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The Development of South Africa's Arms Industry

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Abstract

South Africa is the second largest economy in Africa (after Nigeria) and one of the most industrialised countries in the African continent, ranked as an upper middle income economy by the World Bank. It is also the second largest military spender in Sub-Saharan Africa, and has the most developed arms industry on the subcontinent, with a range of capabilities and has seen considerable change since the end of the 'apartheid' regime that was in place over the period 1948-1994. This paper provides an overview of the evolution of the industry and an analysis of the present nature of the industry and its performance and behaviour.

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1. Introduction

South Africa is the second largest economy in Africa (after Nigeria) and one of the most industrialised countries in the African continent, ranked as an upper middle income economy by the World Bank. It is also the second largest military spender in Sub-Saharan Africa, according to the Stockholm International Peace Research Institute (SIPRI). Furthermore, it has the most developed arms industry on the subcontinent, with a range of capabilities and has seen considerable change since the end of the 'apartheid'[1] regime that was in place over the period 1948-1994.

In the same way as one cannot understand the Cold War arms industry without understanding the Cold War context it developed from, so the South African defence industry is only understandable knowing the context of its 'Apartheid' past. White minority rule was maintained by a high militarization of society and the economy, with partial trade sanctions imposed on South Africa over the period 1986-1991 and the UN arms embargo over the period 1977-1994 having significant effects. With the transition to democracy, the so called 'Arms Deal' over the period 1996-1999 in which a supposed necessary upgrade of equipment was made through offset deals with international arms producers had a major impact on the industry and the level of state and corporate corruption (Feinstein, 2006; Dunne and Lamb, 2003). All these mean that the historical context is hugely important when analysing South Africa's defence industry.

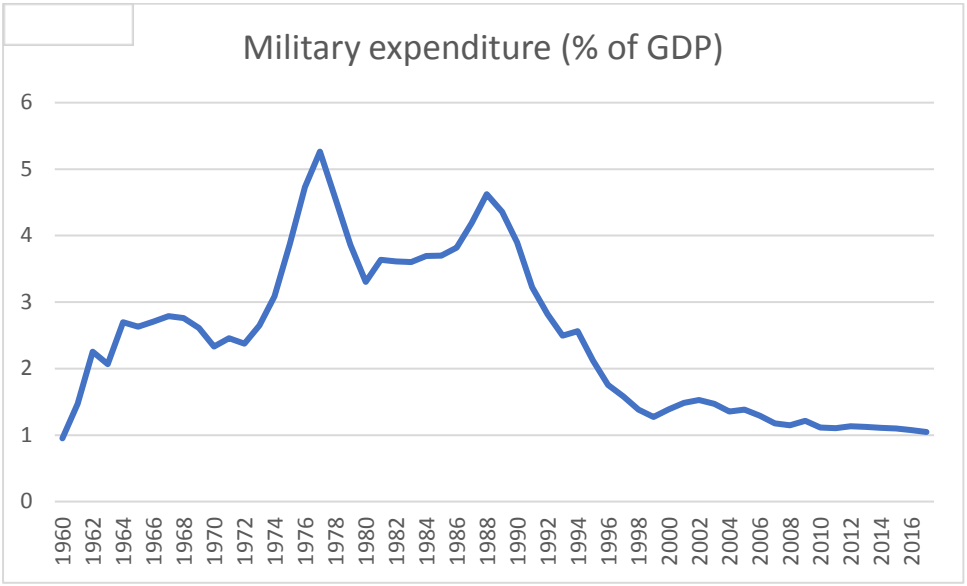
This paper provides an overview of the evolution of the industry and an analysis of its present form. Section 2 considers the pattern of defence spending, arms exports and imports, through the aforementioned phases, while Section 3 focuses on the evolution of the defence industry, with Sections 4 and 5 considering the present nature of the industry and its performance and behaviour, respectively. Lastly, section 6 provides some conclusions about the South African defence industry and offers some insights/recommendations about its future.

2. South Africa's Military Sector

From the 1960s until the beginning of the transition to democracy in 1990, South Africa maintained a high and increasing military burden in support of the apartheid state. The mid-1970s brought important developments to South Africa's defence industry and policy. Specifically, the United Nations arms embargo on South Africa in November 1977 motivated the South African government to move towards the restructuring of the domestic defence industry in order to achieve self-sufficiency in armaments. Armscor the Armaments Corporation of South Africa was established in 1968 and assumed responsibility for the procurement and production of armaments for the South African Defence Force (SADF).

[1] Apartheid was the political and social system under white minority rule based on racial segregation.

Figure 1: Military expenditure as a share of GDP (1960-2017)



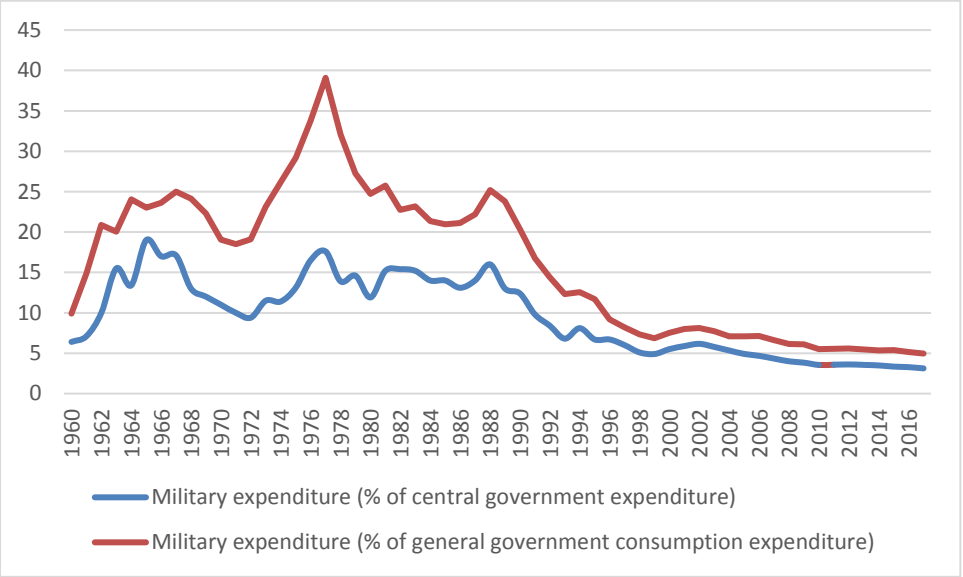
Source: SIPRI

As Figure 1 shows, the military burden (military expenditure as a share of GDP) more than doubled between 1972-1977 (from just below 2.5% of GDP in 1972 to 5.3% of GDP in 1977) mainly because of growing external and internal opposition to apartheid, the independence of Angola and Mozambique in 1974, and the involvement of South Africa in their civil wars. This reflected the purchase of large amounts of imported weapons prior to the imposition of the mandatory UN arms embargo in 1977 and the implementation of a "Total Strategy" to combat the perceived "Total Onslaught" of communist expansionism in Southern Africa. With the growth in demand for weapons and equipment to maintain internal and external security and in anticipation of international sanctions, the apartheid regime invested heavily in the creation of a domestic defence industry. This saw domestic procurement expenditures increase six-fold in current prices in the 1970s (Dunne and Lamb, 2004).

Since the early 1980s, Armscor along with the private sector related industries expanded rapidly. Defence budgets allocated for procurement and armaments during the 1980s increased substantially given South Africa's involvement in a number of regional conflicts (i.e. Angola). The military burden continued to be high until 1988. Since then, there has been a gradual decline reaching 2.5% of GDP in 1994 (the end of Apartheid) with further reductions thereafter. So, the end of the Cold War was accompanied by a reduction in the various tensions and conflicts in many African countries as well as by the end of the apartheid regime in South Africa. These developments led to the resolution of most of the conflicts in the region and also led to reductions in military expenditure in real terms. This was particularly the case for South Africa that had moved to democracy and was facing reduced threats. Furthermore, South Africa withdrew its troops from Angola and Namibia (Batchelor, Dunne and Lamb, 2002).

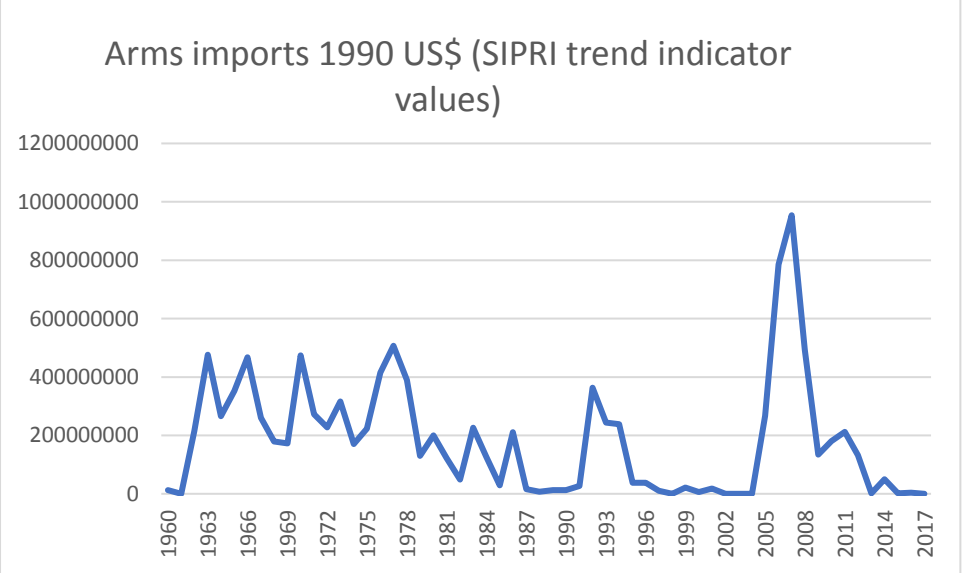
As Figure 1 shows, South Africa's defence budget declined markedly from 1989. It fell by more than 50% in real terms between 1989/90 and 1997/98, with the acquisition budget declining by more than 80% in real terms. This had a dramatic effect on the country's defence-related industry, which downsized and restructured. The public sector was restructured and commercialised, with Armscor split in 1992 into Denel, a new state-owned industrial company and Armscor, which retained responsibility for procurement for the SADF . Since then the industry has had to deal with a trend of slowly declining military expenditure, both as a share of GDP and of central government expenditure (Figure 2), as other claims on resources took precedence.

Figure 2: Military as a share of government spending (1960-2017)



Sources: SIPRI and World Bank

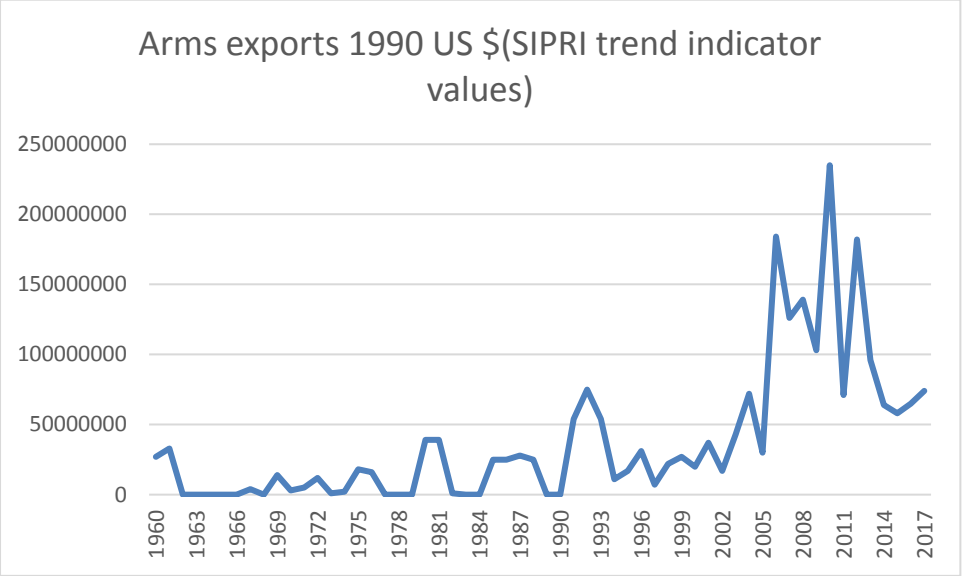
Figure 3: Arms Imports



Figures 3 and 4 present the SIPRI trend indicator values for imports and exports for South Africa. These are based upon the known unit production costs of a core set of weapons and are intended to represent the transfer of military resources rather than the financial value.[2] As Figure 3 shows, imports declined as the arms embargo became effective. Armscor entered the export market in 1982 and, as Figure 4 shows, the value of defence exports has increased substantially since the early 1980's. Defence related industries became some of the largest exporters of manufactured goods in the country.

[2] See https://www.sipri.org/databases/armstransfers/background

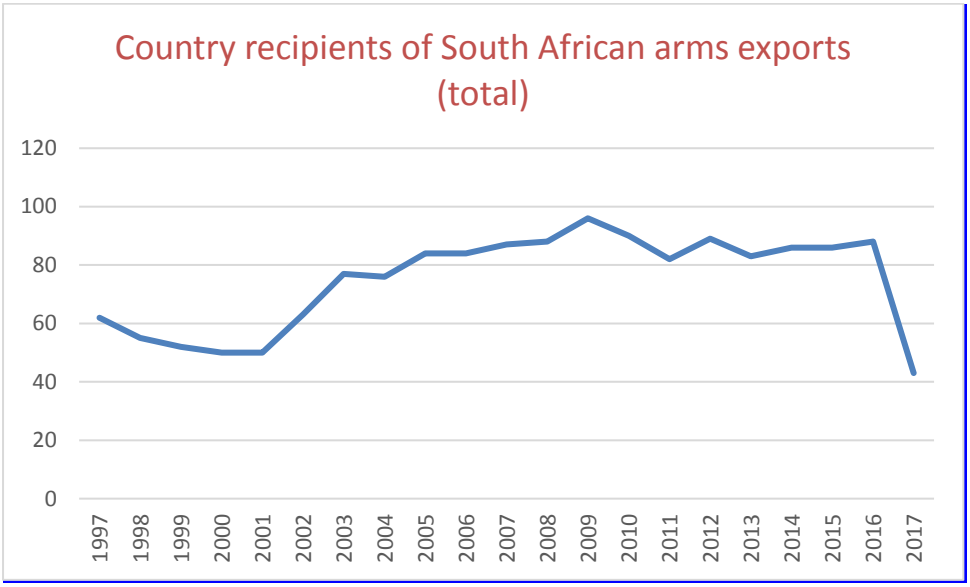
Figure 4: Arms Exports



With the end of Apartheid there was a loosening of restrictions and an increase in exports, though limited by engagement with the so called 'Arms Deal'. This saw foreign arms companies negotiating deals to provide major equipment orders for the South African National Defence Force (SANDF) with offsets (a form of countertrade). These were finalised in 1999 and have since been the subject of controversy. Defence exports saw a further dramatic increase after 2005, benefitting from the increasing international links achieved by the involvement of major British, French and German international arms companies in the domestic companies, as we shall see later.

There was not only an increase in the real value of South African arms exports from 2005 but also a significant increase in the number of countries that imported South African arms and defence-related equipment. That is, the number of export destinations (countries) increased from 50 in 2001 to 96 in 2009, as Figure 5 shows. However, the South African industry was highly dependent on a small number of importing states, particularly the US, which accounted for a quarter of the total value of arms exports between 1997 and 2017. Such dependence has resulted in considerable year-on-year variations in arns export revenue. Between 2007 and 2012 arms exports to the US accounted for 40% of the value of all South African arms exports but since 2013 onwards arms exports to the US have been insignificant, which is one of the key reasons there was a 41% decrease in the US$ value of South African arms exports between 2012 and 2013. Other major importers of South African arms have been India, Sweden, Germany, the United Arab Emirates and Saudi Arabia. Noticeably there was also an increase in arms imports at the start of this period (see Figure 3), so, net foreign income was not that impressive.

Figure 5: Number of Export Recipients



3. The Evolution of the Industry

From the 1960s until the beginning of the transition to democracy in 1990, South Africa maintained a high and increasing military burden in support of the Apartheid state. In 1972 growing external and internal opposition to apartheid, the independence of Angola and Mozambique in 1974, and the involvement of South Africa in their civil wars, led to large increases in military spending, with the military burden peaking in 1977 at just under 5% of GDP. The apartheid regime invested heavily in the creation of a domestic defence industry (Dunne and Lamb, 2004).

Such a large change had a big impact on the manufacturing sector, increasing its dependence on arms production between 1972 and 1979. It also led to the creation of what could be termed a military industrial complex (MIC) centred on the state owned arms producer and procurer, Armscor, with private firms acting as sub-contractors. As a result of massive state investment, Armscor developed into one of the largest industrial groups in South Africa and by 1981 had assets of R2000 million, a yearly turnover of R1500 million in current prices and more than 25,000 employees. It was also contracting more than 900 companies in the private sector, which employed about 120,000 people. System development capabilities were established, with Armscor setting up operational research and systems engineering facilities and developing the idea of systems suppliers into the defence industrial base. Sophisticated products such as jet fighters, attack helicopters, armoured vehicles, communications systems, guidance systems, mobile artillery pieces, and reconnaissance drones had to be domestically produced or illegally sourced, so industrial policy favoured the arms industry and encouraged import substituting high technology production.

With the UN arms embargo, what had been produced under license became domestically produced independently and the capacity to develop components, undertake repairs and maintenance had to be developed. This led to the establishment of a level of technical sophistication and independence that was unique to arms production in developing countries (Batchelor, Dunne and Lamb, 2002). Resources

flooded into the arms and other strategic industries creating growth but, as Batchelor, Dunne and Saal (2000) argue, leading to inefficient allocation of investment and inefficiencies that led to serious economic problems in the 1980s.

Things changed towards the end of Apartheid and between 1989 and 1997, South Africa's defence expenditure declined by more than 50% in real terms. This started with the withdrawal of South African troops from Angola and Namibia and continuing with South Africa's political transition and resulting downsizing of the South African military establishment. This had a dramatic effect on the country's defence-related industry, which downsized and restructured and as we have seen the public sector was restructured and commercialised, with Armscor split into Denel and Armscor, which retained responsibility for procurement for the SANDF (Batchelor, Dunne and Lamb, 2002). .

Armscor's procurement policies, including more transparent and competitive procurement from both local and foreign suppliers, fundamentally altered the 'cosy' relationship that was evident between the public and private sector industry during the Apartheid era. The African National Congress (ANC) led government's commitment to black economic empowerment from 1994 resulted in a number of empowerment deals and equity partnerships between the (largely white) private sector defence companies.

South Africa's re-admittance into the international community and the lifting of the United Nations mandatory arms embargo in May 1994, allowed South Africa to legitimately purchase armaments from foreign suppliers for the first time since 1977. The decline in domestic procurement expenditure and the shrinking international market, led to considerable downsizing within both the public and the private sector, with the share of imports in total procurement spending remaining relatively constant.

In response to this decline in demand, the local defence firms pursued a number of supply-side adjustment strategies. Denel and the three largest private sector defence groups (Reunert, Grintek and Altech) experienced financial problems, but all reduced their dependence on their defence business to less than 20% of turnover and offset the declines in domestic defence with significant increases in non-defence work and export orders.

This downsizing and restructuring of the local defence industry took place in something of a policy vacuum, with the government adopting a 'hands-off' approach to defence industrial adjustment as military spending declined. This changed in 1996 with the 'Defence Review', a national review of South Africa's defence needs and capabilities. This set out four options for a force design for the SANDF. The option that emphasised reduced manpower and increased capital intensity was approved by Cabinet and Parliament in April 1998. This option recognised that there was no short or medium term military threat to South Africa, and that the defence budget would remain restricted for an extensive period of time. However, this option did envisage the acquisition of a wide range of major defence equipment for the SANDF due to aging equipment, but these purchases would require both Cabinet and Parliamentary approval. This subsequently laid the groundwork for what was to become known as the Strategic Defence Package (SDP) in September 1999, a R29.9 billion arms acquisition programme[3].

To justify its decision to purchase arms from foreign suppliers and to win public support for the deal, the South African government stressed the potential positive effects of sellers' proposed industrial

[3] In fact the approval of the Defence Review in 1998 was not an approval of the SDP, as it explicitly stated that every procurement would need Parliamentary approval. This was neither sought nor given and the SDP was merely presented to the house in December 1999.

participation offers (offsets) on investment, job creation, and growth in South African defence related industry and the national economy at large. At the time of approving the program, the South African government indicated that foreign suppliers had made offset offers worth an extraordinary R104 billion, more than three times the value of the arms deal itself. This would result in the creation of more than 65,000 jobs over a period of 7 years. Since then the deal has been mired in controversy and has seen considerable debate and public scrutiny, to an extent unrivalled in any other country (Dunne and Lamb 2005; Feinstein 2011).

Leaving aside the issue of whether the expenditure on arms was necessary at all on security grounds, the choice of imports with offsets was risky. At the time, the purported economic benefits of offsets had been questioned and what little empirical evidence that was available already suggested that offsets tend to have a much smaller impact on the local economy than is usually promised (Brauer and Dunne, 2005). It was difficult to judge whether arms prices are reasonable since there are no standardized goods and fixed prices in the defence market. It was also unclear whether the work attached to offsets was genuine new work and whether it would be sustainable once the term of the arms deal expired. It is also worth noting that the offsets were skewed in favour of riskier civilian offsets and as was recognised in the August 1999 Affordability Report, civilian offsets were considered considerably more risky than direct defence offsets. Thus, there were considerable doubts about the benefits and concern at the political costs (Dunne and Lamb 2005; Feinstein, 2011; Sylvester and Seegers, 2008; Holden 2008).

In 1999 the successful bidders were announced, with defence contractors in Britain, Sweden, Italy and Germany being selected. It was publicised that the total deal would cost R30 billion (in 1999 prices). Allegations of corruption, fraud and misconduct surfaced shortly thereafter, implicating both South Africans and foreign defence contractors (and their representatives). Given these allegations, investigations into the South African arms deal were pursued in Britain, Germany, South Africa and Sweden. The investigation by the United Kingdom's Serious Fraud Office into the actions of British Aerospace (BAE) Systems was arguably the most revealing in terms of the problematic role arms brokers had played in securing the contract for BAE. BAE, along with Saab (Sweden) had been awarded a tender to supply the South African Air Force with jet trainers and combat aircraft. This investigation revealed the existence of a group of arms brokers, who had allegedly been clandestinely contracted through front companies by BAE Systems to lobby the South African government on BAE's behalf.[4] Red Diamond Trading Ltd, established by BA Systems in the British Virgin Isles in 1998 was allegedly one such company. Investigators have stated that there were reasonable grounds to allege that these brokers paid bribes and engaged in other corrupt activities to obtain significant advantage over their competitors in the tendering process[5]. In addition, it was suspected that the decision to award the tender to BAE/Saab was primarily the result of a deliberate intervention by the Minister of Defence (Joe Modise) at the time.[6]

In Sweden, Saab admitted to that a payment of R24 million had been made through its South African subsidiary, SANIP, which they stated was by then under the control of BAE Systems, who was ultimately responsible for the payments.[7] In addition, a senior Swedish trade unionist was implicated in facilitating

[4] Stefaans Brümmer and Sam Sole, How arms 'bribes' were paid, *Mail and Guardian*, 5 December 2008, 2-3.

[5] Indeed, it was through Red Diamond Trading that payments were made to middlemen and agents in South Africa, including the special advisor to Joe Modise. In total, the SFO tracked £115m that was transferred to agents on the deal through overt and covert (Red Diamond) avenues.

[6] William John Downer, Founding affidavit, In the High Court of South Africa (North Gauteng High Court, Pretoria) in the matter between the National Director of Public Prosecutions (applicant) and Fana Hlongwane (respondent) for an ex parte order in terms of section 38(1) of the Prevention of Organised Crime Act 121 of 1998, Cape Town, 2 March 2010.

[7] See 'Saab completes internal investigation regarding consultant contract in South Africa', SAAB Press Statement, 16 June 2011, https://saabgroup.com/media/news-press/news/2011-06/saab-completes-internal-

the payment of funds to an influential South African trade union, the National Union of Metalworkers of South Africa (which was aligned to the ANC).[8] In Germany, an audit of Ferrostaal (which was awarded the contract to supply the South African navy with submarines) conducted by a US law firm, Debevoise and Plimpton revealed that over R300 million in "questionable" payments was paid in relation to the South African submarine deal.[9] High ranking politicians in South Africa were implicated in receiving bribes, including former President Jacob Zuma. The controversy led to the establishment of the Seriti Commission in 2011. Nonetheless, the work of the Commission was dogged by controversy and its findings did not implicate ex President Zuma in any wrongdoing. The work of the Commission has been widely criticised and is regarded by anti-corruption activists and commentators as a sham[10].

Various investigations and legal challenges, by for example, Parliament and the Auditor-General, further exposed the problematic role of arms brokers[11]. Investigations and numerous media reports pointed to a host of other arms brokering individuals and entities allegedly involved in bribery (Feinstein, 2011).

Denel continued to dominate the domestic defence market, averaging 48% of the domestic market between 1992 and 2000, significantly lower than in the 1980s, when the former Armscor subsidiary companies (now part of Denel) accounted for nearly 70% of the domestic market. Denel also continued to dominate most of the seven major sectors of the domestic defence market, particularly aerospace, ammunition (small, medium and large calibre), weapons systems (including infantry weapons, cannons, artillery systems and missiles) and military vehicles (Dunne, 2006).

The other major sectors of the domestic defence market, namely electronics, maritime and support equipment were dominated by the three largest private sector defence firms, namely Reunert, Altech (now merged with ADS) and Grintek. In 1996, these three private companies accounted for over 80% oria requiresf the private sector's share of the domestic defence market. Since the early 1990s these three firms have acquired many small and medium sized private defence firms in an attempt to consolidate their positions in the domestic market. These firms, like Denel, have also attempted to vertically integrate, by outsourcing far less of their defence business than in the past. Denel also dominated many of the sub-sectors of the domestic defence market such as information technology and testing.

The process of vertical integration had a negative impact on the hundreds of smaller defence firms, particularly those that acted as suppliers and sub-contractors for the larger defence firms. Many small and medium-sized private defence firms exited the defence market, merged with, or were acquired by, larger defence firms (e.g. Reunert acquired the armoured car division of TFM in early 1997). As a result, the domestic defence market (excluding imports) became increasingly concentrated. In 2000, Altech's defence interests were taken over by the black economic empowerment grouping African Defence Systems (ADS). ADS in turn became a subsidiary of French-based conglomerate Thomson CSF, which was renamed Thales in 2001.

Denel has, however, had a rather poor financial performance since its establishment in 1992. Over the

investigation-regardingconsultant-contract-in-south-africa/ and Saab admits R24-million bribe paid to clinch arms deal, Mail and Guardian, 16 June 2011.

[8] Tabelo Timse et al, Swedish TV reveals fresh claims in South Africa's arms deal, Mail and Guardian, 22 November 2012.

[9] Paul Kirk, The Citizen, More dirty arms deal money, 5 August 2011.

[10] https://www.corruptionwatch.org.za/corruption-blind-seriti-commission-zero/

[11] Schabir Shaik was one such brokering persona. At the time of the arms deal he was a financial advisor to Jacob Zuma, a key arms deal government decision-maker and from 2009 to February 2018, the President of South Africa. In 2005 Shaik was convicted of corruption and fraud relating to the solicitation of bribes from a French arms manufacturer, Thompson-CSF for Jacob Zuma (J. Squires, The State versus Schabir Shaik and 11 other, Judgment, 31 May 2005, Durban.) Shaik was imprisoned in 2008 with a 15-year sentence, but was released on medical parole the following year.

period 1992-96 its turnover declined by an average of nearly 6% per annum in real terms, while the three largest private sector companies, Reunert, Altech and Grintek, witnessed increases in real turnover during the same period. The late 1990's was more mixed, with the companies restructuring internally, and Reunert showing a decline in turnover (ADS's turnover, as a subsidiary of Thales, is now incorporated into the parent company's financial reports). Denel's total employment declined by nearly 9 percent between 1992 and 2000 from 15,572 to 11,090. The group has continued to shed jobs and employed around 10,000 in 2005 and almost half of that by 2017. This has been a major concern, given the high unemployment levels in South Africa.

The larger private sector firms performed well in the early and mid 2000s –a reflection in part of the impact of the defence offset programme. Reunert and Grintek yielded particularly impressive financial results for 2003 and 2004. During the second half of 2005, SAAB took a majority stake in Grintek.

Clearly, the changes in the defence market reflected to some degree the changes taking place internationally, but there are also noticeable differences. As we have seen the end of apartheid led to substantial changes in the sector but also left it with a legacy of a large public sector producer and a strong grouping of private sector firms. Moves from1998 to restructure and privatise Denel came to be closely bound up with the arms procurement package (SDP) and the associated industrial participation programme, and the decision to find a large international defence company to take a strategic equity partnership in Denel. BAE Systems and Denel signed a memorandum of understanding in 1998 and in 2000, Cabinet approved BAE Systems as the preferred strategic equity partner for the Denel Aerospace and Ordnance Groups. It was hoped that the finalization of a strategic equity partnership with BAE Systems could be achieved by March 2001, but for various reasons the deal was not struck, leaving the two organizations in a formal and comprehensive but weakened partnership, with some degree of buy-in from BAE Systems, but without substantive equity and management participation. Within Denel Aerospace, Snecma/Turbomeca was approved as the strategic equity partner at division level for the business unit Airmotive. Similarly, within Denel Ordnance, the UK pyrotechnic manufacturer Pains Wessex Defence was confirmed as strategic equity partner for the Swartklip division (Dunne, 2003).

In 2006 the creation of Denel-SAAB Aerospace was widely vaunted as being the great 'pay-off' of the SDP. In return for $1bn in (civilian) offset credits upfront, SAAB agreed to take a stake in Denel Aerospace, integrate it into their supply lines and transform management. The project totally failed (Saab were still awarded their credits) and the management reverted back to Denel's control. It would appear that SAAB agreed to get involved with Denel Aerospace to get a huge whack of offset credits, but as these credits were not tied to any form of economic performance, little effort or investment was put into the new entity, and the exited after a number of disappointing years[12].

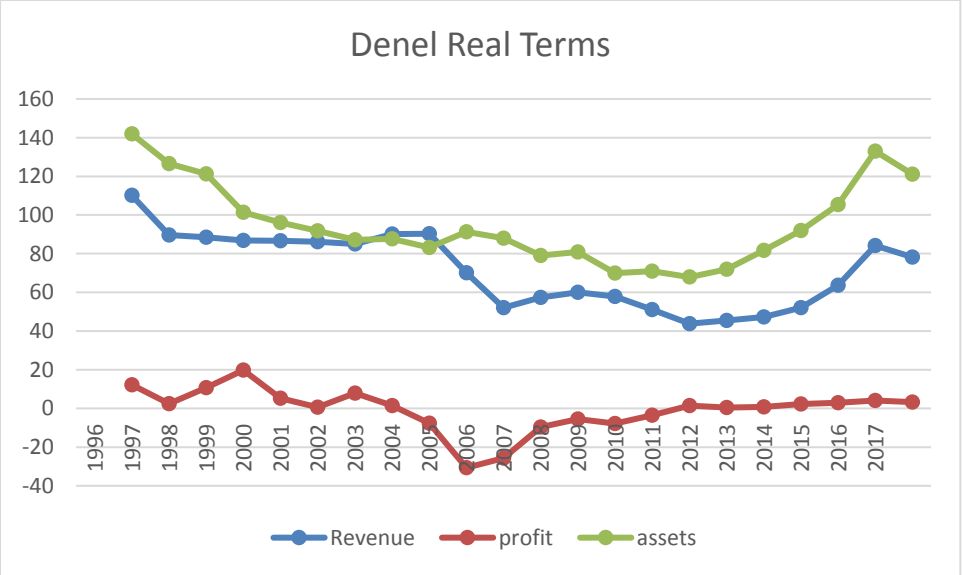
Up to the mid-2000s the level of revenue and assets increased little, if at all, in current prices and as Figure 6 shows they declined in real terms (adjusting for the CPI). Since 2011 they have increased, but in real terms are still lower than in 1997.

Figure 6 also shows that Denel was, not surprisingly, a loss making enterprise for most of the period, reporting losses from 1998 to 2011, apart from 2001 when a small profit was reported. There was also a trend of increasing losses which bottomed out in 2006. It also had low revenue and was operating with

[12] 'Final Report of an Impact Assessment Undertaken at Denel Saab Aerostructures (Proprietary) Limited Related to an Aerospace Project Within the National Industrial Participation Program', NAD Auditors, 2010'. And Joint Submission of Paul Holden and Andrew Feinstein to the People's Tribunal on Economic Crime, February 2018, p. 237 -238, https://corruptiontribunal.org.za/site/wp-content/uploads/2018/02/AD1-Joint-Submission-to-the-Peoples-Tribunal-Paul-Holden-and-Andrew-Feinstein-final.pdf

ageing assets. One response in the early 2000s was to return to concentrating on the Group's perceived traditional strengths, although this is not without its contradictions, and to downsize in areas such as small arms. The Commercial and IT group were split off from Denel Aerospace and Denel Ordnance in 2001, and emerged as a separate entity. Denel's new business model positioned the company as a lead systems integrator in the domestic market and a domestic supplier and exporter of niche sub-systems and components. The Group was consolidated into three manufacturing clusters or industrial parks as part of this strategy, namely, Denel Aerospace, Denel Land Systems, and Denel Commercial (Denel Reports, various).

Figure 6: Denel's Performance

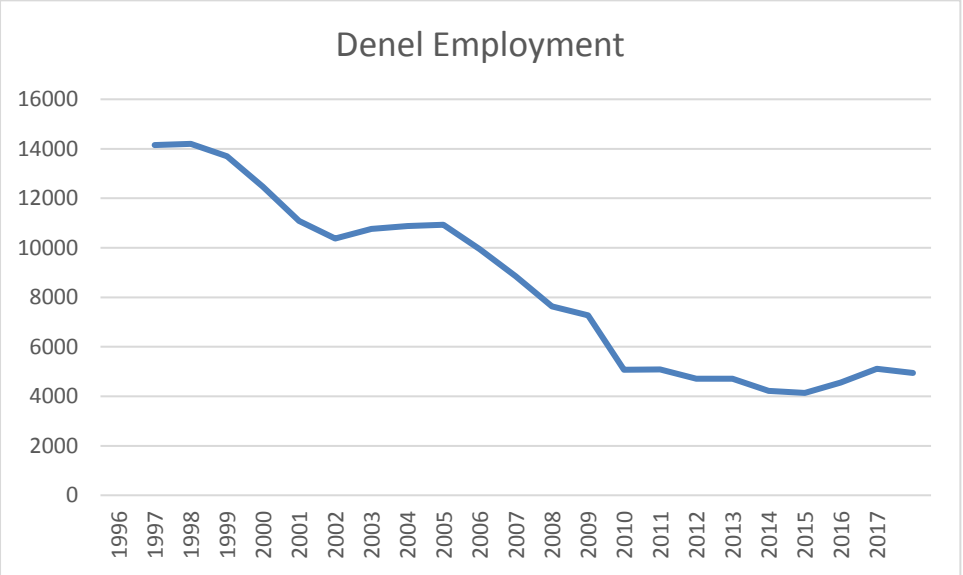


With declining SA arms expenditures, Denel aimed to transform into a horizontally integrated global integrated supplier, rather than a vertically integrated local SANDF supplier and focussed on reducing costs (Denel Report, 2013). It saw the continuing problems as low revenue and was operating with ageing assets and continuing government subsidies. Various strategic, cost saving and restructuring initiatives from the mid-2000s led to positive profits from 2011, but limited cash generation. Further, as noted in a report on the performance of state-owned enterprises in 2005, the Department of Public Enterprises, expressed concern that Denel's efforts to boost revenue through a focus on the export market had "resulted in an unfocused conglomerate" and there was "a lack of a clear strategy for global supply chain integration" (Department of Public Enterprises, 2005: 26). This remains a problem for the company, restricting investment in R&D and working capital and making it still dependent on government bail outs. For the 2017/18 financial year Denel reported a R1.7 billion loss, and was having difficulty paying staff salaries and fulfilling approximately R18 billion of outstanding orders (Reuters, 2018). In this regard, the South African government announced in October 2018 that it will provide a R3.43 billion guarantee to assist Denel with necessary restructuring and its existing financial difficulties (Defence Web, 2018a).

It is also clear from Figure 8 that the move back to profitability has been linked to the growth of exports as a share of revenue and this raises a number of issues, with dependence on a number of countries and the tensions between the need to export and the existing arms export control regulations. Recently, the

decline in exports to the USA, the growing importance of the Middle East which is increasingly controversial and the drop in the number of recipients does not suggest that prospects are good for future exports.

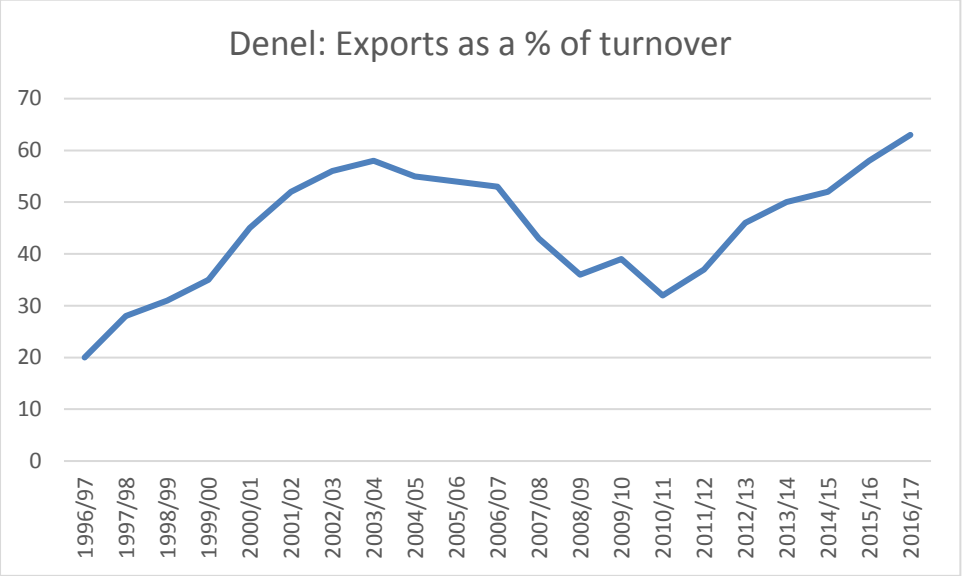
Figure 7: Denel Employment



In terms of the industrial sectors, the market-driven processes of downsizing and restructuring led to a loss of capabilities, including skilled human resources. South Africa's maritime and naval shipbuilding industry, which is concentrated in Durban and Cape Town, downsized quite dramatically, with the attendant loss of valuable capabilities and skills. The country's only naval shipyard, Dorbyl Marine, closed down in the early 1990s because of poor trading conditions. The industry thus lacks the capacity to design and manufacture major naval ships including submarines, although a few companies have the capacity to design and manufacture small harbour patrol boats. However, the local maritime industry has a limited capacity in naval electronics (including shipborne radar systems), systems integration (combat suites), ammunition (including naval bombs and mines), research and development and ship repair and maintenance. Batchelor and Dunne (2000) suggested that this sector was not particularly well placed to benefit from the Navy's acquisition programmes without significant investments to upgrade and expand its existing capabilities. Some of these predictions have become reality.

In contrast, South Africa's aerospace industry, which is concentrated in a few companies in Gauteng, had a relatively well-developed capacity to design and manufacture missiles, aerospace engines and fixed and rotary wing military aircraft. The industry also had significant capabilities in electronics (including radar), avionics, systems integration, weapons systems, and ammunition. Again, Batchelor and Dunne's assertion that aerospace was well placed to benefit from the Arms Deal programmes has proved accurate.

Figure 8: Denel Exports Share



The South African government remains committed to supporting the defence industry. In this regard, the 2015 Defence Review, stated that: "South Africa requires an effective defence capability, which includes, as an integral element, a defence industry to support sovereign capabilities and maintain an essential level of strategic independence" (Department of Defence, 2015:15-2). This, according to the Defence Review document, will include concerted assistance with the marketing of South African defence-related products and in the gaining access to potentially profitable markets abroad (Department of Defence, 2015: 7-6). In this regard, the Defence Industry Fund was established in July 2018 to support small and medium enterprises to become more globally competitive (DefenceWeb, 2018b).

However, the South African defence industry remains tainted by allegations and evidence of corruption, mostly the result of the SDP offset arrangements. More recently Denel has been implicated in the issue of 'State Capture', which were allegedly corrupt dealings between former President Zuma and a number of associates, particularly the Gupta family, to illegally access and derive considerable income from state contracts[13]. Denel has lost two CEOs and a Chairman in the last few years over the setting up of a unit in Asia in cooperation with VR Laser Services, a Gupta owned company that has recently been declared bankrupt. These developments led to discussions within government, especially within the Parliamentary Joint Standing Committee on Defence, for the governance of Denel to be shifted from the Department of Public Enterprises to the Department of Defence (Parliamentary Monitoring Group, 2018).

4. Defence Industrial Structure at Present

In the 2017 Denel Annual Report, the company reported progress in the consolidation of aerospace entities, maintenance of traditional areas in artillery, motorised infantry, munitions and precision guided weapons and the extension of capabilities, mainly into cybersecurity, command and control. The Denel aviation business was consolidated at the Kempton Park campus and Denel Aeronautics continued

[13] The Gupta brothers are wealthy Indian businessmen who, through their links with the then president, gained influence in South Africa to the extent of what is termed 'state capture'. The extent of this is becoming apparent with the statements being made to a Commission and the damaging impact of the resulting corruption with ongoing power cuts. See https://www.businesslive.co.za/fm/features/2018-09-06-counting-the-cost-of-state-capture/

commitments to the Airbus A400M programme and is acquiring Turbomeca Africa to provide helicopter engine parts capabilities. There are also discussions with the DoD on upgrading of the Rooivalk attack helicopter, details of which are given in the Appendix. More than 60% of revenue was coming from exports and new collaboration with one of China's state owned defence firms in the local maritime sector. Denel Maritime also took over the management of the SA naval dockyards. This is an impressive range of capabilities, though considerably more limited than its earlier incarnation.

As Table 1 shows Denel retains a relatively large number of divisions and they vary markedly in their dependence on export revenues, ranging from 99% of total revenue for LMT, which works on Airbus contracts, to 27% in Pretoria Metal Pressings. It also has large holdings, but less than 50% ownership, in 5 associated companies, including Rheinmetall Denel Munition, a joint venture with the German group and it is about to make full acquisition of Turbomeca Africa.

Table 1: Denel Structure 2017

	Employment	Revenue*	Exports (%)
Denel Aerostructures	440	553	97
Denel Aviation	605	1092	33
Denel Dynamics	803	1627	62
Denel Land Systems	761	2675	73
Denel Vehicle System	654	1171	74
LMT Holdings SOC Ltd	204	152	99
Denel Overberg	158	137	31
Pretoria Metal Pressings	1093	583	27

*million rand, current prices
Source: Denel Integrated Report 2016/7

Denel remains the major player in the South African arms industry. It is supported by the state and has no local competition for its main products. The decline in procurement expenditure and the willingness to import has led to an increasing importance of exports and a number of the private companies are really parts of large company international supply chains. Much of the industry is focused and it has become less of a burden on the State and focussed on niche markets.

A good indication of the nature of the defence industry is given by the membership of the Defence Manufacturers Association (AMD). This was created at the end of Apartheid and the break up of Armscor to operate as a lobby for the constituent parts of the industry. The membership consists of a range of relatively small companies in niche markets, often providing support, parts and components; foreign company subsidiaries; foreign company joint ventures; and companies associated with local firms. They range across a number of industrial sectors, including aerospace, marine, vehicles, engineering, clothing, logistics and consultancy services. Those with international linkages are usually part of international supply chains. Table A1 in the appendix provides a full list of the companies that are claimed as members in 2018.

There are no systematic data about the changing size of the defence industry readily available, but figures presented in a recent defence industry strategy document give a snapshot. This suggests that using 2017 rand prices SANDF acquisition from the South African defence industry dropped from R26.2 billion in 1989/90 to R7 billion in 2017, Research and Development funding declined from R6.1 billion in 1989/90 to R850 million in 2017 and defence industry turnover has dropped from R31.6 billion in 1989/90 to R19 billion in 2016. Employment dropped from around 130,000 employees in 3,000 companies in 1990 (9% of manufacturing employment and 10% of manufacturing companies), to around 15,000 employees in 120 companies. This represents a considerable contraction in the sector and is argued to represent loss

of both breadth and depth of capabilities, although the core capabilities are considered to remain intact[14].

5. Industry Conduct

As we have seen, the industry started operating in the Apartheid state beset by arms embargoes. It then acted as the client for the government, with Armscor as the procurer and producer and a small number of private companies. It developed into a large industry with a level of sophistication unknown for a developing country, but at considerable economic cost. Its structure was that of a monopoly state owned supplier with some private sector procurement and little competition.

Changes occurred with the end of Apartheid leading to a decline in demand and a more hands off approach from government, aside from splitting Armscor into separate procurement executive and producer (Denel). The existence of such technical skills at relatively low cost made South Africa of interest to the Western defence companies that were at the time internationalising their supply chains. So, companies downsized and developed links with foreign companies.

The major changes in the defence industry occurred from the early 2000's with the government's aforementioned decision to procure weapons systems for the SANDF from foreign suppliers. This made explicit an already implicit government view that the maintenance of a general capability in military production was not feasible. Once this decision was made, a considerable amount of effort was put into attempts to obtain as much as possible from the potential supplier, both in the form of defence-related industrial participation, to maintain the competitive parts of the industry, and non-defence products. A major justification for the packages became the economic benefits through these offset deals.

The defence industrial participation (DIP) components, provided something of a lifeline to the South African defence industry, while at the same time undercutting any remaining aspirations for South Africa to maintain its own defence industrial base (Dunne and Haines, 2006). The initial response from the defence industry was generally favourable and they started to develop links with the foreign suppliers.

In the early stages of the implementation of the SDP, Batchelor and Dunne (2000) raised concerns about the capability of the local industry to benefit from the deals. They suggested that while the aerospace sector seemed best placed to benefit and to prove themselves attractive to foreign companies, the electronics sector might have a harder time and the maritime sector was likely to struggle. This seems to have been borne out (Dunne and Lamb. 2004). Certainly, it was the DIP side of the offsets that showed most success with the non-defence industrial participation (NIP) scheme tending to disappoint. Denel and certain of the private companies were drawn further into the international networks of defence production through both direct and indirect DIP projects, but not much was seen of technology transfer or use of improved indigenous technology. Certain DIP contracts were of a nature that has obliged contractors to rethink their niche business and their form (e.g. Eloptro and Tellumat).

Most of the investment involved equity purchases, rather than fixed investment in plant and capital. These equity investments were linked to the arms purchases from countries such as Germany, Italy, Sweden and Britain, but also part of larger initiatives by European governments to promote increased trade between South Africa and themselves. An increasing participation of European defence groupings

[14] See http://www.dod.mil.za/advert/ndic/doc/Defence%20Industry%20Strategy%20Draft_v5.8_Internet.pdf and http://www.defenceweb.co.za/index.php?option=com_content&view=article&id=52310:sa-defence-industry-fund-officially-launched&catid=7:Industry&Itemid=116

and investors in the South African industry, at prime contractor and sub-contractor levels was part of the already ongoing restructuring and expansion plans of international defence groups, such as EADS, Thales and BAE Systems. This gave local companies opportunities to develop niches in the international market through their links with the foreign companies. Within the private sector, the SDP tended to favour the larger defence firms and in the end led to their takeover. There were a number of joint ventures between European and South African defence firms, allowing South African defence firms to become part of these European companies' global supply chains. Together with reduced domestic procurement the defence sector shrank, with attrition especially noticeable for the smaller firms.

Denel has also established joint ventures in the Middle East. In the UAE, it established a joint venture with the International Golden Group (IGG) in 2006, titled Denel Asia, which focused on the production and marketing of artillery and aerospace systems. In Saudi Arabia, Rheinmetall Denel Munition, which is joint venture with Rheinmetall Waffe Munition GmbH (Germany) of which Denel holds a 49% stake, built an ammunition manufacturing facility in partnership with the Saudi Military Industries Corporation in 2016[15]. Private sector defence companies have also established joint ventures with business entities in the Middle East, such as the partnerships established between the Paramount Group and IGG (in the UAE); and between the Paramount Group and the King Abdullah II Design Development Bureau and Jordan Manufacturing Services Solutions. There was also some evidence of a significant impact on South Africa's defence exports. Some European governments have been 'prompted' to purchase South African defence products in favour of their own products, despite criticism from their domestic defence industries. Some of the preferred European suppliers linked with South African defence firms in bids for foreign defence contracts[16].

In recent years the ailing Denel has attained profitability, but survives only with government support and is increasingly dependent on what are non-competitive contracts and exports through the linkages it has created. The only real competition is the willingness to buy foreign and this is limited by the desire to maintain Denel. The larger private companies are no longer purely local and a number of foreign companies have an important presence, though there are some newer local players, such as the Paramount Group. It is an impressively sophisticated industry for a country at South Africa's level of development, but it is in no way a comprehensive defence industrial base. It does however retain capabilities in most large weapon system technologies to allow SA to be an intelligent customer. A major problem is the dynamic between the internationalisation, growth of exports and impressive arms export controls that SA established. Despite the marked downsizing and restructuring, the SA defence-related industry remains highly capital, skill, import and research intensive, with relatively limited linkages to the civilian economy.

[15] In fact Rheinmettall has been explicit in stating that they have invested in Denel (and other subsidiaries) so that they can avoid German export law, specifically the fact that German exports to Saudi Arabia are forbidden. RDM allows Rheinmettall to sell to Saudi Arabia from South Africa, taking advantage of the fact that SA arms exports are barely monitored and may involve corruption. Indeed Saudi Arabia's government made serious moves towards buying a share of Denel (https://www.reuters.com/article/us-saudi-safrica-arms-exclusive/exclusive-saudi-makes-1-billion-bid-for-partnership-with-south-africa-defense-group-denel-idUSKCN1ND14Q). With growing concerns and the atmosphere created by the investigations into state capture, this has been stopped by government.

[16] Local industry is integrated into the global aerospace industry OEM supply chains, including Augusta Westland, the Airbus group, Alenia Aeronautica, BAE Systems, Boeing, Dassault, Gulfstream (part of General Dynamics), Lockheed Martin, Rolls-Royce, Saab and Safran. Another example is Denel Land Systems links with Patria and BAE Systems. http://www.engineeringnews.co.za/print-version/south-african-defence-industry-moves-to-collaborate-at-home-and-abroad-to-thrive-2014-10-24

6. Concluding Remarks

The South African defence industry has undergone considerable restructuring, reflecting to some degree the changes in the international environment. Military spending as a share of GDP declined markedly from 1989 to 1998 and although steadying it remains on a declining trend. The industry has certainly declined and changed considerably since the end of Apartheid and did see some benefits from the SDE offset deals, though at questionable cost. The Arms Deal has now been seen as fundamentally corrupt and to have been corrupting to the young democracy. There has been an increasing involvement of foreign defence companies with SA companies becoming part of international supply chains, with state owned Denel, the only large comprehensive systems integrator in decline and struggling. Denel has also recently been mired in the state capture scandals. The declining domestic procurement has led to pressures to exports that have now led to problems and pressures on arms export control regulations.

What is left is an arms industry that is a shadow of it previous self, but impressive for a country at the level of South Africa's development. It has companies that are internationally engaged with major contractors and act as suppliers in niche markets. Nevertheless, the defence industry represents a relatively small share of manufacturing output around half of which is Denel, which, while in profit, has serious liquidity problems. This puts pressure on the government to provide contracts to Denel, rather than to seek competitive bids, with the only potential competition usually coming from foreign contractors. Given the problems with the public sector resulting from state capture, relatively low economic growth, and the extremely high unemployment rate, the Government is unlikely to remove support from Denel anytime soon.

Appendix

Rooivalk

South African began the development of an attack helicopter, the Rooivalk in 1984. But it was still under development when the war in Angola ended in 1988 and the defence budget cuts started. Budget cuts inflicted further on the programme, and the planned acquisition was cut from 36 to only 12. This deprived the programme of the benefits of economies of scale.

The first prototype made its maiden flight only in 1990.But the delays meant it was obsolete aircraft when it finally began to be delivered to the SAAF in 1998. As a flying machine it is lauded, but its avionics system is outdated.

Only 12 production standard aircraft have been manufactured, all for the South African Air Force (SAAF) and no export orders have been won. This results from the fact that it is relatively expensive, given the lack of economies of scale; foreign worries about future support and the long-term viability of Denel; the fact that the Rooivalk is very heavily dependent on French technology, now owned by Eurocopter. Denel tried to get exports without Eurocopter's agreement and support, and potential customers were warned that they could not be guaranteed the support they would need for the engines and dynamics. This effectively killed off any remaining interest in the Rooivalk. Any recent interest has tended to come from countries that South Africa does not export to, based on its ethical arms trade policy[17].

Table A1: Defence Manufacturers Association (AMD) companies 2018

Company Name	Specialism
AMT: Advanced Maritime Transports:	Transport, logistics
Aerosud Aviation:	Aircraft maintenance repair parts emp 800
Hensoldt: Airbus DS Optronics	German: protection/surveillance emp 4000
Aselsan SA	Turkish: radio electronics. emp 5335
Aurecon SA	Engineering consulting emp 7500
Aztec Electronics	Power systems
BPL: Bidvest Panalpina	Logistics/supply chain
Bohlabela Ltd	Wheels
CCII Systems:	Naval systems
Cernofon CC	Technical advice offsets?
Compliance and Security	Advisory services
CSIR Defence Peace Safety	R&D
Cybicom Atlas Defence:	Naval systems
Damens Shipyards Cape	Shipbuilding and repairs
DCD Protected Mobility:	Armoured vehicles -mine detector
Denel SOC	Denel group emp 4941
Desert Wolf Consulting:	Engineering, projects
Emanzi Engineering	Consulting engineers
ETION (was Ansys)	Digital technologies
F&R Catai Transport	Transport solutions
Floida Engineering	Aerospace & defence; radar comms
FMM and TGT Construction	Recycling, construction
GEW Technologies:	Intelligence and security equip
Icarus Marine	Hydrofoil boats/patrol/interceptor
ILC Lerumo	Engineering support
Imperial Armour	Personal protection accessories
Integrated Convoy	Armoured personnel carriers RIVA
Intertechnic Contracting	Support services artillery

[17] Keith Campbell (2017) What went wrong with the Rooivalk? Engineering News http://www.engineeringnews.co.za/article/what-went-wrong-with-the-rooivalk-2007-06-08-

Katlego Global	Logistics
Lorris Duncker Consultancy	Arms control consultant/offsets
M-Tek	Electromechanical components subsystems
Megaray	Optical and Thermal. US
Milkor:	Multiple grenade launcher
MTU South Africa	Diesel engines
Natcom Group: Electronic Systems	Electronics (in business rescue 2014?)
Nautic South Africa	Shipbuilding support
North Park Group	Radar electronic warfare technology
Offsets and Consulting	NIP and DIP advice
Optronics Africa CC	Import and export technology support
Osprea Logistics SA	Peacekeeping operations support
OTT Solutions	Support services?
OTT Technologies	Armoured and mine protection vehicles
Chute Systems	Parachutes
Paramount Group	Naval systems
Pearl Coral 1173 T/A TFASA	Security consultants
PGSI Group	BEEE investment
Protoclea Advanced:	Image engineering/surveillance
Reployable Camp Systems	Camp systems
Reutech:	Radar, comms, electronics
RGC Engineering	Precision engineering
Rheinmetal Denel:	Ammunition
Rippel Effect Systems	Grenade launchers
S Plane Automation	Control aerospace/unmanned
SAAB South Africa	Electronics
Siemens	Engineering electronics
Southern African Shipyards	Shipbuilding, repair, maintenance
Tau Aerospace	Part of Safomar BEE aerospace
Tellumat Defence	Electronic systems
Thales South Africa Systems	Electronics/Engineering Frigate combat management, emp 160
TMI Dynamatics	Aerospace design and integration
Truvelo Manufacturers:	Weapons and Ammunition
Twiga Services and Logistics	Military vehicles
Vepac Electronics	Power supplies
Vliegmasjien	AUV plane
VR Laser Services	July 2018 went bust -Gupta owned, linked with Denel
ZD Investments T/A ZD Utilities	Engineering systems
Zebra Sun	Body armour

Source of information: members list on www.amd.org.za and individual company web sites.
Note: emp is employment

References

AMD (various) Defence Manufacturers Directory. http://www.amd.org.za/

Batchelor Peter and J Paul Dunne "The Peace Dividend in South Africa". Chapter 2 in Broemmelhorster, Joern (ed) (2000) *'Demystifying the Peace Dividend',* Bonn International Conversion Centre and Baden-Baden, Nomos Verlagsgesellschraft, pp 25-46.

Batchelor Peter and J Paul Dunne "The Restructuring of South Africa's Defence Industry", *African Security Review,* Volume 7, no. 6, 1998, pp27-43.

Batchelor, Peter and J Paul Dunne "Industrial Participation, Investment and Growth: The Case of South Africa's Defence Related Industry". *Development Southern Africa,* Volume 17, No. 3, September 2000, pp 417-35

Batchelor, Peter J Paul Dunne and David Saal "Military Spending and Economic Growth in South Africa", *Defence and Peace Economics* Volume 11, No. 6, 2000, pp 553-571.. ISSN 1024 2694.

Batchelor, Peter, J Paul Dunne and Sepideh Parsa. "Corporate Performance and Military Production in South Africa". *Defence and Peace Economics* Volume 11, No. 6, 2000, pp 615-641. ISSN 1024 2694.

Birdi, Alvin, J Paul Dunne and David Saal "The Impact of Arms Production on the South African Manufacturing Industry", *Defence and Peace Economics* Volume 11, No. 6, 2000, pp 597-613.. ISSN 1024 2694.

Brauer Jurgen and J Paul Dunne "Arms Trade Offsets and Development", *Africanus: Journal of Development Studies,* Vol. 35, No. 1, 2005, pp. 14-24.. ISSN 0304-615X.

Brauer, J. and Dunne, P. (eds.) (2004). *Arming the South: The Economics of Military Expenditures, Arms Production and Trade in Developing Countries.* Palgrave, April 2002. ISBN: 0-333-75440-9

Brauer, J. and Dunne, P. (eds.) (2004). *Arms Trade and Economic Development: Theory, Policy, and Cases in Arms Trade Offsets*. September 2004, Routledge: London. ISBN: 0-415-33106-4

DefenceWeb (2018a) Denel's government guarantee extended to 2023, DefenceWeb, 30 October 2018, http://www.defenceweb.co.za/index.php?option=com_content&view=article&id=53567:denels-government-guarantee-extended-to-2023&catid=7:Industry&Itemid=116

DefenceWeb (2018b) SA Defence Industry Fund officially launched, 6 July, http://www.defenceweb.co.za/index.php?option=com_content&view=article&id=52310&catid=74&Itemid=30

Denel (various) "Annual Reports"

Department of Defence (2015) South African Defence Review 2015. Pretoria: Department of Defence.

Department of Public Enterprises (2005) An Analysis of the Financial Performance of State Owned Enterprises. Pretoria: Department of Public Enterprises.

Dunne J Paul "The Making of Arms in South Africa", E*conomics of Peace and Security Journal*, Volume1, No. 1, January, 2006. ISSN 1749-852X.

Dunne J Paul "The Making of Arms in South Africa", *Economists Allied for Arms Reduction (ECAAR) Review*, Volume1, January 2003.

Dunne J Paul and Guy Lamb "Defence Industrial Participation: The Experience of South Africa", Chapter 19 in Jurgen Jurgen Brauer and Paul Dunne (eds) *Arms Trade and Economic Development: Theory Policy and Cases in Arms trade Offsets,* Routledge, September 2004. ISBN: 0-415-33106-4

Dunne, J Paul and Eamon Surry (2006). Arms Production. In the Stockholm International Peace Research Institute (SIPRI), *Yearbook, 2006: Armaments, Disarmament and International Security*. Oxford: Oxford University Press, chapter 9, pp 387-418.

Dunne, J Paul and Guy Lamb (2004) "Defence Industrial Participation: The Experience of South Africa", Chapter 19 in Jurgen Brauer and Paul Dunne (eds) *Arms Trade and Economic Development: Theory*

Policy and Cases in Arms trade Offsets, Routledge, September 2004, pp 284-298. ISBN: 0-415-33106-4

Dunne, J Paul and Richard Haines"Transformation or Stagnation? The South African Defence Industry in the Early 21st Century". 2006, Vol. 6 No. 3, *Defence Studies*.

Feinstein, Andrew (2011) The Shadow World: Inside the Global Arms Trade, Hamish Hamilton/Penguin, London.

Holden, P. 2017. Indefensible: Seven myths that sustain the global arms trade, Zed Books and University of Chicago Press. Collected by Paul Holden

Holden, Paul (2008) The Arms Deal in Your Pocket, Jonathan Ball, Jeppestown, RSA.

Parliamentary Monitoring Group (2018) NCACC Annual Reports: 2016 & 2017, with Ministers of Defence & Energy; Deployment resources funding; Mozambique Channel piracy; Department of Military Veterans status, 7 June 2018, https://pmg.org.za/committee-meeting/26606/

Reuters (2018) Union demands bailout for Denel, DefenceWeb, 12 November 2018, http://www.defenceweb.co.za/index.php?option=com_content&view=article&id=53718:union-demands-bailout-for-denel&catid=7:Industry&Itemid=116

SIPRI (various years) *SIPRI Yearbook: Armaments, disarmament and international security*. Oxford: Oxford University Press.

Sköns, E. and Dunne, J.P. (2007). "Arms Production, Economics of". In Lester Kurtz (ed) *Encyclopaedia of Violence, Peace and Conflict*, 2nd edition.

Sköns, E. et al. (1998). Military expenditure and arms production. In *SIPRI Yearbook 1998: Armaments, Disarmament and International Security*. Oxford: Oxford University Press, pp. 185-213.

Smith, Ron P "Military Economics", Palgrave, 2009, an excellent nontechnical overview

Sylvester, Justin and Annette Seegers (2008) South Africa's Strategic Arms Package: A Critical Analysis. Scientia Militaria, South African Journal of Military Studies, Vol 36, Nr 1, 2008. doi: 10.5787/36-1-45