 1989 are mentioned in the category A. Normally large military electronics projects include provisions for the follow-on supply of parts, spares, maintenance, testing and training, sometimes indefinitely.*[3] For example it is very likely that the British company STC (ICL), which in 1978 delivered computers to the South African police, still has ties with this body.*[4]

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[2] Unified List, 1988, p.78.
[3] Automating, 1982, p.48.
[4] Management Dec.1978, Computing (UK) 17-8-1978, both cited in: Automating, 1982, p.29. How Britain Arms Apartheid, 1985, p.17.

For the years 1988 and 1989 no links with South Africa were detected for the five computer companies in Australia, Denmark, Finland, Norway and Sweden (the countries that prohibited the export of computer equipment to South Africa). A Swedish investigation in 1987 showed however that Ericsson (from Sweden) had ties with South Africa.*[5] Whether these ties have continued is not clear.

All Data Austalia, Dansk Data, Nokia and Norsk Data and South Africa therefore can be regarded as alternative suppliers of computer equipment, instead of companies that maintain links with South Africa. (See Table VI)

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[5] Gray, Sweden and South Africa, the two faces, July 1987.

Table V. Producers of computers or computer-components that have ties with South Africa *6

ALCATEL, Amsterdam/Paris, Netherlands/France
L Altech (Fin.M.29-4-88)

AMDAHL, Sunnyvale, CA, United States of America
D Large Scale Systems, Randburg (a)(c)
A arms industry (see II.4.).

AMP, Harrisburg, Pensylvania, United States of America
S Contelec Components (Data.23-9-88)

APPLE COMPUTER, Cupertino, California, United States of America
S Business Solutions, Westcliff Ridge (a)
S CHT Distributors, Johannesburg (Comp.20-2-89)
D Falcon Computers (c)
S Viol & Erasmus, Braamfontein (a)

ARTHUR ANDERSEN, Chicago, IL, United States of America
Affiliated with partnership in South Africa under the same name (Fin.M.15-4-88/3-6-88)(Unified List 1988)

AT & T (American Telephone and Telegraph), New York, NY, United States of America
S Electronic Building Elements (Comp.13-11-89)
I Olivetti Africa (22 % via Olivetti in Italy) (c)

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6 This list was drawm up on the basis of:
a.the Computer Mail 1989 Information Technology Yearbook 1989,
b.the IRRC-publication"Internat. Business in South Africa 1989"
c.the IRRC-publication"US and Canadian Business in S.A. 1989"
d.the ICCR "South Africa Focus Company List (Nov. 1989)",
* the South African periodicals Computing South Africa July 1988 - May 1989 (Comp.), Current March 1988 - November 1988 (Curr.), Dataweek September 1988 - April 1989 (Data.), Engineering Week August 1988 - April 1989 (Engi.), en Pulse October 1988 - April 1989 (Puls.), and
* a number of other sources.

BROTHER INDUSTRIES, Nagoya, Japan
I Brother International SA (b)
S Maynards Office Tech., Cape Town (a)
S Softmaster, Verwoerdburg (a)
S Viol & Erasmus, Braamfontein (a)

CANON, Tokyo, Japan
S Canoa Importers, Wendywood (a)
S Facs, Greenside (Curr.5-88)

CASIO COMPUTER, Tokyo, Japan
S Tedelex (ICFTU 1988)

COMPAGNIE GENERALE D'ELECTRICITE (CGE), Paris, France
I Alsthom SA (b)
I CGEE Alsthom SA, Johannesburg (b)
I Cegelec (b)
I Delas Weiz (b)
I Sacgea (b)
I Stein Industries, Johannesburg (b)
I Sieva, Johannesburg (b)
I Walther Environmental Systems (b)
A arms industry (see II.4).

COMPUTER SCIENCES, El Segudo, CA, United States of America
S Computer Sciences (c)

CONTROL DATA CORP., Bloomington, MN, United States of America
D Corporate Data Control (Comp.8-5-89)(d)
E In 1989 a Cyber 932/32 mainframe and a Cyber 910 Unix based processor were sold to steel merchant Van Reenen & Nicholls (VRN) (Engi.28-4-89).
A arms industry (see II.4.).

DATA GENERAL, Westboro, MA, United States of America
S Perseus Computer Systems, Sandton (a)
A arms industry (see II.4.).

DIGITAL EQUIPMENT CORP., Maynard, MS, United States of America
S Dexchange, Sandton (Comp.6-2-89)
S Infotech, Pretoria (a)
S Liz Parker Computers, Cape Town (a)
E In 1989 a DEC Microvax 3600 was sold to South African Post and Telecommunications (SAPT) (Comp.9-1-89).
A arms industry (see II.4.).

EMERSON ELECTRIC, St. Louis, MO, United States of America
D Ascoreg (c)

FUJI ELECTRIC, Tokyo, Japan
D Conway Johnson, Johannesburg (b)
S Fuji Electric, Johannesburg (Annual Report Fuji 1988)
S Key Peripherals, Riviona (Comp.17-10-88)
S Negretti & Zambra Instrumentation & Control, Johannesburg (Puls.4-89)
S South Continental Devices, Randburg (Data.21-4-89)

FUJITSU, Tokyo, Japan
S Communica (Data.1-7-88)
S Joffe Associates, Johannesburg (a)
S Lasernet, Sandton (a)
S M & PD, Wijnberg (a)
S Sage Lan Systems, Johannesburg (a)

GEC (GENERAL ELECTRIC CO. PLC.), London, United Kingdom
I GEC South Africa, Johannesburg (b)
A army (see II.6.).

GENERAL ELECTRIC, Fairfield, CT, United States of America
D Flame Electrical (Curr.3-88)
L+D Genwest Industries (c)

GENERAL SIGNAL, Stamford, CT, United States of America
L+D (name unknown) (c)

GRUNDIG, Furth, Federal Republic of Germany
S Provicom Industries, Johannesburg (Data.4-11-88)

HEWLETT PACKARD, Palo Alto, California, United States of America

S Allen Associates, Johannesburg (a)

D Cadart Systems (Engi.19-8-88)

D Communicomp, Sunnyside (Comp.17-10-88)

D GSD Computer Systems, Johannesburg (Comp.8-5-89)

D Hi Performance Systems (HPS) (Comp.22-5-89)

S Joffe Associates, Johannesburg (a)

S Multipro, Johannesburg (a)

S Quadrant Office Systems, Sandton (a)

D Siltek (d)

D Zytron (Siltek), Ferndale (Comp.21-11-88)

E In 1988 five HP 9000 Series 300 workstations, 1400 mb of disk memory and an array of plotters and printers were sold to the CSIR (Comp.19-9-88).

A arms industry (see II.4.).

HITACHI, Tokyo, Japan

S Bowthorpe-Hellermann Deutsch, Johannesburg (Data.27-1-89)

S Persetel, Sandton (via BASF) (b)

S Shadon Electronics, Wijnberg (a)

E In 1989 a Hitachi mainframe computer was sold to the City of Durban (Comp.27-2-89)

HONEYWELL, Minneapolis, MN, United States of America

D Martech Controls, Johannesburg (Engi.5-8-88)

D Murray & Roberts (c)

E In 1988 a TDC 3000 EOS Jnr and a TDC 3000 Multi-function Controller were sold to Africa Products (Curr.12-88).

IBM, Armonk, NY, United States of America
S Computer Equip. Brokers, Johannesburg (a)
D Information Services Management (a)(c)(d)
S Joffe Associates, Johannesburg (a)
S Multipro, Johannesburg (a)
S Sage Lan Systems, Johannesburg (a)
S TSD (a)
S TSE (a)
E In 1988 a IBM 3745 Communications Controller Model 210 was sold to AECI Information Services (ISM-Inform 7-88, in: Comp.).
A arms industry and police (see II.4. and II.5.).

INTEL, Santa Clara, CA, United States of America
S Electronic Building Elements, Pretoria (Comp.10-4-89/13-11-89)

KOOR INDUSTRIES, Israel
I Afitra (Hunter, 1986, p.34)
I Tadiran (Landgren, 1989, p.138,139,219)
A arms industry (see II.4.).

KYOCERA, Kyoto, Japan
S Jensen Electronics, Kramerville (a)(b)

LUCKY GOLDSTAR, Seoul, South Korea
S Promilect, Randburg (Data.2-12-88)

MATSUSHITA ELECTRIC INDUSTRIAL, Osaka, Japan
S Barlows Manufacturing, Johannesburg (b)

MC DERMOTT, New Orleans, LA, United States of America
I Diamond Power Specialty (Who Owns Whom 1988) (Unified List 1988)

MC DONNELL DOUGLAS, St. Louis, MO, United States of America
D Siltek (c)
E In 1989 a Mc Donnell Douglas 19300 computer was sold to the Borough of Pinetown (Comp.8-5-89).

MEMOREX TELEX, Amsterdam, Netherlands
D CRB (Unified List 1989)(Comp.18-7-88)
E In 1989 20 Gbytes of 3680 Memorex Telex DASD and a Memorex Telex 5480 cartridge sub system were sold to Genesys Computer Services, a specialist disaster recovery company (Comp.13-11-89).

MITSUBISHI ELECTRIC, Tokyo, Japan
I Mitsubishi, Johannesburg (b)
S MSA Manufacturing, Johannesburg (Puls.2-89)

MOTOROLA, Schaumburg, IL, United States of America
S Electronic Research Labs., Cape Town (Curr.11-88)
A arms industry (see II.4.).

MURATA MANUFACTURING, Nagaokakyo City, Japan
S Communica, Pretoria (Data.21-10-88)
S Muraco SA, Wijnberg (a)
S Shadon Electronics, Wijnberg (a)

NATIONAL SEMICONDUCTOR, Santa Clara, CA, United States of America
D Electrolink, Johannesburg (c)
D Reunert Mainframe Systems (c)

NCR, Dayton, Ohio, United States of America
D Fintech (Comp.10-4-89)
S NCK (a)
E In 1988 a NCR Model 75 was sold to the Bloemfontein Municipality (Comp.1-8-88).
A arms industry (see II.4.).

NEC, Tokyo, Japan
S Hard Decisions Distributors (Comp.16-1-89)

NIXDORF COMPUTER, Paderborn, Federal Republic of Germany
I Nixdorf Computer, Johannesburg (b)
E In 1989 three Nixdorf 8890 Series D IBM-compatible mainframes were sold to PG Wood's Germiston-, Cape Town- and Natal branches (Comp.20-2-89).

OKI ELECTRIC INDUSTRY, Tokyo, Japan
S Promilect, Randburg (Data 21-4-89)
S Zytron, Randburg (Comp.27-2-89)(a)

ING C OLIVETTI, Ivrea, Italy
S Accys, Edenvale (a)
S Ardo Cassette Manufac., Randburg (a)
S Joffe Associates, Johannesburg (a)
S Liz Parker Computers, Cape Town (a)
I Olivetti Africa, Johannesburg (b)
E In 1989 about 6000 Olivetti workstations were sold to Nedbank (Comp.30-1-89).

OMRON TATEISI ELECTRONICS, Kyoto, Japan
D Yelland Engineering, Johannesburg (b)

PHILIPS INTERNATIONAL, Eindhoven, The Netherlands
I Philips Electronics, Johannesburg (b)
S RG Systems, Boksburg (a)
E In 1988 ten Sopho-S250 nodes and two Sopho-S1000 nodes (telephone networks) were sold to Rustenburg Platinum, the largest platinum mine in the world (Data.18-11-88).
A armsindustry and police (see II.4. and II.5.).

PLESSEY, Ilford, England, United Kingdom
I Plessey South Africa (b)
I Telephone Manufacturers of South Africa (b)
E In 1988 Plessey PDS 2 design software was sold to the Division of Micro-electronics and Communications Technology of the CSIR (Data.9-9-88).
A army (see II.6.).

PRIME COMPUTER, Natick, MA, United States of America
L+D Cad/Cam Systems, Eastgate (c)
L+D Central Data Systems, Bedfordview (a)(c)
E In 1989 a Prime 6350 processor was sold to KSA Equipment, holders of the Komatsu earthmoving equipment franchise in South Africa (Engi.17-2-89).

RACAL ELECRONICS, Bracknell, England, United Kingdom
I Chubb Holdings, Johannesburg (b)
S North East Consultants, Halfway House (a)
I Racal SMD Electronics, Pretoria (b)
A police (see II.5.).

RANK XEROX, Stamford, CT, United States of America
D Fintech (c)
S Xeratech, Isando (a)
E In 1988 710 Rank Xerox 4045 DP / 4046 DP laser printers were sold to the First National Bank (Comp.18-7-88).

RAYTHEON, Lexington, MA, United States of America
S Badger South Africa (Unified List 1988)
(Who Owns Whom 1988)
S Electronic Building Elements, Pretoria (Data.11-3-88)

SAMSUNG, Seoul, South Korea
D M & PD (b)
S South Continental Devices, Randburg (Puls.2-89)

SANYO ELECTRIC, Osaka, Japan
D Sanyo Electric Trading, Johannesburg (b)
D Teltron (a)(b)

SEAGATE TECHNOLOGY, Scotts Valley, CA, United States of America
D Electronic Back Up Services (EBUS) (Fin.M.2-6-89)
S Peripheral Distributors (a)
D Punch Line, Sandton (Fin.M.2-6-89)

SEIKO EPSON, Nagano-ken, Japan
S (name unknown)(State Departments of Southern Africa 1986/87, Randburg, p.49)

SHARP, Osaka, Japan
D Seartec Industries, Cape Town (b)
A police (see II.5.).

SIEMENS, Munich, Federal Republic of Germany
I Siemens, Johannesburg (b)
I South African Micro Electronic Systems, Pretoria (b)
I Tek Industrials, East London (b)
E In 1988 a Hicom PABX (telephone network) was sold to South African Transport Services' central switching facility in Bloemfontein (Comp.1-8-88).
A police (see II.5.).

SONY, Tokyo, Japan
S DMS Computers, Clubview (a)

SQUARE D, Palatine, IL, United States of America
L Electrical Control Technologies (c)
D Yost Constructions' computer installation and networking services (Curr.7-88)

STC, London, United Kingdom
S Computers for Africa, Cape Town (ICL) (a)
S Computer S/ware Creations (ICL) (a)
I International Computers (South Africa) (b)
S Joffe Associates, Johannesburg (ICL) (a)
I Psion Computers (b)
S STC Components, East London (Data.13-1-89)
S STC Data Systems (Altech), Boksburg (Comp.20-2-89)
E In 1989 a dual ICL 4000/50 system was sold to the Cape Town City Council's National Fresh Produce Market at Epping (Comp.30-1-89).
A police (see II.5.).

SUN MICROSYSTEMS, Mountainview, CA, United States of America
D Sun Workstation Systems (c)

TATUNG, Taipei, Taiwan
D Computer Support Distributors, Pretoria (a)(b)
S Realtime Computer Ser., Cape Town (a)

TEXAS INSTRUMENTS, Dallas, Texas, United States of America
S Alpret (Puls.10-88)
S Galaxy Computers, Johannesburg (Comp.17-10-88)
S Multikomponent, Isando (Data.24-2-89)

THOMSON, Paris, France
A armsindustry (Landgren, 1989, p.106-108,138,141,146).

THORN EMI, London, United Kingdom
I EMI South Africa (b)
S OEN Enterprises, Bryanston (Data.5-5-89)
I Thorn EMI Industries (b)
I Thorn EMI South Africa (b)

TOSHIBA, Tokyo, Japan
D Computer Sciences (b)
D Copytype Electronics (b)
D Industrial Brokers Motors (b)
D Mercedes Datakor (b)
D Tecmo Automation (b)
S Tytron (a)
D Ultrarad-Electro-Medical (b)
D Winder Controls (b)

TRW, Cleveland, OH, United States of America
L (name unknown)(c)

UNISYS, Blue Bell, PA, United States of America
S Bernstein Computer Cons., Cape Town (a)
D Mercedes Information Technologies (c)
S Unidata, Rosebank (a)(d)
E In 1989 a Unisys A4 mainframe was sold to steel distributor Namascor (Comp.13-2-89).
A arms industry (see II.4.).

WANG LABORATORIES, Lowell, MA, United States of America

S Infotech, Pretoria (Comp.10-4-89)

S International Electronic Interprises (Comp.27-2-89)

S Silicon Corporate Sales (Comp.5-12-88)

E In 1989 a Wang VS 7010 and a Wang VS 75E were sold to Rainbow Chickens' Hammarsdale head office and Worcester (Cape) branch (Comp.10-4-89).

WESTINGHOUSE ELECTRIC, Pittsburgh, PA, United States of America

D AEG, Johannesburg (Engi.28-2-89)

S Aztec Electronics, Bedfordview (Data 2-12-88)

ZENITH ELECTRONICS, Glenview, Il, United States of America

S Laptop Computer Centre, Randburg (Comp.17-10-88)

Table VI. Producers of computers that have no investment, licence or official distribution relations with South Africa, and of which in this study it has been established that their products are not for sale in South Africa:

All Data Australia, 57 Robinson Street, Dandenong, Vic.3175, Australia, tel. +61-3-7946714.

Dansk Data, Herlev Hovedgade 199, DK2730, Herlev, Denmark, tel. +45-42-845011.

Nokia, Mikonkatu 15 A, PO Box 226, SF00101, Helsinki, Finland, tel. +358-0-18071.
subsidiaries or sales offices in: Australia, Austria, Bangladesh, Belgium, Canada, China, Denmark, Egypt, France, Hong Kong, Indonesia, Ireland, Italy, Japan, Luxembourg, Malaysia, Netherlands, Norway, Portugal, Saudi Arabia, Singapore, Soviet Union, Spain, South Korea, Sweden, Switzerland, Turkey, United Kingdom, United States of America, West-Germany,

Norsk Data, Olaf Helsets vei 5, PO Box 25, Bogerud, Oslo 6, Norway, tel. +47-2-626000.
subsidiaries, agents or distributors in: Belgium, Brasil, Denmark, Finland, France, Hong Kong, Iceland, India, Ireland, Luxembourg, Netherlands, Pakistan, Sweden, Switzerland, Thailand, United Kingdom, United States of America and West-Germany.

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Anti Apartheid Beweging Nederland, Amsterdam
Anti Militairistisch Onderzoeks Kollektief, Utrecht
Association of West European Parlaimentarians for Action against Apartheid, Amsterdam
Facts and Reports, Amsterdam
Holland Committee on Southern Africa, Amsterdam
International Relations Section PSCF Faculty University of Amsterdam
OSACI, Utrecht
Stichting Onderzoek Multinationale Ondernemingen, Amsterdam
Werkgroep Kairos (christians against apartheid), Utrecht