DEFENCE INDUSTRY STRATEGY

VERSION 5.8 | MAY 2017 | STATUS: DRAFT

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This document comprises background material and a draft defence industry strategy developed by the National Defence Industry Council (NDIC). As such, this document remains subject to changes following inputs received during further consultations and during the public comment phase. It is issued in its current form solely for the purposes of public comment and inputs.

All technical and financial data has been taken from the appropriate official sources or provided by the companies concerned, and is considered to be accurate. It will, however, undergo further verification before the defence industry strategy is finalised.

Issued for public comment by:

Dr Sam Gulube
Secretary for Defence and Chairman of the NDIC

Date: 19 May 2017
# TABLE OF CONTENTS

**DISCLAIMER** .......................................................................................................................... i

**PREFACE** .............................................................................................................................. v

**ABBREVIATIONS & ACRONYMS** ......................................................................................... vii

**PART I: BACKGROUND** ........................................................................................................... 1

**INTRODUCTION** ...................................................................................................................... 1

**DEFINING THE DEFENCE INDUSTRY** .................................................................................. 3

**THE PURPOSE OF THE DEFENCE INDUSTRY** ..................................................................... 4

**SOUTH AFRICA’S DEFENCE INDUSTRY: OUTLINE BACKGROUND** .................................... 5

**LOOKING FORWARD** .............................................................................................................. 11

**MANDATE** ............................................................................................................................. 15

**POLICY** .................................................................................................................................. 17

**DEFENCE INDUSTRY STRATEGY: KEY ASSUMPTIONS** ....................................................... 19

**PART II: THE DESIRED END STATE FOR THE DEFENCE INDUSTRY** ............................... 22

**MEETING THE REQUIREMENTS OF THE DEFENCE FORCE** .............................................. 24

**MEETING THE REQUIREMENTS OF OTHER SECURITY SERVICES & AGENCIES** .......... 29

**ECONOMIC AND COLLATERAL BENEFIT** ............................................................................ 32

**MEETING AFRICAN DEFENCE NEEDS** ............................................................................... 34

**AREAS OF COMPETENCE** ..................................................................................................... 36

**KEY TECHNOLOGY DOMAINS** ............................................................................................. 38

**INTERNATIONAL COMPETITIVE** ........................................................................................... 40

**INTERNATIONALLY INTEGRATED** ........................................................................................... 41

**DEFENCE INDUSTRY OWNERSHIP** ..................................................................................... 42

**PART III: THE CONTEXT FOR THE DEFENCE INDUSTRY** .................................................... 55

**OVERVIEW** ............................................................................................................................... 55

**THE STRATEGIC CONTEXT** ................................................................................................... 55

**THE INDUSTRIAL CONTEXT** ................................................................................................... 97

**THE TECHNOLOGICAL CONTEXT** .......................................................................................... 106

**NATIONAL CONTEXT** ............................................................................................................. 120
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>PART IV: THE DEFENCE INDUSTRY OF THE FUTURE</td>
<td>130</td>
</tr>
<tr>
<td>OVERVIEW</td>
<td>130</td>
</tr>
<tr>
<td>DEFENCE FORCE DEVELOPMENT</td>
<td>130</td>
</tr>
<tr>
<td>DEFENCE REVIEW: POLICY OPTIONS</td>
<td>140</td>
</tr>
<tr>
<td>DEFENCE INDUSTRY STRATEGY: STABILISE AND SUSTAIN</td>
<td>142</td>
</tr>
<tr>
<td>DEFENCE INDUSTRY: TURN-AROUND AND DEVELOPMENT</td>
<td>157</td>
</tr>
<tr>
<td>LONG-TERM SUPPORT FOR THE DEFENCE INDUSTRY</td>
<td>166</td>
</tr>
<tr>
<td>DEFENCE FORCE ACQUISITION STRATEGY</td>
<td>167</td>
</tr>
<tr>
<td>SUPPORT FOR INTERNATIONAL ENGAGEMENT</td>
<td>181</td>
</tr>
<tr>
<td>DEFENCE TECHNOLOGY POLICY AND STRATEGY</td>
<td>183</td>
</tr>
<tr>
<td>INTELLECTUAL PROPERTY</td>
<td>187</td>
</tr>
<tr>
<td>GOVERNMENT SUPPORT TO THE DEFENCE INDUSTRY</td>
<td>188</td>
</tr>
<tr>
<td>DEFENCE INDUSTRY CONSOLIDATION</td>
<td>207</td>
</tr>
<tr>
<td>FUNDING THE DEFENCE INDUSTRY</td>
<td>210</td>
</tr>
<tr>
<td>THE DEFENCE INDUSTRY</td>
<td>215</td>
</tr>
<tr>
<td>DEFENCE INDUSTRY CULTURE AND VALUES</td>
<td>224</td>
</tr>
<tr>
<td>TRANSFORMATION</td>
<td>227</td>
</tr>
<tr>
<td>MEASURING SUCCESS</td>
<td>229</td>
</tr>
</tbody>
</table>
This defence industry strategy is based on the defence industry policy and strategy guidelines set out in the 2015 Defence Review, and is intended to serve as the framework for sustaining and further developing the defence industry. It will be supported by the Implementation Master Plan, which will detail the steps and mechanisms for implementing the defence industry strategy.

The purpose of the defence industry strategy is threefold:

- To support the Defence Force and ensure a reasonable measure of strategic independence and freedom of action for South Africa, by meeting critical requirements of the Defence Force and ensuring sovereign control over certain vital capabilities;
- To provide South Africa with a useful tool of strategy and foreign policy; and
- To reduce the negative economic impact of defence spending by retaining funds in South Africa, creating employment and generating export earnings.

The strategy document is rather longer than some might expect, including background material that those in the defence sector should find familiar. The reason for this is that it is essential for this strategy to be understood, accepted and internalised by other government departments, whose members may not have much knowledge of defence or defence industry issues.

The document comprises four parts:

- **Part 1** sets out the background reasoning as to why South Africa should have a defence industry and a brief outline of the industry’s present situation, as well as government policy and the courses of action open to government in respect of the defence industry.
- **Part 2** sets out the ‘desired end state’ for the defence industry, as derived from the 2015 Defence Review, also taking into account the 1996 White Paper on Defence, the 1998 Defence Review, the 1999 White Paper on Defence-Related Industries and the 1999 White Paper on Science and technology.
- **Part 3** provides the context within which the industry must be considered and within which it must operate, outlining South Africa’s strategic and vital interests, geostrategic trends, conflict in Africa and trends on conflict internationally.
- **Part 4** sets out the envisaged strategy to sustain existing defence industrial capabilities and to lay the foundation for an expanded defence industry in the future.
The strategy will be accompanied by several annexures, which will address some matters in more exhaustive detail.

In drafting this strategy, cognisance has been taken of the defence industry experience, policies and strategies of several other countries, drawing on both government documents and studies and articles prepared by industry bodies or written by individuals. While there are no direct parallels, there are some readily visible elements to be found in the experience and approaches taken by several other governments that are equally relevant to South Africa, and those concepts have been duly adapted and incorporated.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAM</td>
<td>Air-to-Air Missile</td>
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<tr>
<td>ACIRC</td>
<td>African Capability for Immediate Response to Crises</td>
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<tr>
<td>AMISOM</td>
<td>African Union Mission in Somalia</td>
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<tr>
<td>APC</td>
<td>Armoured Personnel Carrier</td>
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<tr>
<td>ASF</td>
<td>African Standby Force</td>
</tr>
<tr>
<td>AU</td>
<td>African Union</td>
</tr>
<tr>
<td>BBBEE</td>
<td>Broad-Based Black Economic Empowerment</td>
</tr>
<tr>
<td>BREXIT</td>
<td>British Exist from the European Union</td>
</tr>
<tr>
<td>BRICS</td>
<td>Brazil, Russia, India, China, South Africa</td>
</tr>
<tr>
<td>BVR</td>
<td>Beyond Visual Range (missile)</td>
</tr>
<tr>
<td>CAD</td>
<td>Cybicom Atlas Defence</td>
</tr>
<tr>
<td>CAR</td>
<td>Central African Republic</td>
</tr>
<tr>
<td>COMINT</td>
<td>Communications Intelligence</td>
</tr>
<tr>
<td>COTS</td>
<td>Commerical off the Shelf (i.e. equipment from the civilian sector)</td>
</tr>
<tr>
<td>C-RAM</td>
<td>Counter-Rocket, Artillery Mortar (base defence system)</td>
</tr>
<tr>
<td>CSIR</td>
<td>Council for Scientific and Industrial Research</td>
</tr>
<tr>
<td>DIF</td>
<td>Defence Industry Fund</td>
</tr>
<tr>
<td>DIP</td>
<td>Defence Industrial Participation</td>
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<tr>
<td>DIRCM</td>
<td>Directed Infra-Red Countermeasures</td>
</tr>
<tr>
<td>DIRCO</td>
<td>Department of International Relations and Cooperation</td>
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<tr>
<td>DoD</td>
<td>Department of Defence</td>
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<tr>
<td>DRC</td>
<td>Democratic Republic of Congo</td>
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<tr>
<td>DPSS</td>
<td>Defence, Peace, Safety and Security unit of the CSIR</td>
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<tr>
<td>DST</td>
<td>Department of Science and Technology</td>
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<td>DTI</td>
<td>Department of Trade and Industry</td>
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<tr>
<td>ECM</td>
<td>Electronic Countermeasures</td>
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<tr>
<td>ECCM</td>
<td>Electronic Counter-Countermeasures</td>
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<tr>
<td>ECOMOG</td>
<td>Economic Community (of West Africa) Observer Group</td>
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<td>EEZ</td>
<td>Exclusive Economic Zone</td>
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<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>EW</td>
<td>Electronic Warfare</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>ICV</td>
<td>Infantry Combat Vehicle</td>
</tr>
<tr>
<td>IED</td>
<td>Improvised Explosive Device (e.g. roadside bomb)</td>
</tr>
<tr>
<td>IFF</td>
<td>Identification, Friend or Foe</td>
</tr>
<tr>
<td>IP</td>
<td>Intellectual Property</td>
</tr>
<tr>
<td>IPAP</td>
<td>Industrial Policy Action Plan (of the DTI)</td>
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<tr>
<td>IPV</td>
<td>Inshore Patrol Vessel</td>
</tr>
<tr>
<td>IRST</td>
<td>Intelligence, Reconnaissance, Surveillance and Targeting</td>
</tr>
<tr>
<td>Acronym</td>
<td>Full Form</td>
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<tr>
<td>---------</td>
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<tr>
<td>JV</td>
<td>Joint Venture</td>
</tr>
<tr>
<td>LEDS</td>
<td>Land Electronic Defence System (self-protection for vehicles)</td>
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<tr>
<td>LMT</td>
<td>Land Mobility Technologies (Denel-owned company)</td>
</tr>
<tr>
<td>MoD</td>
<td>Ministry of Defence</td>
</tr>
<tr>
<td>MOTS</td>
<td>Military off the Shelf (i.e. equipment already in service)</td>
</tr>
<tr>
<td>MRO</td>
<td>Maintenance, Repair and Overhaul</td>
</tr>
<tr>
<td>NATO</td>
<td>North Atlantic Treaty Organisation</td>
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<tr>
<td>NDIC</td>
<td>National Defence Industry Council</td>
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<tr>
<td>NIP</td>
<td>National Industrial Participation</td>
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<td>NIPF</td>
<td>National Industrial Policy Framework</td>
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<tr>
<td>OEM</td>
<td>Original Equipment Manufacturer</td>
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<tr>
<td>OPV</td>
<td>Offshore Patrol Vessel</td>
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<tr>
<td>PAT</td>
<td>Paramount Advanced Technologies</td>
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<tr>
<td>PMC</td>
<td>Private Military Company</td>
</tr>
<tr>
<td>PPPFA</td>
<td>Preferential Procurement Policy Framework Act</td>
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<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
</tr>
<tr>
<td>RDM</td>
<td>Rheinmetall Denel Munition</td>
</tr>
<tr>
<td>RPG</td>
<td>Rocket-Propelled Grenade (light anti-tank weapon)</td>
</tr>
<tr>
<td>SADC</td>
<td>Southern African Development Community</td>
</tr>
<tr>
<td>SAM</td>
<td>Surface-to-Air Missile</td>
</tr>
<tr>
<td>SANDF</td>
<td>South African National Defence Force</td>
</tr>
<tr>
<td>SASAR</td>
<td>South African Search and Rescue Region</td>
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<tr>
<td>SDA</td>
<td>Special Defence Account (the SANDF acquisition account)</td>
</tr>
<tr>
<td>SDPs</td>
<td>Strategic Defence Packages (the 1999 acquisitions)</td>
</tr>
<tr>
<td>SEZ</td>
<td>Special Economic Zone (DTI)</td>
</tr>
<tr>
<td>SDEZ</td>
<td>Special Defence Economic Zone (proposed)</td>
</tr>
<tr>
<td>SMEs</td>
<td>Small and Medium Enterprises</td>
</tr>
<tr>
<td>SMMEs</td>
<td>Small, Medium and Micro Enterprises</td>
</tr>
<tr>
<td>TAU</td>
<td>Tactical Airfield Unit (SA Air Force)</td>
</tr>
<tr>
<td>UAV</td>
<td>Unmanned Aerial Vehicle</td>
</tr>
<tr>
<td>UGV</td>
<td>Unmanned Ground Vehicle</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>UNAMID</td>
<td>UN/AU Hybrid Mission in Darfur</td>
</tr>
<tr>
<td>USD</td>
<td>United States Dollar</td>
</tr>
<tr>
<td>VIP</td>
<td>Very Important Person (not necessarily politicians or generals; also doctors, urgently required repair teams etc.)</td>
</tr>
<tr>
<td>ZAR</td>
<td>South African Rand</td>
</tr>
</tbody>
</table>
PART I: BACKGROUND

INTRODUCTION

1. A capable defence industry is a key part of overall defence capability and the credibility of national defence strategy\(^1\), \(^2\). It provides the ability to sustain equipment in service and the ability to bring equipment into service efficiently, enhancing the effectiveness of the Defence Force and providing a level of strategic independence. The key elements of this level of capability are:

a. Maintenance, repair and overhaul (MRO), making the Defence Force at least partly independent of original equipment manufacturers and their governments, and also reducing downtime by carrying out work in-country. This should be practicable in respect of most equipment and systems.

b. Manufacture of high-rate-of-use munitions, batteries\(^3\) and spares, giving the ability to meet unexpected demand at short notice. This will not be practicable in respect of all munitions and batteries in particular, but should be practicable in respect of those types required in the greatest quantities, giving a level of independence from foreign manufacturers.

2. A defence industry is potentially a key element of overall defence capability in that it “will permit the cost-effective purchase of certain products and systems, ensure life-cycle maintenance and support of such systems, and perform refurbishment and upgrade of existing equipment.”\(^4\)

3. Depending on its range of capabilities, a defence industry can provide a greater level of strategic independence, potentially freeing the country from the need to remain aligned with one or another major power.

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\(^1\) 1996 White Paper on Defence, Chapter 8, Paragraph 3: “The services of an efficient defence industry are needed to...enable the SANDF to meet its constitutional obligations” (DoD Website, not the printed version); 1999 White Paper on the Defence Related Industries; Page 2. Defence Review 1998, Chapter 13, Page 120, Paragraph 2.4 (printed version); Defence Review 2015, Pages 15-2 and 15-3, Paragraphs 8 and 9.

\(^2\) See Annexure 1.

\(^3\) E.g. for radios, missiles, torpedoes, other smart weapons.

\(^4\) White Paper on Defence 1996, Chapter 8, Paragraph 3 (Note: DoD Website, not the printed version).
a. This can be achieved most cost-effectively by developing the ability to adapt and modify equipment to suit the Defence Force's particularly requirements.

b. One level higher is to develop systems integration capability, which will allow the acquisition of equipment, systems and sub-systems from different countries and integrating them locally.

c. The next level is to develop and manufacture equipment and systems optimised for the Defence Force. That is more demanding of investment, but is justifiable when the theatre demands equipment not generally available, or the operational style of the Defence Force requires equipment different to that used by other forces, or when strategic considerations demand a greater level of independence.

4. Depending on its level of capability, a defence industry will also provide the government with a useful foreign policy tool, in the form of the ability to support the equipment and systems of a friendly state\(^5\), or to provide equipment and systems to a friendly state. It can also be a foreign policy tool in the sense of granting a measure of independence in foreign policy from that of major powers.

5. Finally, again depending on the level of capability attained, a defence industry can be a major factor in expanding and deepening the national skills base and furthering national industrialisation policies, generating foreign currency earnings from equipment exports with related services, and creating employment. At the very least, it will avoid the export of currency and jobs to other countries in the course of equipping the Defence Force.

6. A defence industry can even be a key factor in changing the profile of an economy: South Africa's defence industry can be argued to have changed the profile of the economy from one focused and dependent on agriculture and mining, to one with precision engineering, and composite materials expertise, and the ability to develop high-end electronics and software, among other capabilities\(^6\).

\(^5\) White Paper on Defence 1996, Chapter 4, Paragraph 20 (Note: DoD Website, not the printed version).

\(^6\) Comparing the South African economy of 1960 to that of 1990 will show major change in capabilities.
DEFINING THE DEFENCE INDUSTRY

7. The 2015 Defence Review describes the defence industry as comprising “companies (both public and private) that are primarily concerned with the design, development, manufacture, production or support of weapons, munitions, pyrotechnics, equipment systems and other matériel for the Defence Force or for exports; divisions of companies in other sectors that are so engaged; and companies that are major sub-contractors or component suppliers to such activities”\(^7\),\(^8\).

8. The defence industry can be considered as mainly comprising two elements, the defence industry proper and defence-related industries:

   a. **The defence industry proper** comprises those companies that are focused on the development, production, support and sustainment of defence equipment, systems and software, and defence-specific research, although many will also have civilian lines of activity.

   b. **The defence-related industries** include companies that:
      
      i. Are primarily active in the civilian sector but also develop and manufacture sub-assemblies or components for defence equipment or systems, or supply specific material (e.g. armour plate) to the defence industry; and/or
      
      ii. Supply items from their normal non-military production, perhaps with some slight adaptations to military needs.

9. The defence industry proper would include groups such as Denel and companies such as Reutech Radar Systems, Saab Grintek Defence and Rheinmetall Denel Munition.

\(^7\) Defence Review 2015, Chapter 15, Page 15-1, Paragraph 2.

\(^8\) White Paper on the Defence Related Industries 1999: “South African defence-related industries are defined as those clusters of organisation in the public and private sector, and commercial companies and business units of such organisations, which are directly or indirectly active in the provision of goods and services to security forces which are defined as armaments. This provision can include research, design, development, production, assembly, test, evaluation, upgrading, procurement, export, import, maintenance, logistical support, human support or project management. The defence-related industries are mainly involved in the material, mechanical, electrical, electronic and chemical sectors of the manufacturing industry and produce armaments for both domestic and international clients”. It defined ‘armaments’ as “any vessels, vehicles, aircraft, ammunition and weapons, as well as substances, materials, raw materials, components, equipment systems, articles, techniques or services that are designed, modified or adapted to be utilised to equip, maintain or support security operations, or which are used in the development, manufacture or maintenance of such armaments”.


10. The defence-related industries would include, for instance, motor manufacturers that supply military variants of standard trucks, trailer manufacturers who also manufacture field kitchens, as well as companies in the food sector who supply ration packs, and companies in the clothing and textiles sector who supply uniforms. This group would also include services companies that provide professional services to the Defence Force or to the defence industry.

11. From the point of view of the state, the primary purpose of the defence industry is to support the Defence Force by supporting, sustaining, upgrading, modernising, adapting, manufacturing and, where essential or desirable, developing equipment and systems for the Defence Force.

12. A key by-product of this is to reduce the negative impact of defence spending on the economy, by retaining a large proportion of that expenditure within the country rather than ‘exporting’ it to pay for imported equipment and the later support of that equipment, generating employment, advancing skills and expanding the skills base, establishing new technologies and processes, and reducing forex outflows. An additional purpose is to provide similar services to other government departments and agencies where this is relevant and practicable.
13. From the point of view of the companies in the industry, the primary purpose is to survive and generate a good return to underpin growth and satisfy their investors.

14. A key task of the National Defence Industry Council (NDIC) will be to bring those two quite different points of view into a productive alignment. This will demand a synergistic balance between the state-owned and commercial elements of the defence industry that will provide the optimal overall result for the Defence Force and the economy.

SOUTH AFRICA’S DEFENCE INDUSTRY: OUTLINE BACKGROUND

15. Between 1965 and 1990 South Africa developed a defence industry remarkable both for its breadth and depth of capabilities, and for its innovative approach\(^9\), which enabled it to develop several class-leading systems, of which mine-protected vehicles, long-range artillery (G5 and G6) and frequency-agile radios are only some well-known examples.

16. With the December 1988 Three Powers Accord confirming the withdrawal of Cuban forces from the region, the need for conventional forces was greatly reduced, and defence funding was slashed from the 1989 budget onwards, falling by some 50% in real terms over five years.

17. The cuts fell mainly on Defence Force:
   a. Acquisition\(^10\), which fell by 80% over that period; and
   b. Research and development, which fell by 70%.

18. The impact on the industry was quick and severe, with companies cutting internal R&D funding, many smaller defence companies closing down or exiting the defence field, and upstream suppliers cutting their capabilities and capacities. It also led to a ‘brain drain’, both from the industry and from South Africa, with some of the most highly qualified and experienced engineers and technicians being recruited by companies in other countries.

19. With the exception of the 1999 Strategic Defence Packages (SDPs) and a small number of major projects, such as the new Badger infantry combat vehicle, the erosion of defence funding in real terms has continued since

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\(^9\) See Annexure 2 for an outline overview of the development of the industry.

then, with government funds being channelled to address real and urgent socio-economic needs.

20. But operational commitments expanded after 2001, as South Africa took on regional and continental security obligations. The resulting disconnect between defence funding and operational commitments has meant that the Defence Force is under-funded and lacks adequate funds for modernisation, capital acquisition, research and development, and even for adequate maintenance, repair and overhaul of equipment and systems.

**Defence Budget and Acquisition Funding**

**Defence Budget, Special Defence Account, Strategic Defence Packages, SDA+SDP as a % of the Budget**

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11 Note: SDA – Special Defence Account, through which acquisition is handled; SDP – ‘Strategic Defence Packages’, 1999 acquisition of 4 frigates, 3 submarines, 26 Gripen fighters, 24 Hawk trainers, 30 A-109 light utility helicopters and 4 Super Lynx shipboard helicopters).
21. The effect on the defence industry has been dramatic:

   a. Defence Force acquisition from the South African defence industry has dropped from R 26.2 billion in 1989/90 to R 7 billion in 2017 (both in 2017 Rand).

   b. Research and Development funding has declined from R 6.1 billion in 1989/90 to R 850 million in 2017 (both in 2017 Rand)\(^\text{12}\).

   c. Turnover has dropped from R 31.6 billion in 1989/90 to R 19 billion in 2016 (both in 2017 Rand).

   d. Employment has dropped from some 130 000 employees in 3 000 companies in 1990 (9% of manufacturing employment and 10% of manufacturing companies)\(^\text{13}\), to some 15 000 employees in some 120 companies; and

   e. Coupled to this has been a considerable loss of both breadth and depth of capabilities, although the core of its capabilities remains intact for now.

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\(^{12}\) Note: Total national R&D funding (government and industry) was R 29 billion in 2014/15 (Department of Science and Technology's survey of R&D in South Africa.

\(^{13}\) Armscor, which then included what is now Denel, had 30 000 employees (15\(^\text{th}\) largest employer in SA), assets of R 17.5 billion (30\(^\text{th}\) largest company in SA) and a turnover of R 22.4 billion (both in 2017 Rand).
22. This was ameliorated to an extent by the Defence Industrial Participation requirements linked to the SDPs, which brought some new market opportunities and some investment in new technologies and processes that benefited South African companies. Among the positive effects were:

a. The continued development of the Denel Dynamics Umkhonto surface-to-air missile and Reutech Radar Systems’ RTS-6400 tracker, which in turn enabled those companies to continue other development work that has since led to the Al Tariq guided bomb system being manufactured in the United Arab Emirates under a joint venture between Denel and the Tawazun group, and the export of the RSR-210N radar to the Royal Norwegian Navy.

b. Several South African companies used their work on these projects to buy time to refocus on the export market, which has proved very successful for some of them.14

23. The insight into the South African defence industry gained by foreign defence groups that bid for SDP contracts also resulted in some of them acquiring majority stakes in local companies. While this was not uniformly beneficial to South Africa, it has seen some companies survive and prosper that might otherwise not have been able to win sufficient export work to offset the lack of local orders. Among them one could include15:

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14 Based on interviews with executives of several South African defence companies.

15 Suppliers to Hensoldt and RDM employ some 3 000 people engaged full-time on that work, with perhaps another 5 000 engaged part of their time on that work or in companies that are indirect suppliers.
a. Hensoldt Optronics\textsuperscript{16} (300 employees, all of them South Africans; R 700 million turnover, of which R 600 million is from exports);

b. Rheinmetall Denel Munition (2 000 employees; R 2.14 billion turnover, of which R 1.6 billion is from exports);

c. Saab Grintek Defence (700 employees, R 1.1 billion turnover, of which R 880 million is from exports);

24. That same insight also led Atlas Elektronik to partner with Cybicom in South Africa to establish Cybicom Atlas Defence (CAD) to support the SA Navy’s submarines and to undertake other naval work for export. CAD today has 30 employees and a turnover of R 40 million, with some 25% being net forex revenue.

25. While the impact of foreign companies entering the industry has generally been positive, in one case the acquisition of a local company by a foreign group led to the loss of local development capability in several areas. The acquisition of defence companies by entities or groups is, therefore, something to be monitored closely, and in the case of companies involved in projects considered sovereign or strategic, or where sensitive technologies are involved, the state should reserve the right of first refusal to acquire the company or a portion of it.

26. The under-funding of the Defence Force has also meant that it has lacked the funds to invest adequately in the development of new equipment and systems to modernise and upgrade its capabilities, and the very restricted acquisition funding has resulted in tight budgets in the industry, with very limited internal funds for equipment development\textsuperscript{17}:

a. The Army faces most of its prime mission equipment becoming obsolescent or even obsolete, and that key capability gaps are emerging just when it is set to face more challenging tasks. Among the latter are a lack of close-in anti-tank/bunker weapons, air defence systems, air-transportable combat and logistic vehicles, and logistic vehicles to support mechanised forces;

\textsuperscript{16} Previously Airbus Optronics.

\textsuperscript{17} In some cases, this led to such delays in development and acquisition projects, that the system developed to meet a particular requirement has been overtaken by new technologies without ever coming into service. For instance, the ESR 360L radar developed for an Air Force requirement 20 years ago, which is still open.
b. The Air Force lacks a full range of precision weapons for its fighters and combat helicopters, any serious maritime operations capability, and the airlift required to support regional missions as envisaged in terms of the African Standby Force (ASF) and the African Capability for Immediate Response to Crises (ACIRC); and

c. The Navy lacks adequate numbers of ships to meet current and envisaged regional commitments, and lacks the sealift to support regional missions.

27. Despite the challenges, the industry has been able to retain its leading position in some fields, among them tactical communications, radar, electronic warfare and long-range artillery ammunition, and remains very successful in those fields and guided weapons, as well as continuing to generate innovative products in other fields.

28. But the lack of development funding also means that much of the industry’s success in the export market has begun to wither, because it lacks new equipment proven in service, with which to contest effectively in the international market\(^\text{18}\). This trend will accelerate because the industry also lacks adequate funding to keep abreast of developing and evolving defence technologies.

Defence Exports\(^\text{19}\)

\(^{18}\) It is difficult to market complex equipment or systems successfully if they are not in service with the forces of the home country, as potential buyers want to be certain that the equipment actually works, and that it will be supportable over its likely service life. Consider the export failure of the US F-20 fighter and various German armoured vehicles in the past. This can be offset if the company is part of a major international group.

\(^{19}\) Note: The increase in exports from 2006 was largely the result of exports of mine-protected vehicles, mine-detection vehicles and artillery ammunition resulting directly and indirectly from the wars in Afghanistan and Iraq. The steep decline after 2012 came with the end of those orders as the wars stabilised and wound down.
29. There are exceptions, mainly the companies with strong ties to one or more international defence groups, which enable them to keep up and which will also give them additional access to the international market.

LOOKING FORWARD

30. The industry is now, like the Defence Force it supports, on a cusp and requiring decisive action if it is not to collapse for lack of a client base and marketable products. The risk of this has been greatly increased by the failure to fund even the implementation of the 2015 Defence Review’s ‘Milestone 1’, intended to “arrest the decline” of the Defence Force’s capabilities.

31. There are four courses of action open to government in this respect:

a. ‘Business as Usual’: Continue the trend of under-funding and operational over-stretch. Despite the best efforts of the Department of Defence, the resultant lack of acquisition and R&D funding will have the effect of putting the defence industry into an unplanned, unstructured, uncontrolled and accelerating downward spiral, shedding capabilities and jobs.

   i. The Defence Force will become increasingly dependent on foreign-sourced equipment, munitions, spares and foreign technical support, which will result in a loss of strategic independence and freedom of strategic action, and could result in South Africa being placed at risk in the event of foreign support being withheld. In addition, the cost of imported equipment will increase the cost of any selected force design.

   ii. A further problem will be that of maintenance, repair and overhaul (MRO) costs for foreign equipment being in foreign currency, as will be the related shipping costs, which will not only increase those costs, but also render them unpredictable, complicating financial planning for the Defence Force. Added to that will be longer turn-around loops and additional bureaucracy, and the need to hold larger stocks of spares, also increasing overall costs.

b. ‘Planned Shut-Down’: Accept that defence will remain under-funded, and that the industry will wind down for lack of local orders and R&D funding, and plan for a structured and phased winding down of the
industry and the concomitant loss of capabilities. Carefully planned and executed, that should allow at least retention of some core maintenance, repair and overhaul (MRO) capability.

i. While this will still result in a loss of strategic independence, it will allow some freedom of strategic action for short periods.

ii. It may also allow for the beneficial disposal of some operating entities, some intellectual property, and other assets.

c. ‘Stabilise and Sustain’: Decide to retain those defence industry capabilities that are still viable and recover others deemed essential.

i. This will give the Defence Force some optimised equipment and systems and enable it to approach other acquisitions as an ‘intelligent buyer’, retain South Africa’s present level of strategic independence and freedom of strategic action, retain existing jobs, advance scarce skills and bring in some hard currency export earnings.

ii. This will also provide a modicum of stability in the manufacturing sector, where the defence industry has consistently maintained a proven track record of developing top-class engineers, scientists, technicians and artisans for the benefit of the wider economy, and create the opportunity to develop SMEs and particularly black-owned SMEs as suppliers to this high-tech sector, giving them the basis from which to expand into other sectors.

⇒ The development and support for new SMEs will not, however, be viable in an environment where there is insufficient workload for the established companies to continue operating at sustainable levels and where they may even have to lay off long-serving staff.

iii. This will, however, require urgent targeted financial intervention to stabilise selected elements of the industry, prevent further loss of capabilities and to begin rebuilding the skilled workforce, while providing selected equipment and maintenance services, followed by sustained funding at a level that will allow an economically viable order-flow and sufficient R&D to keep the industry abreast of technology in selected fields.
iv. This will also require a focused communication strategy to explain to the public why defence capability, and defence industrial capability in particular, are worth the necessary investment.

d. ‘Stabilise and Develop’: Decide to use the present industry as the foundation for an expanded and better-balanced industry to optimally support the Defence Force, and to create an environment in which this industry can better support economic development and targeted industrialisation by means of localisation of selected bought-in technologies and processes (if necessary by means of legislated industry/sector designation), research and development, and exports.

i. This would allow the development of a balanced defence capability optimised for the likely missions assigned to the Defence Force, and would also enable the industry to considerably expand the export of world-class equipment and systems.

ii. This will require the same urgent initial financial intervention as above, followed by steadily increasing acquisition and R&D funding for the Defence Force and for institutions active in relevant fields of technology development.

iii. In addition, this will require active Defence Force and government support to the industry’s export efforts in order to increase funds available for further development, and the creation of export credit facilities to match the incentives offered by international companies.

iv. This should be accompanied by a focused effort to identify partner companies in other countries with similar defence requirements, to spread R&D costs, exploit existing niches and expand the client base.

v. All of this will need to be backed up by a focused communications strategy, as indicated above, but with additional focus on job creation, the establishment of new technologies, materials and manufacturing processes and their impact on the wider economy.

32. The first and second options would both remove the ability to provide the Defence Force with equipment and systems optimised for the theatre and its operational style, and to cost-effectively sustain them, reducing its tactical
and operational effectiveness and essential flexibility. They would also result in significant job losses, losses of manufacturing capability and capacity that will impact on both military and related commercial sectors, a significant loss of hard-currency earnings from defence exports, and a marked increase in hard-currency outflows for equipment, munitions, spares and related services. The resulting dependence of the Defence Force on foreign-sourced equipment, munitions, spares and technical support will curtail South Africa’s strategic independence, freedom of strategic action and, to an extent, place sovereignty at risk.

33. The third option would avoid most of the negative effect of the first two options, and would be affordable within a defence budget of around 2% of GDP\(^\text{20}\). A proportion of the additional defence funding would go to salaries and industrial investment, while some would return to the National Treasury in the form of taxes on the higher level of activity and its knock-on effects on other sectors. The industry would also be able to expand its export potential, generating both hard currency inflows and additional tax revenue. In addition, there will be spin-off resulting in non-defence products, such as the mining radar developed by Reutech Radar Systems on the basis of its military radar technology, which is generating a healthy hard currency revenue flow.

34. The fourth option would potentially have greater long-term benefits, but would require a greater level of long-term government commitment that is linked to the desire to re-establish South Africa as a manufacturing nation. It would require near- and medium term funding at levels that might prove difficult to provide given the current economic situation and other urgent demands on government funds. This option could, however, be exercised later if the third option was to be implemented in the interim, as a targeted step towards higher industrialisation as well as desired levels of R&D and related new materials and manufacturing technologies.

**The Optimal and ‘Least Worst’ Options**

35. **Optimal**: From a broad strategic perspective, the optimal option would be to ‘Stabilise and Sustain’ the industry, which would be affordable over the near- and medium-term, and which would also provide the flexibility of scaling up

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\(^{20}\) Calculations during 2013 showed that the recommendations of the Defence Review would require defence spending to peak at 2.4% of estimated GDP if implemented over twenty years. Stretching implementation to thirty years kept the cost below 2% of GDP throughout. The longer period would also allow time to develop the expanded senior officer corps and allow phased acquisition to avoid later block obsolescence (i.e. various systems becoming obsolete in the same timeframe, imposing a funding challenge to replace them).
to ‘Stabilise and Develop’ at a later date, when renewed export revenues and increased defence funding so allow.

36. ‘Least Worst’: The ‘least worst’ option would be the ‘Planned Shut-Down’, which would have major and severe consequences for the Defence Force as well as negative economic effects, but which would at least allow a controlled process that could retain key MRO capabilities. This option would, however, nevertheless irreversibly terminate many existing value-added functional and technical capabilities.

37. **Worst**: The worst possible option would be to continue with ‘Business as Usual’ which would result in an uncontrolled implosion of defence industrial capability. The only possible exceptions to this outcome would be those companies that are owned by major foreign defence groups and that are focused primarily on exports. Even they, however, might in time be wound down for want of good reason to retain them in South Africa in the absence of other defence industrial activity.

### MANDATE

38. Constitution: The Constitution states the primary object of the Defence Force as being to “defend and protect the Republic, its territorial integrity and its people” (Section 200/2).

39. In addition, the Constitution provides for the employment of the Defence Force:
   d. “In cooperation with the police service” (Section 201/2/a); and
   e. “In fulfilment of an international obligation” (Section 201/2/c).

40. Logically, this mandate presumes a Defence Force of adequate strength and appropriately equipped.

41. The 1996 White Paper on Defence sets out the “features” required of the Defence Force, and among them includes\(^\text{21}\):
   d. “The ability to expand the size of the Defence Force to appropriate force levels within a realistic warning period”; and
   e. “The maintenance and, where necessary, the adequate and appropriate upgrading or replacement of equipment and weaponry”.

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\(^{21}\) The White Paper on Defence (1996), Chapter 4, Page 17 (in the printed version).
42. The White Paper then specifically states that “The services of an efficient defence industry are required to address these needs and enable the SANDF to meet its constitutional obligations”\(^\text{22}\).

43. The 1998 Defence Review repeated that requirement for a defence industry, quoting the statement of the White Paper\(^\text{23}\).

44. The 2015 Defence Review confirms the requirement for a defence industry, stating that “South Africa requires an effective defence capability which includes, as an integral element, a defence industry”\(^\text{24}\).

45. There is, thus, a clear requirement and mandate for South Africa to have a defence industry capable of supporting the Defence Force.

46. In addition, the 1996 White Paper on Science and Technology:

   d. States that the intention is to have a “smaller but technologically more capable” Defence Force, which implies that the defence industry must have the requisite capability to support the future technologies; and that

   e. “The maintenance of a strong technology base” is “a prerequisite of the new SANDF strategy”\(^\text{25}\), and that this technology base should be capable of:

      i. “Maintaining the capability to detect threats”;
      
      ii. “Being aware of trends in military technology and their implications for the SANDF”;
      
      iii. “Producing technology demonstrators that can rapidly be turned into military technology if necessary”;
      
      iv. “Providing expert advice for procurement purposes”;
      
      v. “Providing test and evaluation services”;
      
      vi. “Supporting and upgrade and maintenance activities”

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\(^{23}\) Defence Review 1998, Chapter 13, Page 120, Paragraph 2.4 (in the printed version).


\(^{25}\) White Paper on Science and Technology (1996), Chapter 8, Section 2.5.

\(^{26}\) Note this refers to what the Department of Defence, Defence Force and Armscor term ‘acquisition’.
POLICY

"The government will not endanger the lives of military personnel through improper deployment or the provision of inadequate or inferior equipment".


47. That statement in the White Paper implies that the government will take all necessary - and practicable – measures to ensure that the Defence Force at all times has equipment, systems, munitions, spares and technical support:
   d. Appropriate to its envisaged and potential missions;
   e. Suited to the geography of the anticipated theatres of operations;
   f. Suited to the needs of a small force conducting operations in a large theatre;
   g. Of a standard to ensure that deployed forces will have an edge over opponents; and
   h. In adequate numbers and quantities, and at desired levels of serviceability and mission readiness.

48. That set of requirements can to an extent be met by means of importing equipment and systems, but that would have adverse financial and strategic implications\(^27\). Experience also suggests that it would be difficult to ensure maintaining the desired serviceability and readiness levels, and that striving to do so would further increase costs.

\(^{27}\) See Annexure 1 for an outline discussion of some relevant aspects.

The weakening Rand would present a major challenge to the Defence Force if over-dependent on imported equipment and systems.
49. The alternative is to manufacture and even develop selected equipment and systems in South Africa, and to ensure the ability to support and sustain all equipment and systems in service efficiently and cost-effectively, which will require a capable national defence industry.
   a. This will require clear and decisive determination of what is required for ‘strategic independence’\(^{28}\), what it is important to have under ‘sovereign’ control\(^{29}\), and in what fields it is militarily or industrially worth developing optimised\(^{30}\) equipment, materials and relevant technologies to address the defined life cycle of that equipment.

   b. Where the capability to develop equipment or systems does not yet exist in South Africa, such items could be assembled or manufactured under licence, enabling the industry to develop the relevant capabilities. This approach was taken successfully in the past: For instance, beginning with licence production of the Panhard AML armoured car, developing it into the more effective Eland; then developing a foreign armoured personnel carrier design into the Ratel infantry combat vehicle, and then developing the Rooikat armoured car from scratch.

50. The 2015 Defence Review, which has been accepted by the Presidency, the Cabinet and Parliament, recommended that South Africa should retain and enhance its defence industrial capability: “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”.\(^{31}\)

51. The same paragraph continues to state that: “A vibrant, focussed defence industry is thus a major asset to South Africa, strengthens its defence and security capabilities; supports its foreign policy initiatives – particularly within the region and on the continent – and is supportive to the national development agenda”.

These aspects will need to be explained by means of a focused and sustained communication strategy, with specific emphasis on the collateral impact that the defence industry has on the wider manufacturing sector, technology advances and materials technology, as well as on human capital development.

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\(^{28}\) Strategic Independence: The ability to employ the Defence Force without being dependent on the approval of another country.

\(^{29}\) i.e. Under National control

\(^{30}\) i.e. Optimised for the climate and geography of likely theatres, the operational style of the Defence Force, and likely opposing forces.

52. The next paragraph of that chapter spells out in broad terms what the defence industry is expected to provide South Africa\(^{32}\): “A vibrant defence industry remains a crucial component of an effective South African defence capability, providing South Africa with a defence and security industrial base that must be positioned to ensure the attainment of the Defence Review and the pursuit of the Defence Strategic Trajectory. This will in the main include, where appropriate, support in pursuit of:

d. Strategic independence.

e. Sovereign capability in selected areas.

f. Optimised equipment and systems.

g. Cost-effective equipment, systems and services to the Defence Force and other security services.

h. Economic benefit derived from necessary defence expenditure.

i. Collateral benefit ensuing from the endeavours of the defence industry.”

53. The latter points would bring optimal benefit if formally aligned with the IPAP and the DST and DTI R&D and materials technology objectives.

54. Given this acceptance of the importance of a capable defence industry, only the latter two of the possible courses of action set out above are actually viable: ‘Stabilise and Sustain’ or ‘Stabilise and Develop’.

55. Given the present financial constraints on government driven by real and urgent demands on available government funding, the ‘Stabilise and Develop’ option is not one that can be credibly exercised at this stage, leaving ‘Stabilise and Sustain’ the only practicable option for the time being.

**DEFENCE INDUSTRY STRATEGY: KEY ASSUMPTIONS**

56. The purpose of this defence industry strategy is to set out the desired trajectory in terms of capability and skills retention, capability development, support, and export orientation and support.

57. This strategy is based on several key assumptions, which are set out and discussed below:

- That government intends to implement the 2015 Defence Review, and it is designed to support that;

e. That the primary client of the defence industry will be the Defence Force, while the government will also support the industry in pursuing export opportunities;

f. That the ‘Stabilise and Sustain’ course of action will be adopted by government to guide the way forward;

g. That the government will provide adequate funding for the Defence Force, to cover its operational employment, training and maintenance, acquisition of equipment systems, spares, munitions and stores, and to fund research and development to secure the future equipment of the Defence Force and the future of the industry;

h. That there will be an internal communication strategy, to ensure that other parts of the government are informed of and support the logic and purpose of this strategy, and an external communications strategy to set out the logic of the defence industry to the public.

58. This strategy is, therefore, based on a ‘Stabilise and Sustain’ approach, with an eye to future further development of South Africa’s defence industrial capabilities when the necessary investment can be made.

59. It is important to understand that the intention is not to recreate the full breadth and depth of capabilities that was developed during the arms embargo era, but to focus on those areas and sectors of defence technology and manufacturing that offer real potential to meet the policy intent” of government.33

60. This strategy is further based on the assumption that government will find ways to make the necessary funding available to the Defence Force to contract local industry in a meaningful way to achieve agreed levels of defence industry capability retention and enhancement. That will enable the Defence Force to acquire equipment and systems to close capability gaps and to modernise or upgrade other capabilities, and to do so on scale that will allow local manufacture and even development, and further enable it to fund research and development in South Africa. If that can be achieved, the defence industry’s ability to generate substantial foreign income will also be expanded.

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61. Apart from funding the Defence Force to execute its acquisition and essential support projects and programmes, this will require a thorough review of how best to fund and manage the necessary research and development, with a particular focus on sourcing and correlating funding from other services, agencies and departments that will benefit from the results of integrated activities.

62. Failing adequate funding, it will not be possible to implement this strategy, and it will be necessary to go over to a ‘Planned Shut-Down’ strategy.

63. Given the risks inherent in an inadvertent unstructured shut-down of the defence industry, which could result from a lack of clarity regarding Government’s policy decision regarding the defence industry, it is essential that government decides, pronounces and commits to a particular policy and strategy, and does so early, clearly and credibly.
PART II: THE DESIRED END STATE FOR THE DEFENCE INDUSTRY

64. **Vision**: A globally competitive and integrated defence industry that supports national interests, and that is the preferred choice for defence related solution on the African continent.

65. **Mission**: To develop and sustain an effective defence industry based on synergy between government and local private role players, capable of meeting the needs of the Defence Force and other clients, and growing beyond the borders of Africa, while also supporting the national development and transformation agenda.

66. **Objectives**:
   a. Provide sustainable sovereign and strategic military capabilities for South Africa.
   b. Enhance the 'country brand'; Team SA advancing the economy through the design and export of local technologies and focused capabilities.
   c. Support the national development and transformation agenda.
   d. Develop strategic science and technology skills and capabilities.

67. The Defence Review sets out the capabilities required of the defence industry\(^\text{34}\) to enable it to support the Defence Force effectively and efficiently, which can be considered to be the 'desired end state' to be achieved by this strategy within the period covered by the Defence Force ‘Milestones’ set down in the 2015 Defence Review.

68. In addition, the defence industry should be capable of:
   a. Meeting most requirements of the Police and Intelligence Services.
   b. Being integrated into South Africa’s wider industrial development.
   c. Helping expand the national science, engineering and technology base.
   d. Helping expand the technical and technological skills base; and
   e. Making it possible to leverage industrial, economic and social gains from defence expenditure.
   f. Competing internationally in selected fields.
   g. Becoming internationally integrated as a supplier to international groups and as a development partner to some, to gain insight and technologies as well as to provide greater and more stable turnover.

\(^{34}\) Defence Review 2015, Chapter 15.
69. Against this background, the aim is to stabilise, sustain and then develop the defence industry to deliver these capabilities and goals:

   a. **Stabilise:**
      i. Establish inclusive collaboration between government and private sector players on both the strategic and operational level.
      ii. Drive the ‘Team SA’ country brand, cutting across the defence industry.
      iii. Develop the agility to respond to changing trends in warfare and in the defence industry.
      iv. Provide urgent relief funding to prevent further loss of defence industry capabilities and capacities.

   b. **Sustain:**
      i. Establish strategic partnerships that provide sustainable sovereign and strategic defence capabilities.
      ii. Support the national development agenda by increasing and widening industrialisation and facilitating access to the industry by designated groups.
      iii. Develop sustainable and optimised multiple funding streams.

   c. **Develop:**
      i. Revitalise the industry to contribute a marked percentage of the GDP.
      ii. Become the preferred provider of defence equipment and capabilities on the African continent.
      iii. Be supported by foreign policy in respect of the export of local technology and defence equipment and capabilities.

70. Related priorities for government and the defence industry include:
   a. Reducing the negative impact of defence spending;
   b. Encouraging and improving local participation;
   c. Creating employment opportunities and increasing skills development;
   d. Encouraging innovation within the defence industry;
   e. Prioritising industrialisation and commercialisation of defence-related products;
   f. Seeking direct investment into South Africa;
g. Establishing, developing and nurturing SMMEs as future employers\textsuperscript{35}; and

h. Increase local investment in sovereign and strategic capabilities to enhance national security.

**MEETING THE REQUIREMENTS OF THE DEFENCE FORCE**

71. The primary purpose from the point of view of the state for having a defence industry is to ensure that the Defence Force is kept well- and appropriately equipped, together with effective support and sustainment of its equipment and systems, to ensure that:

a. South Africa attains and retains a practicable measure of strategic independence and freedom of action;

b. South Africa attains and retains sovereign control over identified key capabilities and technologies;

c. The Defence Force is provided, as far as is practicable, with equipment optimised for its needs; and

d. South Africa is in a good position to assist, support and collaborate with allied and friendly states in defence equipment;

e. While at the same time reducing the negative economic impact of defence spending by leveraging it for job creation, skills development, industrial capability expansion and by means of defence exports bringing foreign currency earnings.

**Strategic Independence**

72. Strategic independence is defined by the 2015 Defence Review\textsuperscript{36} as “the ability of the Defence Force to perform its key functions for extended periods without reliance on direct foreign support in respect of critical\textsuperscript{37} capabilities”. The specific capabilities that fall into this category will be determined by the Defence Force, on the basis of the agreed Military Strategy and Capability

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\textsuperscript{35} A recent World Bank study showed that in Africa SMMEs generate up to 45\% of employment and up to 33\% of GDP. Given the low start-up cost and in most cases the low initial skills requirements, this makes SMMEs an extraordinarily efficient means to achieving economic growth and greater economic equality.


\textsuperscript{37} ‘Critical’ here refers to capabilities, systems and equipment without which the Defence Force would not be able to prosecute operations vital to the interests of South Africa.
Reference Model and the resulting force design, and which will then determine the relevant industrial capabilities.

73. The point is to have sufficient inherent defence capability to give government freedom of strategic action in South Africa’s interests where those may not coincide with major powers.\(^\text{38}\)

\[\implies\] There will need to be an internal communications strategy to explain the benefits and importance of this strategic independence to other government departments, as well as an external communications strategy addressing the public.

74. For this to be possible, the industry must\(^\text{39}\) “have the capability to:

a. Support, maintain and repair critical equipment and systems efficiently and cost-effectively.

b. Adapt or modify equipment and systems to deliver performance advantages over opposing forces, by means of classified algorithms; for instance, secure mode IFF\(^\text{40}\) systems, encrypted radio communications, electronic counter-countermeasures for radar systems.

c. Manufacture critical munitions and batteries.

d. Manufacture such high-rate-of-use spares, components and sub-assemblies that cannot be:
   i. Stockpiled in sufficient quantity;
   ii. Brought into production at short notice without direct foreign assistance; or
   iii. Acquired from multiple foreign sources via multiple channels to negate an embargo by one or more government”, or to assure availability in the event of a crisis that has raised demand for such items in one or more countries.

75. Strategic independence further means having\(^\text{41}\) “the ability to:

a. Conduct operational research across the spectrum of Defence Force responsibilities, in order to:

\[\text{38}\] The Brazilian government has described this as “the power to say no” to a major power.


\[\text{40}\] IFF: Identification, Friend or Foe. An electronic system to identify friendly forces, to avoid fratricide.

i. Fully understand evolving technologies, materials and processes to be an ‘intelligent buyer’; and to

ii. Fully understand the details of systems, subsystems, equipment, software and components that may be acquired from foreign sources;

b. Comprehensively and thoroughly test and evaluate equipment, munitions, systems and other defence materiel to a standard that ensures that items acquired by the Defence Force fully comply with the requirement and the related specifications, including aspects such as reliability, availability, maintainability and durability (RAM-D);

c. Ensure effective in-service testing and evaluation of combat readiness and system efficiency, and to guide required in-service system enhancements and upgrades;

d. Conduct or manage directed, focused research and development in connection with the development of Defence Force requirements and the related specifications."

76. Strategic independence will in many cases be enhanced by collaborating with relevant role players in other countries at particularly the research and development level, thereby keeping abreast of technology developments, innovations and applications. Properly planned and managed, this can be achieved with no detriment to strategic independence through the targeted use of bilateral/multilateral agreements and the defence committees established to service them.

**Sovereign Capability**

77. Sovereign capability\(^\text{42}\) is defined by the 2015 Defence Review as “the ability to ensure, under full national control and without reliance on any direct foreign assistance, certain capabilities identified as vital to national security, including, but not limited to, command and control, secure communications, aspects of precision-guided munitions, elements of electronic warfare, relevant algorithms and relevant software”. The specific capabilities that fall into this category will be determined by the Defence Force, on the basis of the agreed Military Strategy and Capability Reference Model and the resulting force design, and which will then determine the relevant industrial capabilities.

78. This will require within the industry to possess “as far as is practicable:
   a. The capability to integrate and support such systems and equipment;
   b. The capability to design, develop and support relevant algorithms and software;
   c. The capability to design, develop and manufacture certain equipment locally, which does not exclude the use or imported components;
   d. The control of these capabilities under custodianship by either a public or private South African-owned company.”

79. This does not imply a need to design, develop or manufacture all the equipment, systems or even software involved, but rather those items of equipment, those systems, those sub-systems, sub-assemblies or components and that portion of software that it is essential to hold under full national control to:
   a. Ensure uncompromised security; or
   b. Give the Defence Force a decisive edge over any likely opponent.

**Optimised Equipment and Systems**

80. The 2015 Defence Review defines ‘optimised’ in this context as referring to equipment and systems “specifically developed or adapted to meet the demands set by:

   a. A harsh and unforgiving operating environment: Heat, dust, torrential rain, little infrastructure and few and poor roads, bearing in mind that the potential theatres of operations range from desert through savannah to dense forest and mountains.

   b. A demanding operational environment: Low force densities that require dispersed operations, no clearly defined front line or even area of operations, and insecure lines of supply over mostly poor roads.

   c. The operational style developed by the Defence Force to meet those challenges: High mobility/high tempo, dispersed, joint operations, with quick adaptation of the plans as the situation develops or evolves.

   d. The need to be interoperable with legacy equipment and systems, including some equipment and systems used by the Police and other agencies and departments of government.
e. The desire to achieve increased interoperability with regional partners.

f. The need to ensure the supportability of equipment and systems at the home bases and when deployed outside the country.

81. The requirement, therefore, is for the industry to have the capability to design, develop, manufacture, support and sustain such equipment and systems. Some, even many, of those items will also be well-suited to the needs of other armed forces, in terms of their key characteristics, performance and cost, thereby adding to the export potential of the South African defence industry. That in turn will extend production lines, spreading the development cost and freeing funds for company-internal research and development.

82. The Defence Review also sets out some examples as indicative of what may be needed:

a. Wheeled rather than tracked combat vehicles, to provide the operational mobility required for a small force to be effective in a large theatre;

b. Long-range artillery, with the relevant target acquisition and fire control capability, to support dispersed combat elements effectively, given that distances will not always allow close air support;

c. Rugged logistic vehicles, to support high-mobility operations in a large theatre with a poorly developed road net; and

d. Communications equipment and systems suited to the operational, geographic and climatic conditions of the theatre.

83. An important consideration here is that equipment optimised for the needs of the Defence Force will also be well-suited to those of:

a. Other small defence forces that require capable equipment but cannot afford to acquire or sustain equipment developed to the needs of the major powers;

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43 ‘Support’ here refers to ensuring availability and serviceability in-service; ‘sustain’ refers to ensuring that the equipment or system remains effective throughout its service life, for instance include modernisation, upgrade and adaptation or modification to new roles.
b. Other defence forces faced with the requirement to conduct similar operations in similar terrain and climatic conditions.

84. Care will, however, have to be taken not to optimise equipment and systems to the extent that they are no longer exportable, except in very specific cases where the need for optimisation overrides the advantages of export potential.

MEETING THE REQUIREMENTS OF OTHER SECURITY SERVICES & AGENCIES

85. The evolution of both armed conflict and criminal enterprises is demanding increasingly close cooperation among the armed forces, the police, the intelligence services and other security services and agencies.

86. That argues for ensuring the maximum practicable inter-operability among them, which argues for some commonality of equipment and systems, particularly communications equipment and systems.

87. There will also be real benefit in ensuring interoperability among the data capture, fusion, analysis and dissemination technologies, particularly as the economies of scale that could result from cooperation in this field will enable the South African industry to keep pace with the tremendous rate of development in these technologies.

88. In addition, there is potential to reduce overall cost to the country by pursuing common equipment and systems among these various services and agencies where that does not impair their effectiveness or efficiency.

89. Fortunately, there are proven defence technologies that are relevant to these services and agencies.

90. The defence industry must, therefore, examine how it can support these services and agencies and they, in turn, must examine their acquisition and procurement policies to ensure that there is no unnecessary duplication of development or manufacturing effort, or importing of equipment or supplies that could equally well be sourced locally.
91. Much of the equipment and systems that would result from acquisition and procurement cooperation among these services would also have useful export potential.

**Police**

92. The defence industry has a range of equipment, capabilities and technologies proven in the harsh defence environment and also suited to use by the Police in some of their tasks. Adopting such products, systems or technologies will result in economies of scale for the industry and for the defence and security services as a whole.

93. Among these might be:
   a. Command and control technologies;
   b. Communications intelligence and cyber intelligence technologies;
   c. Optical and electronic surveillance and exploitation technologies;
   d. Data capture, fusion, analysis and dissemination technologies;
   e. Weapons and ammunition;
   f. Personal protective equipment;
   g. Training simulation systems, for instance at the command and control level and at the level of firearms, driver and vehicle crew training;
   h. Unmanned vehicle technologies (airborne, ground and marine); and
   i. Vehicles for rural patrol operations.

**Intelligence Services**

94. The intelligence services, similarly, have a range of requirements that could be met from local production or by local development, primarily in the communications security, surveillance and data capture, fusion, analysis and dissemination technologies.

95. Acquiring such equipment and systems from South African companies will serve both to support local industry capabilities and to enhance security.

**Border Management Agency**

96. The planned Border Management Agency will also require interoperability with both the Police and the Defence Force in terms of communications and command and control systems. It will also require radar, optical and other surveillance systems and related data capture, fusion, analysis and
dissemination systems that will be quite similar, certainly at the technology level, to those utilised by the Defence Force and Police.

97. The BMA will also require some off-road vehicles and some weapons similar to those required by the Defence Force and the Police.

**Cyber Defence and Operations**

98. It is, further, clear that there must be cooperation between the Defence Force and the other security services, agencies and government departments in the field of cyber defence and operations, to ensure focussed and efficient investment and to ensure operational coherence among them.

99. While the question of who has ultimate responsibility for cyber defence and operations may yet have to be settled, it can be argued that a major cyber-attack on a country has the potential to cause as much – if not more – damage than even a conventional attack. Thus there is a clear requirement for cyber defence to be part of the defence portfolio, and thus also for this to be addressed by the defence industry. That, in turn, creates the potential for close cooperation among all services, agencies and government departments engaged in this field.

**National Disaster Management System**

100. The defence industry has a range of technologies and equipment and system that are well suited to the needs of disaster and emergency response and management at both national and local government level. Among them are:

   a. Command and control technologies;
   b. Communications technologies;
   c. Sensor and observation technologies (e.g. thermal imaging, aerial observation);
   d. Data management and fusion technologies;
   e. Specialised mobility solutions;
   f. Emergency medical equipment; and
   g. Command and control simulation technologies.

101. Adopting local technologies, equipment and systems for these functions would also serve to enhance interoperability among the relevant agencies, and between them and Defence Force elements deployed to support them during major disasters or emergencies.
102. The industry should, therefore, identify what it can offer in this field and make that fully visible to the relevant bodies, while the responsible departments, agencies and services should make a point of investigating what local capabilities are available to meet their requirements.

ECONOMIC AND COLLATERAL BENEFIT

103. It is further government's intention to maximise the economic benefit to be leveraged off defence expenditure on equipment and systems and their through-life support, thereby reducing the negative effects of defence expenditure.\(^{44}\)

104. To some extent this effect will already be realised by simply manufacturing equipment in South Africa, as this will generate employment, and even more so by local design and development that will generate additional employment and export earnings.

105. It is important to bear in mind that the defence industry does not only generate direct employment, but also creates employment in other sectors that form part of its supply chain, supplying sub-systems, sub-assemblies, components, materials, manufacturing machinery, etc.\(^{45}\)

106. But there is much greater additional potential benefit to be realised from the knock-on, spin-off and spill-over effects of defence manufacturing and development. To this end, insofar as it can be done without detriment to defence effectiveness, the industry will be expected to exercise options that bring benefits in the form of knock-on, spin-off and spill-over effects, for instance:

a. Job creation and skills development, particularly skills that are transferable to other sectors of the economy;

b. Establishment of technologies and manufacturing processes that are transferable to other sectors of the economy, providing a basis for further innovation;

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\(^{44}\) Defence Review 2015, Chapter 15, Pages 15-4 and 15-5, Paragraphs 20 to 23.

\(^{45}\) The Spanish government, for instance, has estimated that the roughly 100 defence companies in the country have some 20 000 employees, another 50 000 are employed in some 350 companies in upstream the supply chain. Jane's Defence Weekly, 8 April 2015, Page 27. The South African experience is quite similar, as is illustrated by the experience of Hensoldt Optronics and RDM (see Footnote 15 above).
c. Development of new technologies and materials, particularly those with dual-use potential;

d. Export of systems, equipment, sub-systems, sub-assemblies, components and munitions;

e. In cooperation with the Defence Force, the selection of systems and equipment, or of sub-systems, sub-assemblies and components that are dual-use in nature, being suited to applications in civilian manufacturing projects. One example might lie in elements of military trucks that could be common with those of civilian trucks and busses.46

107. The experience of other countries highlights the real importance of SMEs in the defence sector. SMEs are regarded as being:

a. More agile and quicker than large industrial groups, and thus better able to adapt to and exploit rapid changes and developments in technology, facilitating the early incorporation into existing equipment and systems and running projects; and

b. A more efficient source of many components and services that have application across the industry, and often also in other sectors, than is the manufacture of such items in-house in the large companies.

108. This presents an opportunity to use defence acquisition as a powerful lever to foster the development and growth of SMEs in the engineering and related fields, and particularly also a lever to increase the participation of young black engineers on the one hand and, mainly for services, veterans on the other.

109. The defence industry strategy and national industrial and development strategies will be aligned with each other to achieve optimal synergies among them and that alignment will be regularly monitored to ensure that the defence industry:

a. Is fully integrated into South Africa’s wider industrial development;

b. Helps expand the national science, engineering and technology base; and

c. Helps expand the national technical and technological skills base.

46 As was done with Atlantis Diesel Engines during the arms embargo era.
47 See also the White Paper on Science and Technology (1996), Chapter 8, Section 2.5.
110. This will require a thorough inter-departmental study of the actual realisable benefits and how optimally to realise them, drawing on the experience of other countries where there are relevant examples to consider\textsuperscript{48}.

111. This will further require a carefully thought-out and planned communication strategy to make these benefits visible to industry and to the public.

112. The industry, in consultation with the Defence Force, will also strive to make maximum use of ‘spin-on’ from existing civilian technologies into defence systems and equipment that can utilise off-the-shelf solutions.

**MEETING AFRICAN DEFENCE NEEDS**

113. Many African countries and, indeed, many smaller developing countries worldwide find it difficult to source defence equipment and systems that are truly suited to their needs.

a. Much of what is produced by the major powers is too expensive to acquire and to maintain, and is often too complex for small and poorly-funded armed forces that cannot afford a large technical support infrastructure.

b. Many African armed forces also face the additional problem that the engineers and technicians needed to support such equipment, are in short supply in their countries and so also in high demand by industry.

c. The alternative from some major powers is equipment that is cheap but shoddy, or so out of date as to be of limited use and extremely difficult to sustain in service.

d. Smaller arms manufacturing countries mostly have an industry focussed on a small part of one sector, which means sourcing from such countries leaves a country’s armed forces with equipment from half a dozen different countries that have quite different training and maintenance philosophies and speak different languages, complicating training and logistic and technical support.

\textsuperscript{48} For instance, studies conducted in Sweden regarding the impact of the Gripen project, and those conducted in Australia regarding the impact of ship-building projects.
e. The evidence of this problem is visible across much of Africa in the form of very disparate equipment fleets, and discarded equipment resulting from supportability and sustainment challenges.

114. At the same time, many African countries find that they cannot, in fact, continue to rely on the more basic equipment in the face of irregular forces that are increasingly well-led, trained, armed and equipped. No government should send its soldiers into a ‘fair fight’, let alone an ‘unfair fight’ in which the opposing force has an edge.49

115. Quite apart from conventional weapons of all kinds, some African countries will find that they must deal with irregular forces and crime syndicates that make effective use of:
   a. Secure communications;
   b. Communications intelligence;
   c. Increasingly sophisticated IEDs in addition to mines;
   d. Guided missiles50; and
   e. Unmanned aerial, ground and surface vehicles, including armed UAVs.51 It must also be expected that some groups will develop the capability to acquire and use unmanned sub-surface vessels.

116. The situation is aggravated where there is some risk or threat of:
   a. Inter-state conflict; or of
   b. Irregular forces acquiring heavy equipment.52

117. South Africa’s defence industry is well positioned to meet many of the requirements of African armed forces:

49 An analysis of the range of capabilities developed by, for instance, the Tamil Tigers in Sri Lanka shows the level of capabilities irregular forces can attain, as does an analysis of the use of guided missiles and UAVs by groups in the Middle East, while even a group as simple as the Lord’s Resistance Army having used a simple form of communications intelligence to warn of troop concentrations, and many irregular forces in Africa employ vehicles armed with weapons capable of destroying medium armoured vehicles. Equally sobering is the range of capabilities of the Latin American narcotics syndicates that are making increasing use of Africa for transit.

50 Consider the increasingly effective use of guided missiles against armour, aircraft and even naval vessels by several groups in the Middle East.

51 In this respect consider the use of UAVs by the Islamic State, Hamas and Hezbollah.

52 As, for instance, separatist guerrillas in Mali, who used equipment of the former Libyan Army, and the CNDP guerrillas in the DRC who at one point had a number of T-55 tanks.
a. It has extensive experience of developing equipment for a small defence force that has never been particularly well-funded\(^{53}\);

b. It understands the requirements of armed forces that must operate under conditions of low force densities and over extended distances;

c. It can draw on the experience of the Defence Force to gain an understanding of the geographic and climatic realities of much of the continent;

d. Its equipment is known to work and to be maintenance-friendly;

e. It can offer a broader range of equipment and systems than any defence industry outside those of the major powers, Turkey, South Korea and Israel; and

f. It can offer equipment and systems at different complexity/sophistication levels.

118. Finally, assisting African countries in acquiring the equipment and systems they need to ensure their security and to defend themselves is in South Africa’s own interests. Peace and stability in the region and on the continent will enable Africa's economies to develop, which will be to the benefit of South Africa as a trading nation and supplier of manufactured goods.

119. In this regard, South Africa will be willing to collaborate with other African countries in the support, manufacture and development of defence equipment and system, including establishing jointly funded and full joint venture projects.

**AREAS OF COMPETENCE**

120. It is the intention of government that the defence industry sector be effective and efficient in its support of the Defence Force. It is, therefore, not the intention to recreate the full breadth and depth of capabilities that was a feature of the industry during the arms embargo era\(^{54}\), as that:

a. Is not essential to South Africa’s national security;

b. Would be inefficient;

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\(^{53}\) Even at the height of the so-called ‘border war’, the defence budget only once exceeded 5% of GDP, and that included re-equipping the Defence Force and developing the industrial capability to do so. Compared to what is spent by other countries in similar situations, this was very tight funding indeed.

\(^{54}\) 2015 Defence Review, Chapter 15, Page 15-6, Paragraphs 35 and 36,
c. Would hardly be practicable;
d. Would remove the industry from international defence supply chains, reducing its export potential; and
e. Would separate the industry from international trends in defence technology and defence manufacturing processes, to the detriment of its ability to keep abreast of developments and to support the Defence Force effectively.

121. The 2015 Defence Review, accordingly, sets out that “the focus of national support for the defence industry, based on military priorities, will therefore be on primarily local sourcing, insofar as is practicable, in the following areas:

   a. Support of equipment, systems and weapons, and the related training systems and facilities;
   b. Manufacture of critical munitions;
   c. Manufacture of critical, specialised batteries and other energy sources;
   d. Manufacture of critical and high-rate-of-use spares and other stores;
   e. System integration to:
      i. Allow optimisation of equipment, weapons and systems for specific Defence Force requirements.
      ii. Minimise political/strategic risk.
   f. Modernisation and upgrading of equipment, platforms and systems to optimise them for their roles as conditions or requirements evolve, and to extend their service lives.
   g. Development of specific critical equipment and systems.
   h. Development of specific optimised equipment and systems.
   i. Sustained manufacture of equipment required in large numbers or amounts.”

122. The Defence Force will:

   a. Determine what is ‘critical’;
   b. Prioritise among those ‘critical’ items;
   c. Identify the timeframes within which certain capabilities will be needed; and
   d. Determine jointly with industry and other government departments the optimal way to meet those identified critical and other requirements locally.

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123. It is envisaged that the development of prime mission equipment\(^{56}\) will be limited to:
   a. Equipment for the Army;
   b. Potentially, further development of the Rooivalk and Oryx for the Air Force, with international partners as required;
   c. Small craft and vessels for the Navy; and
   d. Potentially, partial local design and build of larger vessels for the Navy, working together with international shipyards and systems houses.

124. The decision to develop locally will be taken judiciously and will be based on:
   a. Strategic considerations pertaining at that time (required in-service date, long-term support requirements, security of supply);
   b. The potential military benefits of an optimised solution versus adapting an existing piece of equipment sourced from abroad (including commonality);
   c. The potential benefits to the defence industry (sustain design, development and manufacturing capabilities; export potential); and
   d. The potential wider economic benefits (foreign currency savings, export revenue, employment, technology spin-off/spill-over).

**KEY TECHNOLOGY DOMAINS**

125. In pursuit of the Defence Strategic Trajectory, the initial focus for those capability areas will be on the following technology domains\(^{57}\):
   a. Command and control.
   b. Information warfare and cyber defence and operations, at all levels of war.
   c. Secure communications.
   d. Information technology, including data fusion.
   e. Intelligence-gathering sensor, analysis and evaluation.
   f. Target acquisition and identification.
   g. Unmanned systems (aerial, ground, surface and under-water).
   h. Missile and wider guided munitions.
   i. Night and poor visibility observation and engagement.

\(^{56}\) E.g. armoured vehicles, artillery pieces, aircraft, ships, as distinct from their subsystems and weapons, and as distinct from support equipment.

j. Electronic warfare.
k. Rugged tactical vehicles optimised for operations in the African theatre.
l. Mine and IED detection and protection.
m. Long-range artillery, precision bombardment and point target engagement systems.
n. Chemical, biological and radiological defence, including the manufacture of military carbons and canisters.
o. Battlefield medical care optimised for the African theatre.
p. Modelling, simulation (for development, training and planning) and stimulation.

126. The accelerating development in the field of ‘cyber operations’ since the Defence Review was drafted, and the inherent danger and potential in this field, requires inclusion of that technology domain in this listing.

127. After due analysis and consideration of its potential and practicability, jointly with other government departments, the aerospace sector may be included at the airframe level.

a. It is already included in respect of UAVs and subsystems, as per the list in Paragraph 125 above.

b. The key issue is what realistic potential exists to develop an original equipment manufacturer at aircraft (as opposed to UAV) airframe level in South Africa, apart from the potential inherent in the Rooivalk and Oryx.

128. Further, government will support:

a. Niche capability areas in which the industry has either a demonstrable edge or has the potential to gain and sustain such an edge, be it in terms of actual performance or in terms of cost-effectiveness, which might include:
   i. Precision-guided weapons and precision engagement systems.
   ii. Fire-directing systems.

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58 Stimulators: Systems that emulate, for instance, radar emitters, to test and verify the performance of radar warning receivers.
59 The AHRLAC is at the time of writing still only a project. Should it succeed in winning substantial orders, this would argue for including the aerospace sector at airframe level.
b. Entry into other domains where there is real potential for success, nationally or in cooperation with other nations.

INTERNATIONALLY COMPETITIVE

129. The industry will work to become internationally competitive in selected sectors, and the government will exert its best efforts to assist the industry to achieve this.

130. To this end, the industry will have to focus on being agile, innovative and responsive, to:
   a. Look beyond the needs and requirements of the Defence Force;
   b. Promptly identify new or upcoming requirements, arising from the evolving nature of armed conflict;
   c. Promptly identify the potential of new technologies, materials and processes;
   d. Respond promptly and quickly to adapt existing equipment or systems or develop new variants or entirely new equipment or systems to meet those requirements, or to incorporate those new technologies or materials or to incorporate those new processes in the develop/manufacturer/support/sustain cycle;
   e. Bring those adapted or new products to market quickly:
      i. At the right price point; and
      ii. With the requisite support and sustainment capability in place;
   f. Constantly liaise with clients to keep abreast of how equipment is performing, and to quickly implement improvements.

131. This will require the companies of the industry and the industry as a whole, to:
   a. Keep up to date with developments in defence and related technologies;
   b. Continuously study and analyse current and recent conflicts to identify trends and possible niche areas for which equipment can be adapted or developed; and
   c. Develop collaborative alliances or liaison with international defence groups and companies in other countries.

132. The Defence Force will support the industry in this effort by:
   a. Making available its own analyses of conflict trends and the implications for different equipment and systems;
b. Facilitating contact with armed forces engaged in current conflicts or with recent operational experience;
c. Assisting industry with analysis of information that it has gleaned independently; and
d. Being willing to adapt its requirements and development and acquisition schedules to enable the industry to seize important (in terms of contract value, market entry or nature of the client) export opportunities.

133. General Government support to the industry in this regard will include:
   a. Diplomatic support to gain access to information for analysis;
   b. Marketing support;
   c. Expedited export permits.

INTERNATIONALLY INTEGRATED

134. The industry will further work, with government support, to become integrated in the international defence industry, as a respected and valued supplier and partner.\(^6^0\)

135. **Supplier:** Integration into the supply chain of major international defence groups as a supplier of components, sub-assemblies or sub-systems will:
   a. Ensure a greater and more stable turnover for companies;
   b. Position companies to win additional contracts at the same level;
   c. Position companies to move up the supply chain as they prove themselves;
   d. Provide a measure of insight into developing technologies and processes; and
   e. Make companies more visible internationally, which will benefit their long-term market access generally.

136. **Partner:** Partnering with foreign and/or international defence groups will bring greater benefits than merely being part of their supply chain, albeit also at greater financial risk. Such partnerships will be possible at three levels:
   a. Lead Nation, in areas where the South African industry or research community has particular expertise and can lead a development or research project;

\(^6^0\) See the 1996 White Paper on Defence (Chapter 8, Paragraph 3) (Note: the version on the DoD Website, not the printed version); the 1998 Defence Review (Chapter 13, Paragraph 110) (printed version).
b. Partner, in areas where it has sufficient expertise to be an equal partner in a given development or research project; or
c. Sub-system, sub-assembly or component developer.

DEFENCE INDUSTRY OWNERSHIP

137. The primary purpose of the defence industry is to give South Africa a measure of strategic independence and freedom of strategic action. The government, therefore, will focus on developing the local, indigenous defence industry to, as far as possible, avoid having to subjugate South African interests to those of other states.

138. The acquisition system will, therefore, insofar as it is practicable to do so, give preference to South African defence companies for the acquisition, support and sustainment of key defence capabilities, and to South African companies, academic bodies and research institutes for research and development.

139. To this end, the 2015 Defence Review as follows has set out what will be considered to be a South African company, establishing three classes in descending order of preference for acquisition, support and sustainment:\(^{61}\):

a. **South African Owned**: 51% South African ownership; South African executive management; facilities preferably located in South Africa.


c. **South African Based**: Foreign majority ownership, but facilities located in South Africa and under control of South African staff to the extent required to ensure uninterrupted supply to the Defence Force, and there is an acceptable agreement, if necessary including a government-to-government agreement ensuring security of South African intellectual property. Such companies must further demonstrate a real, tangible and enduring commitment to adding economic value to South Africa and skills development in South Africa.

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\(^{62}\) 26% to ensure South African representation on the board of an otherwise majority foreign-owned company.
140. Companies falling into these three classes will, in descending order, enjoy preference over foreign companies for defence contacts, with the proviso that the performance and quality of their products and their prices are comparable. This preference will be exercised as strictly as may be practically possible in respect of sovereign and strategic items, with other acquisitions and support/sustainment contracts being more flexible.

141. The status of a foreign defence company that is wholly or partly owned by a South African defence company will be determined by:
   a. The level of ownership by that South African defence company; and
   b. The status of that South African defence company (SA owned, partly SA owned or SA based); with
   c. Due consideration for security and security of supply aspects.

142. South African owned companies may compete for all products and services within their field of competence, and will, insofar as practicable, enjoy specific preference in respect of contracts covering capabilities deemed ‘sovereign’ and ‘strategic’, provided that:
   a. Their products and/or services fully meet the requirement in all critical respects.
   b. They demonstrate the ability to support that product through its lifecycle, including such upgrades as may from time to time become necessary or will serve to enhance performance.
   c. No similar product from a partly South African owned, South African based or foreign company demonstrates an overwhelming advantage over their product.
   d. Their price and long-term support price structure are:
      i. Broadly in line with other offers; or
      ii. Are considered acceptable given the advantages of local sourcing.

143. Partly South African owned companies may compete for all products and services within their field of competence, and will, insofar as practicable, enjoy specific preference, after South African owned companies, in respect of contracts covering capabilities deemed ‘strategic’, provided that:
   a. Their products and/or services fully meet the requirement in all critical respects.
b. They demonstrate the ability to support that product through its lifecycle, including such upgrades as may from time to time become necessary or will serve to enhance performance.

c. No similar product from a partly South African owned, South African based or foreign company demonstrates an overwhelming advantage over their product.

d. Their price and long-term support price structure are:
   i. Broadly in line with other offers; or
   ii. Are considered acceptable given the advantages of local sourcing.

144. Partly South African owned companies may also bid for contracts covering capabilities deemed ‘sovereign’, provided they can satisfy the Defence Force that the relevant security requirements will be met, and that security of supply will be assured.

145. South African based, foreign owned companies will not, as a general rule, be asked to bid for contracts covering capabilities deemed ‘sovereign’, but may bid for contracts covering capabilities deemed ‘strategic’ and for all other contracts, and will enjoy preference over foreign companies, provided that:

a. Their products and/or services fully meet the requirement in all critical respects.

b. They demonstrate the ability to support that product through its lifecycle, including such upgrades as may from time to time become necessary or will serve to enhance performance.

c. No similar product from a South African based or foreign company demonstrates an overwhelming advantage over their product.

d. Their price and long-term support price structure are:
   i. Broadly in line with other offers; or
   ii. Are considered acceptable given the advantages of local sourcing.

146. In exceptional circumstances a South African based, foreign owned company may be asked to bid for a contract covering capabilities deemed ‘sovereign’, but only:
a. Within the framework of contract-specific controls set to ensure sovereign control of that materiel and the related technologies and intellectual property; and

b. If security of supply can be assured to an acceptable level.

**Partnerships and Joint Ventures with Foreign Companies**

147. None of what is set out in Paragraphs 137 to 146 above in any way precludes companies:

a. Entering into joint ventures with foreign companies;

b. Developing joint venture entities with foreign companies; or

c. Taking foreign companies as equity partners, for a particular project or with an eye to general cooperation; provided that such action does not:

d. Change the fundamental ownership profile (e.g. 51% local ownership);

e. Impinge on security; or

f. Impinge on the protection of intellectual property owned or partly owned by the Defence Force.

**Foreign Defence Companies**

148. Defence companies with a presence in South Africa but falling short of the requirements set for the three classes of local companies:

a. May bid for contracts that do not cover capabilities deemed either ‘sovereign’ or ‘strategic’ and will enjoy preference over foreign companies with no presence in South Africa.

b. May, in some circumstances, be allowed to bid for contracts covering capabilities deemed ‘strategic’, if they can demonstrate that:

i. Local manufacture and support can be established where that is practicable; and

ii. Security of supply and support/sustainment can be ensured despite possible prohibition by the government of the country in which they are headquartered or in which the majority of the ownership resides.

149. Where a foreign company’s presence in South Africa is no more than a marketing or representative office, that company will enjoy no preference over other foreign companies.

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63 It is worth noting that some 50% of people employed by the defence industry in Australia, are employed by foreign/international defence companies and groups.
150. Foreign companies may bid for contracts not covering capabilities deemed ‘sovereign’ or ‘strategic’ but may be required to establish a local branch to support or assist with the support of that equipment or system, or perhaps even to manufacture it locally if:
   a. That is important to ensure effective support to the Defence Force;
   b. There is a major economic impact; and if
   c. That is practicable.

151. All foreign companies will be required to meet the industrial participation requirements set from time to time by:
   a. The Department of Defence; and
   b. The Department of Trade and Industry.

152. Similarly, South African and South African-based companies will be required to comply with the prescribed DIP and NIP obligations in respect of imported components or sub-assemblies or sub-systems the value of which exceeds the relevant threshold.

**General Considerations**

153. Any company wishing to bid for a defence contract must be in compliance with all South African legislation and regulations save where a specific waiver has been granted by the government:
   a. For strategic reasons;
   b. To facilitate the development of a particular capability in South Africa; or
   c. To facilitate the establishment of a new company that will be of benefit to the support of the Defence Force.

154. Any company wishing to bid for a defence contract must demonstrate a track record or, if newly established or a new entrant to the South African defence market, a clear intent to support the national development agenda as outlined in government policy from time to time. In evaluating bids specific emphasis will be placed on a commitment to training and skills development and to the expansion and deepening of South Africa's knowledge and technology base. The evaluation of their actions or proposals in this regard will take into account variances between sectors and the relative size of a company in judging what may be practicable.
State-Owned Enterprises

155. At present there are two groups of state-owned companies active in the defence industry in South Africa, in the development, manufacture and support/sustainment of equipment and systems:
   a. The Denel group of companies; and
   b. Certain enterprises and entities within the acquisition agency, Armscor.

156. In addition, there is the Defence, Peace, Safety and Security unit (DPSS) of the Council for Scientific and Industrial Research (CSIR).

157. It is the intention to retain these entities in state ownership, although this does not in any way preclude these entities entering into cooperative or collaborative agreements or joint ventures with private South African companies or foreign entities or, in the case of Denel, taking on equity partners in one or more of its companies.

Denel

158. Denel is regarded as a national security asset, with the primary purpose of designing, developing, manufacturing, supporting and sustaining such defence materiel that:
   a. Government prefers to source locally, for security or economic reasons; and that
   b. Is not commercially viable for private industry to design, develop, manufacture, support or sustain.

159. Denel has the additional mandate to design, develop, manufacture, support and sustain equipment and systems for other security departments, agencies or services that prefer to source that equipment or system locally for security or economic reasons, and when that equipment or system is not commercially viable for private industry.

160. As a state-owned enterprise Denel will:
   a. Work in partnership with other South African defence and wider commercial manufacturers and service providers where practicable;
   b. Encourage and foster the establishment and development of small and medium companies in the defence industry; and
   c. Will, in principle, not seek to compete with private South African companies.
161. Of the Denel companies three are considered to be sovereign assets:

a. Denel Dynamics (missiles, guided weapons, UAV systems), which also controls the Spaceteq division that is developing a satellite capability.

b. Denel Integrated Systems (systems integration capability)\(^{64}\).

\(^{64}\) This does not imply that only DIS may be contracted for system integration projects. The Defence Review has stipulated that all sovereign projects can be contracted to either an SOE or a South African owned defence.
c. Denel Maritime\textsuperscript{65}.

162. Of the other wholly-owned Denel companies, the following are considered to be \textit{strategic} assets:

a. Denel Land Systems (turret systems, artillery, infantry support weapons), which includes Mechem (de-mining, Casspir family of vehicles, camp services);

b. Denel Vehicle Systems, comprising: OMC (combat vehicles), Mechatronics (remote weapon stations and light vehicle turrets, helicopter turrets), and Gear Ratio (transmissions);

c. Denel Aviation (aircraft manufacture, modification, qualification, certification and support), incorporating Aerostructures (aircraft components and sub-assemblies);

d. Denel Pretoria Metal Pressings (small arms and cannon ammunition);

e. Denel Overberg Test Range, which is an integral and essential element of South Africa’s test, evaluation, qualification and certification capability.

163. In addition, Denel owns 51\% of LMT Holdings, a special vehicle house (21\% held by the Pamodzi group, the remainder by management);

164. Two Denel group companies are majority foreign-owned, but both fall within the ‘partly South African owned’ category in all respects, and enjoy the relevant preference:

a. Rheinmetall Denel Munition is 49\% Denel-owned, and is considered to be a strategic asset.

b. Airbus Optronics is 30\% Denel-owned.

165. The former Turbomeca Africa (51\% held by Safran HE) was wound down to an MRO capability 100\% owned by Denel as a result of market contraction.

166. Denel further owns:

\textsuperscript{65} This company is a \textit{sovereign} asset as regards the management of the Naval Dockyard, and a \textit{strategic} asset in its wider role. It must be noted that the Dockyard differs from other sovereign assets within the industry in that it is also a Naval and Defence Force asset. As such no element of foreign management is acceptable.
a. 49% of Tawazun Dynamics in the United Arab Emirates (guided weapons; 51% held by the Tawazun group); and
b. 49% of Pioneer Land Systems in the United Arab Emirates (armoured vehicles; 51% held by the International Golden Group).

167. The state may permit investors, local or foreign, to acquire minority shares in certain of the Denel companies where that will be to the benefit of the group and the Defence Force.

**Armscor**

168. While Armscor is the defence acquisition agency, and de facto consulting engineering service to the Department of Defence, it also serves the Defence Force by providing capability management support, managing research and development for the Defence Force, and conducting some research and development itself.

169. Armscor will generally contract a prime contractor to provide the required system or equipment, but may in an emergency situation act as the prime contractor when there is no local company able to do so effectively within the available timeframe.
170. Armscor will be the primary custodian of Department of Defence Intellectual Property, and will:
   a. Establish and maintain the capacity to register, keep up to date and account for all DoD IP assets;
   b. Establish a system to enable SMMEs, particularly those falling within the BBBEE policy bracket and those owned by veterans, to access and exploit that IP.

171. Armscor will, further, be empowered, in line with national legislation and DoD policies, to commercially extract value from existing and future DoD-owned IP, with:
   a. Due consideration for the impact of royalty charges on export potential, with the latter overriding the former to the overall benefit of the industry and the Defence Force;
   b. All revenue generated in this way being applied in support of the Defence Force.

172. In cases where IP has been co-generated with private company that has invested therein, or with another state, ownership will reside with the parties on a pro-rata basis. Armscor will then ensure that maximum value accrues to the benefit of the Defence Force, but not at the expense or risk of reducing export potential or discouraging future cooperation.

173. In its role as acquisition agency, Armscor controls several test and evaluation entities that it is intended will remain in state ownership, and that will also be available to support the defence industry in the development and qualification of defence equipment and systems for export and to foreign defence companies as agreed to by government, as well as to wider industry as may be appropriate, and to foreign defence companies:
   a. Alkantpan. Ballistic test range for medium/heavy calibre munitions; also conducts various other test programmes.
   b. Ergotech. Ergonomics research, design, specification, testing and evaluation.
   c. Flamengro. Computational fluid dynamics and finite element analysis support for design, development, testing and evaluation.
   d. Gerotek. Vehicle mobility, performance, endurance, reliability test and evaluation and design optimisation.
   e. Paardefontein: National antenna test range (operated by Gerotek).

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66 Based on the respective amounts invested in R&D, product development, industrialisation and preparation for production.
174. Armscor controls several entities involved in research, development and manufacturing, which it is intended will remain in state ownership. These entities will also be available to support the wider defence industry in the development and qualification of defence equipment and systems for export, as well as to wider industry as may be appropriate:
   a. **Armour Development.** Platform and personal protection equipment.
   b. **Hazmat.** Development and manufacture of chemical/biological protective masks and filters, and of activated carbon.
   c. **Institute for Maritime Technology.**
   d. **Protechnik Laboratories.** Research, test and evaluation of chemical/biological protection.

175. In addition, Armscor has several divisions and institutes that support the Defence Force:
   a. The **Defence Decision Support Institute** provides high-level decision support to the Defence Force.
   b. The **Innovation Division** is tasked with exploiting commercial opportunities arising out of Armscor’s primary role.
   c. **The Technology Management, Analysis and Industrialisation Division** is responsible for managing technology programmes for the Defence Force, with branches for electronics, aerospace, maritime, support and landward technologies.
   d. **The Defence Equipment and Personnel Support Division** arranges the utilisation of Defence Force equipment, materiel and test facilities, the provision of Defence Force personnel and access to Defence Force facilities in support of industry initiatives.

176. Given the growing importance of remotely-operated and robotic systems and equipment, and of cyber and information operations, it is recommended that Armscor establish units specifically focused on these areas of technology.

177. Armscor must also establish a level of capability in the field of satellite technology as it affects the operations of the Defence Force, linking this unit to the Spaceteq unit of Denel Dynamics and to the South African Space Agency.

178. In addition to the above roles and functions, Armscor will:
   a. Be instrumental in supporting and promoting the South African defence industry and its companies abroad, under the guidance of the NDIC, in cooperation with the Aerospace, Maritime and Defence
Industries Association (AMD), the Department of International Relations and Cooperation (DIRCO);

b. Be empowered, and appropriately capacitated and staffed, to act as government representative in armaments related dealings with other governments;

c. Manage Defence Industrial Participation (DIP) programmes, coordinating with the National Industrial Participation (NIP) programmes of the Department of Trade and Industry as may be relevant and beneficial to either party; and

d. Manage the sale or disposal of redundant or surplus equipment and munitions.

**Council for Scientific and Industrial Research**

179. The Defence, Peace, Safety and Security (DPSS) unit of the CSIR has as its primary function the provision of sovereign research and development and test and evaluation for the Defence Force and other security services. This work is funded primarily by the Defence Force.

180. The DPSS unit also conducts contracted work for foreign and international companies in the defence and related fields, which brings additional revenue and insight into defence and security technology developments elsewhere.

181. The unit has divisions focused on:
   b. Command, Control and Information Warfare.
c. Landward Sciences.
d. Radar and Electronic Warfare.
e. Technology for Special Operations.
g. Integrative Systems Group.

182. The DPSS unit of the CSIR also has a test and evaluation facility at Paardefontein, which it uses for EW development and vehicle blast testing.
PART III: THE CONTEXT FOR THE DEFENCE INDUSTRY

OVERVIEW

183. Any strategy can only be developed, refined and kept up to date within a relevant context. In respect of a defence industry strategy that is a four-fold context encompassing:

a. **The Strategic Context**: The roles and missions of the Defence Force, expectations of the National Executive, the evolving strategic environment and the evolving nature of conflict in the theatre.

b. **The Industrial Context**: The evolution of the international defence industry, which will impact on the South African industry and on the Defence Force.

c. **The Technological Context**: The development of defence technologies and trends in fields relevant to the Defence Force.

d. **The National Context**: Economic, industrial, financial and social policies.

184. The following sections set out an overview of each of those four contexts.

THE STRATEGIC CONTEXT\(^{67}\)

185. The level to which the defence industry should be developed and at which it should be maintained, will depend on the roles and missions assigned to the Defence Force, on the underlying foreign policy, and on the evolving geostrategic situation and the evolving nature of armed conflict in the relevant region. The latter two, in turn, will impact on both foreign and defence policy, which will define what is expected of the Defence Force and, derived from that, what level and nature of industry support it will require.

186. This is not to undervalue the importance and potential of international sales independent of Defence Force requirements, but those are not by themselves a primary driver for the development of a national defence industry strategy. That is based primarily on national defence requirements.

187. The first element to consider, and which must form the basis of all defence policy and strategy, military strategy and force design, and thus of the defence industry strategy, are South Africa's strategic and vital interests.

\(^{67}\) See Annexure 3 for a more detailed discussion.
**Strategic Interests**

188. South Africa’s primary strategic interest is a peaceful, secure and stable southern African region, essentially the Southern African Development Community (SADC) within which it can develop its economy and thereby enhance the wellbeing of its people. Given the great importance of the sea, both for its resources and as a trading route, this includes the seas contiguous to the region.

189. One can recall here former President Thabo Mbeki stressing the importance of:

“**peace, security and stability, and democratic governance, without which it would be impossible to undertake meaningful economic activity**”.

68

190. This, however, also requires the SADC to have at least stable neighbours, so the stability of the countries adjacent to the SADC is also a key strategic interest of South Africa.

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191. In this context it is wise to heed the words of former Tanzanian President Benjamin Mpaka:

“If your neighbour is not stable, you will not be stable for long; if your neighbour collapses the fall-out from that will not stop at the border”.

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192. It is also important to remember that South Africa has vital interests that lie outside its territory, which it must protect jointly with the relevant countries.

193. The importance of peace, security and stability in the SADC region and its environs is such that South Africa will be willing to deploy military forces if that becomes necessary. Thus, South Africa has in the past deployed military personnel and/or forces to:

a. Lesotho (1998);

b. The Democratic Republic of Congo (since 2001 in several roles);

c. Burundi (2001 – 2009);

d. The Comoros (2001 to 2006);

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69 Sub-Saharan Africa accounts for some 30% of South African exports, compared to 12% to China (Dr Montfort Mlachila, IMF resident representative in South Africa on 8 March 2017 at the University of Johannesburg). The planned Trilateral Free Trade Area (T-FTA) comprising the SADC, the East African Community and the Common Market for Eastern and Southern Africa provides a market of some 600 million people, worth US $ 1 trillion (Dr Rob Davies, Minister of Trade and Industry).

70 Speech at and SADC function on 27 August 2003.
e. Uganda and South Sudan for the latter's independence celebrations (2011);

f. The Central African Republic (2013); and

g. Conducts regular patrols in the Mozambique Channel (since 2011).

194. Taking a wider view, peace, security and stability in Sub-Saharan Africa as such is also in South Africa's interests as a trading nation. Thus, South Africa has deployed:

a. Military observers and staff officers to the UN and AU missions in Eritrea and Ethiopia (2000 to 2008);

b. Troops to Darfur (2004-2016);

c. Staff officers to the UN mission in Liberia (2003 to 2005); and

d. A military assistance team to Cote d'Ivoire (2005 to 2006).

e. South Africa also deployed the combat support ship SAS Drakensberg and Special Forces elements on standby during efforts to resolve the crisis in Cote d'Ivoire (2011).

195. It is further in South Africa's interests as a trading nation to live and trade in a peaceful, rules-based world. While this is unlikely to see the deployment of major forces, it has seen the deployment of:
a. Air Force and Special Forces elements to support efforts by the President to drive forward the African Union ‘Road Map for Libya’ (2011); and

196. This engagement, particularly, within the SADC and its environs is recognised in the 2015 Defence Review, which recommends that the Defence Force should be able to sustain three simultaneous major (combat group level) extended operations while also undertaking several minor and shorter-term operations and maintaining a brigade-level intervention capability.

197. This requirement has implications for force strength and design for the combat services, the Military Health Service and Defence Intelligence, including requirements for specific equipment and systems, many of which can be met by local industry.\textsuperscript{71}

\textbf{Vital Interests}

198. South Africa also has external vital interests the security of which must be guaranteed, and that may at times require protection. Among them are the Lesotho Highlands Water Scheme, the Cahora Bassa hydro-electric power station and Maputo port in Mozambique, and the maritime trade route through the Mozambique Channel, which carries most of the country’s imported oil.

199. There are also other external interests that will become vital in the future, including the gas and oil fields of Namibia and Mozambique, the oil fields of Angola, the Grand Inga hydro-electric scheme in the DRC, the power stations Botswana plans to build to supply power to South Africa, and the overland trade routes through Zimbabwe and Zambia into Central Africa.

\textsuperscript{71} This is discussed in more detail in Annexure 3.
200. It is also important to understand that South Africa is not immune to terrorist attacks on embassies or government officials visiting other countries, or to abductions of South African business people or tourists by criminal syndicates, guerrillas or terrorists in other countries.

201. These factors will also make some specific demands on the Defence Force's capability set.\(^{72}\)

**African and International Expectations**

202. There are also expectations in Africa and internationally regarding the regional and continental security role that South Africa should play as the continent's 3rd largest economy, its only industrial economy, and one of the top fifty economies in the world.

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\(^{72}\) This is discussed in more detail in Annexure 3.
Geostrategic Trends

203. The primary geostrategic trends affecting security and stability are the evolving roles of the United States and China, Russia’s efforts to regain lost power and prestige, and the emergence of new major powers. It will also be worth watching how foreign policy and strategies develop in the major European powers, particularly in the wake of the United Kingdom exiting the European Union.

204. The United States. The United States is a reluctant global power, having been dragged back onto the global stage by the ‘9/11’ attacks and their aftermath. The first indications of the likely foreign policy and strategy of the incoming administration suggest that the US will turn inward once again, as it has done in the past after major conflicts. The United States today depends on foreign trade for only some 14% of its GDP, and most of that trade is with Canada and Mexico. Add coming independence from imported oil, and there is little to keep Washington or, more importantly, the voters focused on what is happening elsewhere.

205. There will be three exceptions:

a. A continuing focus on groups it believes intend to attack the United States itself, its representatives, its citizens or its interests, which will see the US conduct a range of operations against such groups. Those operations will range from intelligence and special forces operations through the use of UAVs or precision air strikes, to cooperation with the security forces of other countries to deal with groups on their territory.

b. A close focus on the actions of China, which seeks to rival and later overtake the US as the regional power in the Pacific, and then to rival the US on the global stage.

c. Monitoring the actions of Russia and Iran, which could come to present a threat to NATO partners.

206. As the US becomes independent of Middle East oil, that region will begin to become of less interest to the US, within the limits set by the powerful Israeli lobby in Washington. Given the importance of Middle East oil to its major allies in Europe and Asia, and to its main competitor in Asia, and assuming Iran continues its nuclear weapons programme, the US will, however, retain a close interest and a presence in the Persian Gulf.
207. The only real strategic interests that the United States has in Africa are to counter China politically and to keep check on Islamist extremist elements that might use Africa as a base from which to conduct attacks against the United States. It must be borne in mind, however, that this does not mean that the US government will not support, even push, defence sales into Africa.

208. **China.** China is intent on establishing itself not just as the regional power in the Pacific, but also as a ‘great power’ – i.e. able to influence events in other parts of the world, and but to some extent even as a ‘super power’.

209. In this it faces the challenge that its demographics – a very steep aging curve – sets a time limit within which it can achieve that status and then maintain it, which lends an urgency to its efforts that may explain its current rather adventurist policy in the South and East China Seas, on the Indian border and in Myanmar\(^73\). This has had the unintended result of driving many countries in the region to turn to the United States for strategic support, which in turn aggravates China’s negative view of the United States.

210. While China faces no major external threat to its territory or security, it does have some territorial ambitions along its border with Russia, and may sooner or later have to deal with the collapse of its client state in North Korea. Its other security challenges are in the north of the country, where Islamic peoples are less than enamoured of Chinese rule, and perhaps in the future in Tibet, which hankers after lost independence.

211. China is also challenged by a lack of natural resources and arable land, which it has been seeking to address by securing a long-term hold on relevant assets in Africa. Africa is also a key market for products it can no longer successfully export to other regions, and with its large number of countries, a region in which it will seek to recruit client states who will support it in the various international bodies. This essentially economic strategy has also seen China undertake major construction projects in some African countries, in some cases bringing large numbers of Chinese workers, who then often remain behind, which is beginning to have political repercussions.

212. One development flowing from the need to import raw materials, and particularly the need to secure the flow of oil from the Middle East and Africa,

\(^73\) See the reference in Annexure 3 to the article “Six Wars to be fought by China in the next Fifty Years” that was published in the government-controlled Wenweipo newspaper in Hong Kong in July 2013.
has been a growing naval presence in the Indian Ocean. That presence was triggered in part by the problem of piracy in the region, but is now also part of a wider strategy. Replenishment facilities or agreements have been put in place in Sri Lanka, Pakistan and Seychelles, and the Chinese Navy has also begun with the construction of a base in Djibouti. There are also naval ties with Bangladesh and Myanmar.

213. China has also become a serious competitor in the African defence market, presenting its equipment as offering reasonable performance at a reasonable price, and at times making equipment available at what might best be termed ‘friendship prices’ as part of a strategy to gain influence. Even where that is not the case, it is open ‘unorthodox’ marketing and sales strategies and has, for instance, been willing to accept payment in raw materials rather than money.

214. India. India sees itself, not unreasonably, as the pre-eminent power in the Indian Ocean, and as a major power en route to becoming a great power. It has the population and the economic base to achieve this, less hampered by an ageing curve than is China.

215. India is faced with two hostile neighbours, Pakistan and China, both like itself nuclear armed, and the latter set on expanding its sphere of influence, and must cope also with multiple insurgencies of varying intensity within its borders. The main impact of these is that the country maintains a very large standing military.

⇒ A particular aspect of the latter point, is the growth of the Indian Navy, which is in part a natural outcome of being the major power in an oceanic region as well as being a trading nation, but is also in part a response to the growing Chinese Navy, its more frequent appearance in the Indian Ocean and China’s perceived efforts to establish naval facilities, if not bases, in countries around India – Bangladesh, Myanmar, Sri Lanka, Pakistan and Seychelles, as well as Djibouti. India may choose to respond by establishing bases or replenishment facilities of its own in the region, already having established replenishment arrangements in Mauritius and Seychelles.

216. India is also, like China, challenged by a lack of natural resources, and is seeking secure sources of oil and other raw materials, in Africa and elsewhere. In addition, as a power seeking greater global status, it is also intent on winning support from other countries for its position on international matters.
217. **Russia.** Russia faces major economic and internal political challenges and seems to be seeking to address them in part by rebuilding at least the appearance of being a ‘super power’ as was the Soviet Union. With a population of 144 million and an economy similar in size to those of South Korea and Australia, this will not be possible: Either this effort will stay at the level of a military *Potemkin Village* except as regards the nuclear arsenal that is its only claim to ‘super power’ or even ‘great power’ status, or the attempt to regain its past glories will once again bankrupt the country.

218. Russia’s primary strategic interest is to develop and sustain a belt of client states if not allies around it, hence its adventurism along its frontiers, which has had the unintended effects of driving Eastern European countries closer to NATO, and causing Europe to begin to reconsider whether the post-Cold War defence cuts perhaps went too far\(^74\). In other parts of the world – including Africa - Russia will seek to play mainly a spoiling role vis a vis the United States and China.

219. **New Major Powers.** The falling away of the competition between the United States and the former Soviet Union has seen the gradual emergence of new regional powers, some of them perhaps with aspirations of becoming a major or ‘great’ power’. This will continue despite the apparently renewed completion between the United States and Russia, and the competition between the United States and China.

220. Among them are Japan, Brazil, South Korea and Turkey and potentially Iran, and in the longer term perhaps also Indonesia. The strategic focus of these countries will for now be on their regions and, in some cases, on securing access to oil and other raw material and on trade routes. Hence, for instance, Japanese naval activity in the northern Indian Ocean, which has also led to the establishment of a base in Djibouti.

221. Their interest in Africa will generally be limited to the extent to which they source raw materials from the continent and as an offset market for their manufacturing and related service industries. The exceptions to this, apart from China and India, will include Brazil, which sees the West African littoral as its sphere of interest; and Turkey, which is making a major effort to play a greater role in African countries with large Muslim populations, and which

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\(^74\) Even neutral countries like Finland and Sweden are reconsidering their defence cuts since the 1990s, with Sweden having decided in 2017 to reintroduce conscription to expand its force levels.
has, for instance, recently opened a training base in Somalia that is intended to provide training for up to 500 Somali personnel at one time\textsuperscript{75}.

222. \textbf{The European Powers}. Apart from assuming the role of major or great powers within the region surrounding their European base, their international activities are likely to focus on working with the United States and other major powers, notably India and Japan, to ensure the continuation of a more or less ‘rules-based’ world in which they can trade.

223. Unlike the other major powers, those of Europe have a vested interest in Africa becoming a stable and prosperous continent: They want a stable neighbour along the southern shore of the Mediterranean, they want to avoid a flow of refugees, and a prosperous Africa has the potential to be a lucrative market for their manufactured goods.

224. Against that background, it can be expected that the European countries will continue to support the African Union and peace support operations in Africa, and that they will be willing to intervene militarily in support of friendly governments when that is essential. This will most probably take place in line with historic colonial ties or as mandated by the European Union. In this regard France is likely to continue to be the ‘lead power’, with multiple permanent bases in Africa, although Germany could well begin to play a much greater role.

225. With the advent of ‘BREXIT’, the United Kingdom exiting the European Union, it seems likely that London will not only continue its previous policies in Africa, but seek to build on them to assume a greater role vis a vis the continental European powers.

226. \textbf{BRICS}. This began as an acronym for a group of countries investment bankers thought might do well over the medium term (BRIC). South Africa was invited to join to create an image of ‘South-South’ solidarity and to provide entree into Africa. As a political or strategic entity BRICS has little reality other than as a tool to counter the United States and Europe in the interests of, mainly, China and Russia. Economically the group has also ceased to interest, with Brazil, Russia in trouble and the Chinese economy slowing.

\textsuperscript{75} Sputnik news agency, 17 March 2017.
227. The countries of BRICS have little in common, and are mostly in competition with each other economically and diplomatically, and particularly so in Africa. BRICS also holds within itself the seeds for future fracture in the extant hostility between China and India and the incipient tension between China and Russia over territorial issues.

228. **Non-State Actors.** Another trend is for non-state groups to conduct war operations that are not much different to those conducted by formal governments. This applies both to guerrilla and terrorist groups, and in some countries also to criminal groups operating in concert with guerrillas (as in Colombia) or, at lower levels of intensity, independently (as in Mexico). This is discussed further in the relevant sections below.

229. **Private Military Companies.** A related trend has been the expansion of the activities of private military companies (PMCs), contracted by governments to conduct a wide range of operations that are at least paramilitary in nature, if not actually military. While most such companies have been contracted to provide logistic and technical support, some are engaged in intelligence collection and evaluation, VIP close protection and infrastructure protection. There have also been cases of PMCs being contracted for actual military operations, such as Executive Outcomes, contracted by the Angolan government for certain operations against Unita, and contracted by the Sierra Leone government for operations against the Revolutionary United Front.

**Foreign Forces in Africa**

230. The military weakness of most African countries south of the Sahara has meant that they have been unable to effectively counter various guerrilla, terrorist and criminal (e.g. pirates and narcotics smugglers).

231. That has led to a renewed increase in the deployment of foreign military forces in Africa, including the establishment of permanent – or at least long-term – bases by newcomers to the continent, primarily to counter extremist Islamist groups and Somali pirates and, in the case of the United States, also to support operations against the Lord's Resistance Army in East Africa.

a. **China** is building a naval base at Obock in Somalia, its first overseas military base, which is reportedly intended to accommodate several thousand personnel over and above the naval facility as such.

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76 IRIN, 20 February 2017.
b. **France** has some 3,500 personnel at permanent (Chad) and temporary (Burkina Faso, Mali, Mauretania, Niger) bases as part of Operation Barkhane, intended to support local forces to suppress extremist Islamist activities in the Sahel. France also has permanent bases in Cote d’Ivoire (between 500 and 900 personnel), Gabon and Djibouti.

c. **Germany** has established an air transport hub at Niamey in Niger to support German troops serving with the UN force in Mali.

d. **India** has had a “listening post” in Madagascar since 2007, has naval replenishment facilities in Mauritius, and is planning to build a naval base in the Seychelles.

e. **Japan** established a base in Djibouti in 2011, primarily to support counter-piracy operations.

f. **Saudi Arabia** is planning to build a base in Djibouti, apparently intended to support operations in Yemen.

g. **Turkey** has recently opened a base in Somalia, intended as a training facility for the Somali military.

h. **The United Arab Emirates** began developing a naval and air base at Assab in Eritrea in 2015, to support operations in Yemen, and has a 30-year lease on a naval and air base at Berbera in Somaliland. In addition, the UAE has deployed attack aircraft and UAVs to Egypt and eastern Libya for operations against jihadists, and has training facilities in Puntland (training the Maritime Police Force) and Somalia (training the Counter-Terrorism Unit, the National Intelligence Service and the Security Agency).

i. **The United Kingdom** has a permanent training support unit in Kenya.

j. **The United States** has bases and facilities of various types in Africa, ranging from the large, permanent base in Djibouti to ‘bare bones’ facilities for special forces operations on an ‘as required’ basis. At the beginning of 2017 these included bases and facilities in Burkina Faso, Cameroon, Chad, the Central African Republic, the Democratic Republic of Congo, Djibouti (the only permanent base in Africa, some 3,200 personnel), Ethiopia, Gabon, Ghana, Kenya, Niger, Somalia, the Seychelles, Senegal, South Sudan and Uganda.
Trends in Armed Conflict

232. Again there are several discernible trends in the nature and conduct of armed conflict that have come to the fore in the post-Cold War period. Africa is not immune to these trends, and they must be taken into account when considering South Africa’s defence requirements. Among these trends are:

a. Asymmetric Warfare;

b. Cities as Battlefields;

c. International Terrorism;

d. Paramilitary Capabilities of Criminal Groups;

e. Cyber Operations; and

g. The renewed focus on conventional operations.

Asymmetric Warfare

233. Asymmetric warfare has become something of a ‘buzzword’ but is actually nothing new:

a. The weaker party in many conflicts in history has often chosen a guerrilla strategy rather than risk swift defeat by the more powerful opponent;
b. Asymmetry can also refer to a country choosing to play to its strengths, rather than engaging an opponent on its terms, for instance:
   i. Maritime versus land power; or even
   ii. Economic action rather than military action.

   c. Asymmetry also applies when a powerful country defeats a weaker opponent.

234. However, the term is most often used to refer to conflicts where one side chooses to use irregular forces. In that sense asymmetric warfare has several forms, including:
   a. Insurgency;
   b. Guerrilla warfare;
   c. Sabotage;
   d. Terrorism; and
   e. Will most often comprise a mixture of all or some of these methods.

There has been a clear trend towards intra-state conflicts, which mostly take the form of asymmetric struggles. This is not, however, any guarantee against future inter-state war, which may itself not be conventional in style.

235. What makes asymmetric warfare relevant today is not just the history of insurgencies in recent times, but the fact that current defence technologies have given major armed forces such an edge over smaller or less advanced forces – particularly in terms of situational awareness and command and control capabilities – that they stand no chance in open conflict. That reality will result in weaker countries looking to asymmetric strategies that at least

77 Consider, for instance, how the large and apparently well-equipped Iraqi armed forces were brushed aside by the coalition forces in 1991 and 2003.
offer the chance of wearing down a stronger enemy or of inflicting casualties at levels unacceptable to the public in that country.

*Implication:* Inter-state conflict will not necessarily take the form of open war. It could instead see the use of one or more asymmetric strategies.

236. States have also begun to employ unconventional strategies that could best be described as ‘semi-military’ and asymmetric to achieve particular ends, including the employment of unacknowledged military forces, occupation of territory by stealth, occupation of unsettled territory, or the use of civilian elements to exert pressure on an opponent.78

*Implication:* This demands much greater situational awareness on the part of both intelligence services and security forces, and will require the development of a new concept of operations to counter such ‘semi-military’ aggression.

237. There is also a trend since the 1940s for the people of a defeated country not to accept that defeat, which can lead to resistance in the form of insurgency or guerrilla warfare or also, as is the case today, terrorist attacks carried out in the victorious country.

238. Finally, there is insurgency, guerrilla warfare or terrorism by a group that perceives itself as unfairly treated within its country.

*Implication:* This can impact on the conduct of peace support operations, as those could require complex counter-insurgency strategies and tactics rather than simpler counter-guerrilla or anti-terrorist strategies, which will require a quite different mix of forces and quite different equipment types.

239. One particular sub-trend of the past two decades has been the evolution of some irregular forces to a semi-conventional level, using heavily armed light vehicles (“technicals”) and even armoured personnel carriers, artillery79 and tanks80 in some cases, guided missiles81, UAV systems82 and communications

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78 Consider, as examples, the Russian occupation and annexation of the Crimea and the Chinese occupation and fortification of islands and reefs in the South China Sea, and their use of fishing fleets as de facto auxiliaries.

79 For instance, in Mali, Nigeria, Somalia, Iraq/Syria and Myanmar.

80 For instance, in the DRC (the CNDP), Nigeria (Boko Haram) and Iraq/Syria.

81 For instance, in Egypt, in Iraq/Syria and in Yemen.

82 For instance, in Palestine and in Syria. This presents a serious challenge for air-defence systems as such small UAVs are extremely difficult targets, and because they present a very poor ‘exchange ratio’ between
intelligence\(^\text{83}\). In the future one must also expect cyber-attacks at some level. Some guerrilla forces have also demonstrated the ability to develop a naval element and even a small air arm\(^\text{84}\).

**Implication:** Operations against irregular forces can no longer always be safely left to simply-equipped and lightly-armed forces as in the past. Some operations against such forces will require medium and even heavy force elements. This will also apply in the case of some peace support operations.

240. In addition, the Islamic State has been reported by the Organisation for the Prohibition of Chemical Weapons to have used mustard gas in the north of Iraq against Kurdish forces\(^\text{85}\). There is no reason to assume that other irregular forces might not follow that example in the future.

**Implication:** The general assumption in the past that chemical warfare was only a potential factor in war against another state, and had been largely ruled out except in the case of rogue states, thus no longer holds. Forces fighting guerrillas will have to consider and prepare for possible use of at least improvised chemical weapons.

241. Some irregular forces have also begun to master operational principles such as mission command and simultaneity, applying those skills to operate inside the decision cycle of the security forces. They are also proving adept at using innovative command and control techniques, for instance exploiting social media to disappear among the general ‘noise’.

**Implication:** This will demand greater flexibility and quicker decision-making by security forces, and will demand innovation in the field of COMINT.

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\(^\text{83}\) Even the Lord’s Resistance Army in East Africa has used a form of electronic intelligence, taking note of concentrations of cellular telephone conversations in rural areas as an indicator of army forces grouping in that particular area.

\(^\text{84}\) For instance, the Tamil Tigers in Sri Lanka, who had a substantial navy of small craft and logistic support ships, were building small submarines, and also had a small air arm with some light attack aircraft that carried out attacks on Sri Lankan ground forces and air bases. At the lower end of the scale, Hezbollah in Lebanon has employed micro-light aircraft for infiltration.

\(^\text{85}\) Foreign Policy 22 April 2016, quoting the Director General of the OPCW, Ambassador Ahment Üzümc. For the record, rebels and Syrian government forces have been reported to have used Sarin and Mustard gas in Syria.
Cities as Battlefields

242. Another trend is for warfare to increasingly play itself out in and around cities and towns, particularly in the developing world. There is little of value in the rural areas of most developing countries, and control of the country generally depends on holding towns and cities. In addition, the regular forces of most developing countries lack the resources to fight classic battles in open terrain.

**Implication:** This has potentially serious implications for armed forces as fighting in urban terrain is especially demanding in terms of the numbers of troops required and will require specialised tactics, weapons and equipment (breaching and scaling equipment, specialised reconnaissance equipment (e.g. to establish whether enemy are in a particular building), specialised communications equipment for use in high-rise buildings and in subways, specialised weapons).

**Implication:** A particular challenge will arise when combat takes place in squatter shanty towns, as most normal infantry weapons used in among the typically flimsy structures of such settlements will bring unacceptable risk of causing civilian casualties and excessive damage to dwellings and possessions.

![Global Urbanization Trends](image)
243. Irregular forces prefer to operate ‘amongst the people’, because that makes them vastly more difficult to identify and engage, particularly given the risk of civilian casualties and the lesser but still important matter of inconvenience to the population.

- **Implication:** Apart from specialised equipment suited to the particular urban terrain in which operations are to be conducted, this will also require a particular focus on intelligence and surveillance, and will require relevant language skills, perhaps supported by computer-based aids.

- **Implication:** There will also be a need for dedicated force elements to manage and assist the civilian population (e.g. medical treatment, food, clothing, shelter) and to identify enemy hiding among them in towns and in refugee groups.

**International Terrorism**

244. There have been several changes in the use of terrorism as a strategy. In particular:

a. Terrorism has become truly international, as demonstrated by the ‘9/11’ attacks in the United States in 2001;

b. Terrorism has become potentially more lethal, as demonstrated by those attacks, but also as demonstrated by the use of nerve gas by the Aum Shinrikyo sect in Japan in 1995; and

c. The advent of remotely radicalised or self-radicalised small groups or ‘lone wolf’ terrorists, as in the recent attacks in European cities.

245. In addition, there has been the advent of what might best be termed ‘strategic terrorism’, attacks carried out in a country with the intention of inflicting massive civilian casualties as a means to persuade a government to desist from a course of action. Examples include the train bombings in Madrid (2004) and London (2005), and the attacks in Kampala (2010) and Nairobi (2013).

246. And, as has been the case before, terrorists may well attack a target in a country that has nothing whatsoever to do with a particular conflict, simply because it is a low risk way of striking at citizens or businesses of the country involved in the conflict. The attacks on the US embassies in Kenya and Tanzania in 1998 are good examples.
247. Terrorism must, therefore, be understood as something that may accompany another form of conflict, or indeed comes as part of a conflict in which South Africa has no part, for instance those in the Middle East.

Implication: The Defence Force and the other security services – will need to be prepared to deal with this. This will require greater focus on intelligence and surveillance, including the utilisation of some military systems and capabilities.

**Paramilitary Capabilities of Criminal Groups**

248. There have been two developments in recent years that have the potential to elevate the problem of organised crime to one that can require involvement of the military:

- a. Some organised crime groups have developed paramilitary capabilities and must be dealt with as if they are guerrilla forces. Examples include some bandit and smuggling groups in Africa and the Latin American drug cartels, with the latter's use of miniature submarines being perhaps the most striking example.\(^{86}\)

- b. There is a trend for criminal groups to cooperate with guerrillas and terrorists, each party bringing its particular assets, capabilities and contacts into play. Examples include smugglers in the Sahel, pirates in Somalia and the drug cartels in Colombia.

249. A related problem is that some guerrilla and terrorist groups use criminal activities as a form of fund raising, as have some of the guerrillas in Colombia and as has Abu Sayef in the Philippines.

250. These trends are also clearly visible in Africa and will continue to affect the operations of criminal groups, other groups working with them and those of the security forces.

Implication: The Defence Force will have to take this into consideration when planning future operations in Africa.

Implication: Other security agencies and services will have to consider acquiring military equipment for some purposes, and the ability to employ it to good effect.\(^{87}\)

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\(^{86}\) Some years ago a Kenyan Police helicopter was shot down by cattle rustlers using an SA7 shoulder-launched anti-aircraft missile; more recently a Tanzanian game park surveillance helicopter was shot down by poachers using small-arms.

\(^{87}\) One current example is the Meerkat optronic/radar surveillance system employed in the Kruger National Park to counter rhinoceros poaching.
Cyber Operations

251. The ‘cyber’ domain is still new territory to conflict, but is increasingly being exploited for intelligence and propaganda/information operations purposes, and more recently also for offensive purposes. Examples of the latter might include:
   a. 2007: Denial of service attacks on Estonian government and commercial systems during April.
   b. 2008: Denial of service attacks on Georgian government and commercial systems during July and August; including an attack on the control and safety systems of a key oil pipeline, which led to an explosion.
   c. 2010: Operation Olympic Games, a joint US/Israeli operation aimed at disrupting Iran's nuclear programmes by means of the Stuxnet virus.
   d. 2015: Attack on part of Ukraine's power grid in December, together with hacking of various government systems.
   e. 2016: Attack on part of Ukraine's power grid in December, again together with hacking of various government systems.

252. This development raises the question of how one defines an act of war. Is an attack that cripples national infrastructure – potentially causing serious damage and even casualties – by means of malware to be equated to a physical attack such as an air strike? If so, how does the state respond?

253. In addition, defence and military systems are increasingly networked, and there is a trend to using standardised software backbones to simplify operation. That increasingly makes the military, both its own infrastructure and operating units, vulnerable to cyber-attack. A present example might be that of UAV command links being hacked to either access the video they are downloading, to disrupt the use of the system, or even to seize control of the UAV.

254. Implication: Neither South Africa as a whole, nor the Defence Force are an exception to the trend to ever greater reliance on networks and the vulnerabilities they bring with them. It is also worth considering that:
   a. South Africa and the Defence Force are arguably substantially more vulnerable than other African states, or any irregular forces (military, guerrilla, terrorist or criminal) likely to be encountered. That makes for a one-sided vulnerability that could be dangerous, bearing in mind that
255. Once the government and the Defence Force have developed an overall concept of how to counter such attacks, the Defence Force will have to develop the relevant capabilities. Careful thought must also be given to the question of where the benefits of networking are outweighed by the risk of hacking and/or disruption. In some cases there may be greater benefit in staying with older technologies that are not vulnerable to cyber-attack.

**Warfare Concepts**

256. The past decade has also seen the emergency of a host of new concepts seeking to explain the evolving nature of conflict\(^88\), which are discussed in outline in Annexure 3. Among them are:

a. **Effects-Based Operations\(^89\)**: This essentially refers to identifying the desired effect of an intended operation and then optimising the force mix and the plan to achieve that. It does not differ markedly from the well-established doctrine of ‘maintenance of the aim’.

b. **4^th^ Generation Warfare\(^90\)**: This is a view that future war will see a blurring of lines between war and politics, and will centre on transnational actions of terrorism and psychological warfare. The operations of Al Qaeda and ISIS could fit into this paradigm.

c. **Compound War\(^91\)**: This envisages future as making deliberate and simultaneous use of regular and irregular forces in the same operational and even tactical context. Examples would include cooperation between regular Russian forces and partisans in WW 2 and

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\(^88\) These concepts have mostly been developed and then taken further by several groups of officers, in most cases officers of the United States military, but have been adopted to various extents by the armed forces of many countries as a basis for thinking and discussion.

\(^89\) One of the key developers of this concept was Lieutenant-General David A. Deptula, US Air Force.

\(^90\) One of the key developers of this concept was the US defence analyst William S. Lind.

\(^91\) One of the originators of this concept was Thomas Huber of the US Army Command and General Staff College.
the cooperation between SA Army units and Unita elements in the southeast of Angola in 1987/88.

d. **Complex War**\(^{92}\): This concept is used to describe a conflict situation in which there are multiple actors with differing aims and agendas operating simultaneously in the same theatre. The present situation in the east of the DRC is a good example.

e. **Hybrid War**\(^{93}\): This concept is used to describe a conflict in which one side (or both) uses a mix of irregular tactics, conventional weapons, terrorism and criminal behaviour within the theatre or area of operations. Examples might include the operations by Chechen forces in Grozny in the mid-1990s and Hezbollah in South Lebanon in 2006.

f. **Netwar**: This is a concept developed by RAND in the United States, described as low-intensity warfare by social-networked actors. Examples could include the Zapatista insurgency in Mexico, the ‘narco-guerrillas’ in Colombia and some of the Somali pirate groups.

g. **Unrestricted Warfare**\(^{94}\): This is a concept developed by two officers of the Chinese Army and published in 1999. It envisages a composite military/civilian grouping of forces and agencies conduction operations in the military and various civilian spaces to achieve the aim of the war. It includes ecological (including climate modification), economic, legal (‘lawfare’), cyber/network, psychological, irregular and conventional operations.

h. **Formless Warfare**\(^{95}\): A concept that has begun to be discussed recently, centred on the integration of artificial intelligence, deep learning systems and autonomous and remotely-operated systems. This envisages very fast and comprehensive gathering of intelligence, followed by prompt and swiftly executed strikes against targets of opportunity and importance by autonomous or remotely-operated systems. The ‘formless’ element lies in there not being any

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\(^{92}\) One of the originators of this concept was the then Lieutenant-Colonel Frank G. Hoffman, US Marine Corps Reserve.

\(^{93}\) One of the originators of this concept was Nathan Freier, then in the office of the Secretary of Defense. One of the key writers on this concept was the then Lieutenant-Colonel Bill Nemeth, US Marine Corps.

\(^{94}\) Colonel Qiao Liang and Colonel Wang Xiangsui (since promoted); PLA Literature and Arts Publishing House, February 1999.

distinguishable front line or even an identifiable area or theatre of operations.

257. While all of these concepts offer interesting insights that need to be considered, it is also important to understand that none are entirely new. The history of warfare is replete with examples of wars or operations conducted in just such a manner as set out in the various concepts.

258. The important factor here is to understand that armed conflict is not always a simple matter of either conventional forces engaging on a defined battlefield, or guerrillas hiding in the forest, or urban terrorism. Armed conflict can and often will cover that spectrum as well as including other forms of ‘attack’, be they cyber, economic or legalistic.

259. **Implication:** These forms of warfare will demand a ‘whole of government’ approach to defence against such attacks. While the Defence Force will remain the primary actor in defending against physical attack, it is not well-equipped to deal with the other forms of attack. At the same time, it will be essential that defence against such attacks is conducted in a fully integrated way, with all relevant forces, departments and agencies working in close collaboration and with full sharing of raw and processed intelligence.

A Renewed Focus on Conventional Forces

260. The adventurist actions of China\(^{96}\) and Russia\(^{97}\) in recent years have led to some countries in Europe and Asia to reconsider the extent to which their ‘conventional’ armed forces were scaled down after the end of the Cold War. This may well spill over into the force designs of their allies and client states in other parts of the world, including Africa.

261. It is also important to note the flow of new ‘conventional’ arms and equipment to African armed forces\(^{98}\). This holds the danger of intra-state conflicts becoming semi-conventional in nature, and means that an inter-state conflict could see the employment of some quite modern equipment and systems. The war between Ethiopia and Eritrea and the clashes between South Sudan and Sudan are informative in that respect.

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\(^{96}\) For instance, the occupation and fortification of islands, islets and reefs within the Exclusive Economic Zones of other countries.

\(^{97}\) For instance, the invasion and occupation/excision of parts of Georgia in 2008 and the annexation of Crimea.

\(^{98}\) Including, for instance, Su-30 fighters, T-90 tanks, self-propelled 155 mm guns, 100 km range A-100 multiple rocket launchers and armed UAV systems.
262. **Implication**: The Defence Force may find itself involved in a peace support or other operation that places elements between forces equipped with modern armour and combat aircraft. This will have to be taken into account in terms of force design, force levels and acquisition priorities.

**Armed Conflict Trends in Africa**

263. Africa has not been immune to armed conflict in all of its forms, and is unlikely to acquire any such immunity.

264. Armed conflicts in Africa since the end of the Cold War have included:
   a. Inter-State War;
   b. Trans-National War;
   c. Civil Wars and Failed States;
   d. Guerrilla War;
   e. Coups d'Etat;
   f. Popular Uprisings;
   g. Terrorism; and
   h. Organised Crime.

265. In addition, there have been:
   a. Peace Support Operations (peace-making, peace-keeping, peace-enforcement)\(^99\);
   b. Foreign Intervention Operations;
   c. African Intervention Operations; and there are
   d. Various border disputes with some potential to escalate to armed conflict.

\(^99\) Peace support operations (PSOs) include the employment of military forces to support negotiations between belligerents who have ceased war operations (peace-making), to keep the peace between belligerents in a fragile situation while negotiations are initiated or in hand (peace-keeping) and to force an end to conflict even if one or more parties do not wish to stop fighting (peace-enforcement). The term can also cover stabilisation operations, support to local forces to deal with ‘spoilers’.
266. It is also important to bear in mind Africa’s rapid population growth: This is going to place major strain on governments’ ability to deliver services, and on natural resources, all of which will combine to result in internal political stresses in some countries, and friction over artificial, colonial era, borders in others. The potential for conflict in Africa must, thus, be considered to be high and increasing over the medium- to long-term.

267. To that must be added that major power competition will to some extent also play itself out in Africa, again with the potential to aggravate or trigger conflict.

**Inter-State Conflict**

268. Since the end of the Cold War there have been five inter-state conflicts of varying intensity:

a. 1998-2000: Ethiopia versus Eritrea over the Badme Triangle;
b. 2008: Eritrea versus Djibouti over a border dispute;
c. 2007: Puntland versus Somaliland over a border dispute;
d. 2010: Puntland versus Somaliland over a border dispute; and
e. 2011: Sudan versus South Sudan over the Abyei region.
269. While most of these were brief and/or involved minor clashes, the war between Ethiopia and Eritrea was a major and bitter conflict, and saw both countries move very quickly to acquire and learn to use modern equipment, particularly fighter aircraft (MiG-29s and Su-27s).

270. The conflict between Sudan and South Sudan also saw considerably use of conventional forces, again including combat aircraft and main battle tanks (among them Chinese Type-96 tanks and Russian T-72 tanks obtained from Ukraine).

271. It is also worth bearing in mind the Ogaden War between Ethiopia and Somalia in 1977, which involved a large foreign contingent (some 20 000 Cuban troops) air- and sealifted to Ethiopia to support its operations against Somalia.

272. While a similar deployment is now highly unlikely, foreign advisors and private military companies have played a role in a number of African countries, and it is quite possible that a major power might deploy a proxy force to protect or advance its interests. Where the stakes are considered sufficiently high, major power forces could become involved, although this remains unlikely over the near to medium term.

273. Implications: While South Africa is unlikely to become directly involved in inter-state conflict in Africa, it is quite possible that South Africa might be asked to provide part of a force to:

   a. Be interposed between the belligerents to prevent direct conflict breaking out;

   b. Be deployed along a border between a belligerent country and another country, to prevent spill-over; or

   c. Be deployed to secure a settlement of a conflict, which could see renewed fighting erupting and would therefore require a strong interposed force to prevent that.

   d. Such an operation would require the deployment of at least a medium force (e.g. Rooikat and Badger) with tactical air support, and in some cases the deployment of fighter aircraft in support of the ground force and to protect against air attack, or to conduct a ‘deny flight’ operation within the framework of the mission.

100 Consider how DRC and Zimbabwe Defence Force elements crossed into Zambia in 2000 to escape destruction by advancing Rwandan forces. Consider also how the neighbours of the former Yugoslavia deployed forces along their borders with that country during the wars of its break-up, to prevent any fighting spilling over into their territory.
In addition, one could see three ‘regime change’ operations as falling into this category:

a. 1996: The invasion of Zaire (now DRC) by Uganda, Rwanda, Burundi and Angola, to remove the government of President Mobutu.

b. 1997: Angola’s intervention in the Republic of Congo to ensure the transfer of power to Colonel Sassou-Nguesso; and

c. 2006: Ethiopia's intervention in Somalia to unseat the Union of Islamic Courts from government, which continued until 2009.

In addition, there were the 2011 operations by NATO and other countries (including Qatar and the United Arab Emirates) in support of rebels seeking to oust the government of Colonel Ghadaffi, which could also be counted as a ‘regime change’ campaign.

The wars fought in Zaire and later the Democratic Republic of Congo between 1996 and 2003 were inter-state, trans-national and regime-change in nature:

a. Inter-state in that Uganda, Rwanda and Burundi in the east and Angola in the west invaded because the Zaire/DRC government was allowing guerrilla operations from its territory against them.

b. Trans-national in that during the second phase it was a war between Angola, with Zimbabwe and Namibia allied with it, on the one hand, and Uganda and Rwanda on the other, over the government of the country.

c. In its second phase this conflict also briefly spilled over into Zambia, when a DRC Army brigade with an attached Zimbabwe Army battalion crossed the border to escape destruction by advancing Rwandan forces.

The operations being conducted by a multi-national force against the Lord’s Resistance Army in the DRC, CAR and South Sudan might also be classified as a trans-national war or at least ‘conflict’, given that the forces of four African countries (the fourth is Uganda) supported by US Special Forces are conducting operations spread over the territory of three countries.

Similarly, the conflict triggered by Boko Haram in the northwest of Nigeria has also become a trans-national war, involving Boko Haram attacks in Nigeria, Niger, Cameroon and Chad, and the armed forces of those countries.
combining efforts to counter Boko Haram, in some cases including operations on each other’s territory.

**Guerrilla Wars**

279. Guerrilla\(^{101}\) wars varying in nature (true insurgency, separatist guerrillas, nihilist guerrillas) and intensity, currently affect fourteen countries in Africa.

280. While some of these are quiescent and others quite low-key, the guerrillas that came close to overrunning Mali and those that operate off and on in Chad and Sudan are examples of how challenging such conflicts can become:

a. The rebels that overran the northern three-fifths of Mali operated to an extent as a semi-conventional force, with armoured personnel carriers and multiple rocket launchers supporting the more typical ‘technical’ elements, and proved adept at hiding among the population when French forces destroyed their manoeuvre elements.

b. Guerrillas operating from Sudan against the Chad government have demonstrated remarkable planning and logistic skills, best demonstrated by the 500-vehicle raid on the capital in 2008, carried out by a force that moved in many small groups over distances of 1 000 to 1 500 km before forming up east of N’djamena. It might well have taken the capital had French forces not protected the airport, allowing the Chad Air Force to bring attack helicopters to bear.

c. The Justice and Equality Movement (JEM) in Darfur mounted a 1 000 km raid by a force of 140 vehicles on Omdurman in 2008, shooting down a MiG-29 and overrunning an air base in the process.

281. A key point to consider here is that a proportion of the light 4x4 ‘technicals’ used by these guerrilla forces are armed with weapons lethal to most armoured personnel carriers and light armoured vehicles: 14.5 mm heavy machineguns, 23 mm cannon, 37 mm cannon, 73 mm SPG9 recoilless rifles and 106 mm recoilless rifles.

282. Irregular forces in the Middle East have also made use of guided weapons against both armoured vehicles and aircraft, particularly in Syria and Yemen,

\(^{101}\) From the Spanish ‘small war’, coined after the use of irregular forces in Spain to resist Napoleon’s French forces.
and against ships close inshore.\textsuperscript{102} This trend must be expected to carry over to irregular forces operating in Africa.

283. There is also a clear trend for irregular forces to make increasing, and increasingly varied, use of UAVs for reconnaissance, command and control and attack. While this is currently confined to the Middle East, it is a trend that will spread. Current examples include:

a. The Iraqi government forces fighting to recapture Mosul from IS, reported 73 UAV attacks during the first day of their offensive into the western part of the city, and 40 on the second day. These were mostly small commercial UAVs delivering improvised bombs made with 40 mm grenades or handgrenades.\textsuperscript{103}

b. IS in Syria has used UAVs for reconnaissance and for command and control over ground forces during attacks on Syrian government forces bases\textsuperscript{104} and has also used armed UAVs\textsuperscript{105}.

c. Hezbollah in Lebanon has used UAVs for reconnaissance and has fitted some with explosive warheads for one-way missions\textsuperscript{106}.

d. Hamas in Gaza has used UAVs for reconnaissance and has begun arming some UAVs, thus far only with unguided rockets\textsuperscript{107}.

284. In addition, irregular forces in Yemen have used explosive-laden unmanned small craft to attack a Saudi Arabian Navy frigate off the coast in January 2017.

285. More generally, there has been a clear trend for guerrilla forces to not only become better armed, but also better led, better trained and better equipped, making them considerably more dangerous.

286. Another point to consider is that these wars can spill over national borders, as is clearly the case with Boko Haram (active in parts of Nigeria, Niger,

\textsuperscript{102} For instance, the Hezbollah use of a C-802 anti-ship missile against the Israeli corvette INS Hanit in July 2014, the use of an anti-tank missile to attack an Egyptian patrol vessel off Sinai in July 2015, and the missile attack against the UAE fast transport off Yemen in October 2016.

\textsuperscript{103} Washington Post, 28 February 2017.

\textsuperscript{104} National Defense Magazine, August 2014.

\textsuperscript{105} Heavy.com news, 6 February 2017 repeating from an ISIS website.

\textsuperscript{106} FAS Public Interest Report, Spring 2014, and other source.

\textsuperscript{107} Ynet News, July 2014 and other sources.
Cameroon and Chad), the Lord’s Resistance Army (active in parts of the Central African Republic, the Democratic Republic of Congo, South Sudan, and Uganda) and the several guerrilla groups operating from the DRC against Uganda, Rwanda and previously also Burundi.

287. **Implications**: There are implications here for the Defence Force:

- **a.** South Africa may be asked to assist a country affected by a major guerrilla conflict, either directly or as part of an African Union or United Nations mission\(^\text{108}\); or

- **b.** South Africa may be asked, again directly or as part of an AU or UN mission, to deploy a force to prevent a guerrilla conflict from spilling over into an adjacent country.

- **c.** Any such contingent must have the strength and combat power to be effective in its assigned role and mission, and to deter any attack on itself of its elements, which will in some cases require the deployment of at least medium forces and Air Force elements in support.

- **d.** It will also be necessary to develop the capability and capacity to counter unmanned systems, perhaps by jamming command links or GPS signals, or perhaps by means of shooting them down. This is a new area of defence technology and there seems to be an opportunity here for industry to establish a niche capability.

### Civil Wars and Failed States

288. Somalia and Libya are both quite clearly ‘failed states’, in the sense that there is no single effective government. One could also classify the Central African Republic as such, as it still does not have a government able to exert power over even a major portion of the country, let alone being able to govern and administer the country effectively. Similarly, Mali is dependent on foreign forces to exert any control over its northern parts.

289. The collapse into ‘failed state’ status was in all these cases preceded by what amounted to a civil war, in Libya after the authority and legitimacy of the government collapsed, and in the CAR after two neighbouring countries

\(^{108}\) As in the DRC and until last year in Sudan's Darfur region, and as in the brief intervention in the Central African Republic in 2013.
decided that a ‘regime change’ was necessary, although that in effect also developed into a civil war.

290. The civil war origins underlying these failed states makes stabilisation and peace building exceptionally difficult, and will require both forces able to fight ‘spoilers’ who might be well armed (e.g. Libya) and the political patience to remain in the country long enough for hatreds to cool sufficiently for there to be a real chance of settlement.

291. Unless and until a stabilisation force is deployed into such a failed state, it will become a source of instability to its neighbours, offering ungoverned spaces for exploitation by criminal groups, guerrillas and terrorists.

292. **Implications**: South Africa may be asked to deploy a force or contribute to an AU or UN stabilisation force in such a situation\(^{109}\). That force must be of a strength and combat power to be able to perform that mission and to deter or defeat attack on itself by disaffected elements of either side in the civil war, which elements might well have access to heavy weapons. Depending on the level of weaponry available to the belligerent parties in the affected country, this will in some cases require deployment of at least a medium force and Air Force elements\(^ {110}\).

**Coups d’Etat**

293. There have been thirteen coups d’etat and attempted coups d’etat in Africa since 2000. While a coup d’etat may not always develop into a regional security problem, or an internal situation that demands military intervention, that is always a risk.

294. Two examples of this are the events that followed the attempted coup d’etat in Cote d’Ivoire in 2002 and the events following the 2013 coup d’etat in Mali. Another more recent example was in the Gambia where the sitting president decided not accept an election that went against him, and the chief of the military initially chose to support that sitting president.

295. **Implication**: A key point to consider in respect of a possible intervention operation, is that if the coup d’etat was conducted by the armed forces of the

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\(^{109}\) This could, for instance, have eventuated had the AU Road Map for Libya been taken into effect, which would have seen the stabilisation force faced with conventional weaponry in the hands of all the belligerent parties, much as was the case in Bosnia.

\(^{110}\) Consider here the attack on French troops by the Cote d’Ivoire Air Force in 2004.
country, they will have the weapons and equipment of those forces available to resist an intervention should they decide to do so. Here one can remember the attack on French forces by the Cote d'Ivoire Air Force in 2004.

**Popular Uprisings**

296. Popular uprisings are similar to coups d'etat in that they will not always – or even often – result in a situation that requires military intervention. But they can result in such a situation, as the case of Libya illustrates:

a. Initially loud claims – perhaps true – that the Libyan armed forces were deliberately targeting ordinary civilians forced the hand of the United States and several European countries, leading to the rather reluctant decision to conduct a ‘deny flight’ campaign that then evolved into strikes on government forces.

b. Since then the continued turmoil in Libya has led to Egypt and the United Arab Emirates deploying forces in support of the Tobruk government.

297. The primary danger of such a situation deteriorating into chaos and perhaps into a long-term failed state, is the risk of spill-over into neighbouring countries. This is again well illustrated by the case of Libya, with weapons and equipment of the Libyan armed forces having been a factor in the initial success of the rebels in Mali. The continuing chaos in Libya has also proved very convenient for drug cartels and groups engaged in trafficking people.

298. **Implications**: Depending on how such a public uprising plays out, the situation might in some cases see South Africa asked to provide a force as part of an AU or UN:

a. Intervention and stabilisation operation; or

b. Border security operation to prevent movement of guerrillas, terrorists, bandits and smugglers from the country in question into adjacent countries until such time as the country again has a functioning government.

c. The former would require a force equipped and armed to protect itself, but also for internal security and public order tasks, as well as the provision of emergency aid and relief to the civilian population; while
d. The latter would require a force tailored for the terrain of the particular border, with appropriate surveillance\textsuperscript{111}, patrol and reaction force equipment.

**Terrorism**

299. Terrorism\textsuperscript{112} remains a threat in Africa, with most guerrilla wars or insurgencies seeing at least some incidents of what could be described as terrorism, but also in the form of extremist Islamist terrorism. Examples of the latter include the bombings of the United States embassies in Kenya and Tanzania in 1998, the 2002 attempt to shoot down an Israeli airliner in Kenya in 2002, the bombing of a Russian airliner departing Sharm el Sheikh in Egypt in 2015, and the various attacks on western tourists in North Africa.

300. The key point here is that none of these attacks were aimed in any way at the country in which they were carried out. This has implications for the belief that foreign policy can protect against terrorism, and the public belief that South Africa is immune to this threat.

301. There have also been examples of ‘strategic terrorism’ in the form of attacks carried out by Somalia’s Al Shabaab in Kenya and Uganda, perhaps partly in retaliation for those countries having forces with AMISOM supporting the government of Somalia, but also perhaps in an attempt to bring public opinion in those countries to force the governments to withdraw their forces from Somalia. This, too, is worth noting with respect to future participation on peace support or intervention operations.

302. **Implications:**

a. South Africa may see terrorist attacks carried out in South Africa against foreign embassies, consulates, businesses or tourists; or

b. South Africa may find its embassies or consulates, South African owned businesses or South African tourists becoming targets of a terrorist attack or for abduction;

\textsuperscript{111} Which must be able to discriminate between people and animals moving in the border area.

\textsuperscript{112} The term ‘terrorism’ is not used here in its typical propaganda sense, but as a technical descriptor of the key nature of this form of warfare, which is deliberately and specifically aimed at the civilian population, with the intention of instilling terror that, it is hoped, will cause the opposing side to collapse or give in. It differs quite clearly from guerrilla warfare, which is aimed at infrastructure, major economic targets and the opposing forces by forces too weak to engage in open warfare, and which does not deliberately target civilians.
c. South Africa may be asked to assist another country in countering terrorism or in dealing with the aftermath of a major attack.

d. Such operations, particularly outside South Africa, will almost certainly exceed the capabilities of the Police, requiring the Defence Force to develop the relevant set of capabilities, and the ability to promptly and rapidly deploy forces.

Organised Crime

303. While organised crime in Africa has not reached the levels of paramilitary capability that it has in Latin America, there are groups that require military rather than purely police action.

304. Additionally, there is a clear trend for organised crime groups to cooperate with guerrillas and terrorists. That gives the former access to better weapons and training, and enables the latter to exploit the criminal groups’ knowledge of the country and its people, and is a serious challenge when attempting to develop a coherent intelligence picture.

305. Implication: While the Defence Force is unlikely to become involved in direct operations to suppress organised crime in other countries, it has responsibility for border safeguarding and must keep abreast of how criminal groups are developing methods and tactics, and the weapons and equipment they use, particularly communications equipment, and must be able to counter them. South African forces may also inadvertently come into contact and perhaps clash with armed organised crime groups in African countries in which they are deployed for peace support or other missions.

306. Piracy. While piracy in East African waters has been suppressed to a considerable extent as a result of international naval operations and the use of armed ship protection teams, there is nothing to suggest that piracy in African waters as such will cease to be a problem – in fact the experience of Asia is that pirates find ways to resume operations once they have analysed the countermeasures of the security forces.

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113 Continuous analysis of the smuggling operations on the US/Mexican border will prove useful in this regard, as might analysis of the operations of Colombian narcotics groups and ‘Narco Terrorists’.

114 Note: Technically, ‘piracy’ refers only to armed attacks on ships (or aircraft) outside the jurisdiction of any country – i.e. “on the high seas”, but practically in includes attacks on ships in national waters, although that is referred to as “armed robbery at sea” for legal purposes.
307. Given South Africa’s ‘island economy’ and the fact that it is a trading nation, seaborne trade is vital to the economy. Piracy is, therefore, a potentially grave threat that must be addressed continuously as a preventive measure, with surge operations as required. As the main shipping route for oil imports, the Mozambique Channel will require a continuous presence for the foreseeable future, while any growth in trade with West Africa will require the ability to join forces with the countries of that region to counter piracy along the trade routes.

Peace Support Operations

308. There have been multiple United Nations peace support missions in Africa since the end of the Cold War. They have ranged from relatively simple peacekeeping, as was the case with UNTAG in Namibia, to full-on combat operations as is currently the case with the Force Intervention Brigade in the east of the DRC, and as was the case with the, now somehow generally overlooked, UN operations to end the Katanga secession in what is today the DRC.

309. At present there are eight such missions ongoing, with that in the DRC (MONUSCO) being the largest, with some 18 260 troops supported by combat helicopters after the United Nations mandate was upgraded to a Chapter 7 peace enforcement operation. This force has been attacked on many occasions, and the Force Intervention Brigade, which includes a South African Army battalion and is supported by South African Air Force combat

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115 90% of exports go by sea, and all imported oil comes by sea.
and transport helicopters (Rooivalk and Oryx), has seen considerable and quite hard-fought action.

310. In addition, there is the hybrid African Union/United Nations mission in the Darfur region of Sudan (UNAMID), with some 17 000 troops. This force, too, has suffered multiple attacks by well-armed irregular forces, including one in which a Nigerian Army company base was attacked and overrun by a force of more than 1 000 irregulars with various heavy weapons and some armoured vehicles. Similarly, albeit on a smaller scale, several South African Army patrols were ambushed by forces that outnumbered and outgunned them.

311. There is a visible trend of irregular forces becoming better led, better trained, better armed and better equipped, making them considerably more dangerous than in the past. This will lead to more actual combat missions in the future, to establish some level of peace and security to allow the stabilisation of the affected country or part of a country to commence and to be conducted with some chance of success.

312. **Implications:** Given South Africa’s position and desired role in Africa, it is inevitable that the Defence Force will continue to participate in various peace
support operations. It is equally inevitable that some of those operations will involve combat operations. That will require the deployment of a contingent with the strength and combat power to have an absolute edge over the ‘spoilers’.\footnote{Consider, for example, the peacekeeping efforts in Bosnia: Attempts to stabilise the situation using only light (and lightly armed) forces operating under very restrictive rules of engagement resulted in the massacre at Berenice. Only after medium and heavy forces were deployed – including tanks, artillery and fighter aircraft – was the mission able to achieve what it was intended to achieve.} There is also a clear requirement to ensure a good and quick to establish degree of interoperability with foreign forces engaged in such missions, with particular emphasis on communications, command and control (C\(^3\)) and intelligence, reconnaissance, surveillance and targeting (IRST) systems.

**Foreign Intervention Operations**

313. The military weakness of most Sub-Saharan African countries and the inability to fully operationalise the African Standby Force has led to several foreign interventions in recent years.

314. There have been several major foreign (i.e. countries from outside Africa) intervention operations since the end of the Cold War, all of them quite recent:

a. **2000**: Britain's Operation Palliser in Sierra Leone to prevent the fall of Freetown to the Revolutionary United Front rebels, involving a task force of some 4 000 troops, including a naval task group with an aircraft carrier.

b. **2003**: The European Union's Operation Artemis, the interim deployment of a 1 800 strong force, with French Air Force fighters and SA Air Force Oryx helicopters in support, to the Ituri region of the DRC to stabilise the region after the withdrawal of Ugandan forces.

c. **2008**: The EU Force deployed in Chad and the Central African Republic in an effort to prevent guerrilla attacks in the Sudan border area, which involved 3 700 troops deployed in the two countries and another 600 on standby. The mission was ended in 2013.

d. **2011**: NATO's intervention in Libya, which primarily took the form of air strikes in support of rebel forces, including air strikes flown from aircraft carriers.

e. **2013**: France's Operation Serval in Mali, to prevent rebel forces from overrunning the country, involving a task force of some 4 500 troops, including mechanised forces and combat helicopters, and supported by air strikes flown from Chad and even directly from France.
f. **2014**: France’s **Operation Sangaris** in the Central African Republic, in support of the United Nations force there, involving some 1 500 troops including mechanised elements and attack helicopters and with strike fighters in support.

315. One could include here the 2004 Cote d’Ivoire crisis, which saw French forces intervene, and the Cote d’Ivoire Air Force carry out an attack on a French base.

316. France has since reconfigured its forces in the region, withdrawing from the CAR, but establishing a 4 000 strong task force in Mali and Niger to combat extremist Islamist elements (**Operation Barkhane**).

317. The primary lesson to be learned from these interventions is the strength of the force that was deployed and the fact that all included some combat aircraft in support and all of the French operations included mechanised elements.

318. It is important to bear in mind here that South Africa has in the past participated in a European intervention mission in the DRC (the Ituri Brigade in 2003), and it is not at all unlikely that South Africa will do so in the future, if only to ensure that such operations have a real African participation.

319. **Implication**: This will require a force commensurate with the mission and the foreign forces involved, and it will require at least communications interoperability with those foreign forces.

**African Intervention Operations**

320. Less well known is that African forces executed seventeen intervention operations, albeit with European or United States airlift and logistic support. The major operations among them are:

   a. **1990-1999**: The ECOMOG intervention in Liberia, peaking at 16 000 troops with armour and air support;
   
   b. **1998-2005**: The ECOMOG intervention in Sierra Leone, peaking at 17 500 troops and including naval elements;
   
   c. **2003**: Deployment of a brigade-strength force to the Central African Republic, which however failed in its mission to stabilise the situation;
   
   d. **2004**: The African Union Mission in Sudan (AMIS) of some 7 000 troops, which was deployed in Darfur, but proved to weak and was absorbed
into the ‘hybrid’ African Union/United Nations Mission in Sudan (Para 144 above);
e. **2006, continuing:** The deployment of the African Union Mission in Somalia (AMISOM), which continues, with a strength of 22,700 with armour and air support, and which has included a sea-landing operation to seize the port town of Kismayo.
f. **2008:** The African Union intervention in the Comoros, to restore central control over the island of Anjouan.

321. The primary lessons to be learned from these operations for purposes of planning and force design are their scale and the fact that they included mechanised forces, air support and in some cases naval support.

322. Interesting among the smaller intervention operations was the African Union intervention in Comoros, which saw a small force flown to Grand Comoro and then landed ‘over the beach’ on Anjouan Island.

323. South Africa has itself intervened (with Botswana) in Lesotho (1998) and on a smaller scale in the Central African Republic (2013).

324. **Implications:**

   a. Given South Africa’s position in Africa and its desired role, and given further the leading role South Africa has played in the initiation of the African Standby Force and the African Capability for Immediate Response to Crises (ACIRC), it is clear that South Africa will be asked to participate in some such operations in the future.

   b. This will require the deployment of a force that is commensurate in strength and combat power with the nature of the mission and likely opposing forces, and with South Africa’s standing as the 3rd largest economy in Africa and as the lead nation in setting the development of this African capability in train.

   c. This will, further, require effective and quickly established interoperability with such other African forces as may be involved in a given operation.
Border Disputes

325. There are at present at least thirty border disputes of varying seriousness and intensity between African states, some concerning multiple sections of border or border areas. While most of these are likely to be resolved peacefully or simply ignored, they do present a risk.

326. Where such a dispute does escalate to conflict, that would be a classic situation calling for the deployment of the African Standby Force or the African Capability for Immediate Response to Crises (ACIRC).

327. That would bring a real possibility of the Defence Force becoming involved as part of a peacekeeping, interceding or intervention force. That, in turn, could see elements of the Defence Force facing conventional forces with modern equipment.

Distance and Space

328. All operations in Africa by the Defence Force, or indeed any force, will be affected by either distance or space as a result of the immense size of the African continent: 7 400 km west to east and 8 000 km north to south.

![The True Size of Africa](https://example.com/image)

Maps by Kai Krause for Invisible Children

Distance

329. Any operations by the Defence Force other than in adjacent countries will be affected by the great distances over which the force must be deployed and then sustained through the course of the mission. For instance:

a. Goma in the DRC is 2 700 km from Air Force Base (AFB) Waterkloof.
b. Bangui is 3 490 km from AFB Waterkloof.
c. Juba is 3 405 km from AFB Waterkloof.
d. Bujumbura is 2 480 km from AFB Waterkloof, and sea and overland route for heavy equipment would be some 3 200 km from Durban to Dar es Salaam and then 1 426 km by road to Bujumbura.

330. **Implications:**

a. This creates a clear requirement for:
   i. Strategic (long-range, heavy) airlift;
   ii. Tanker aircraft to refuel fighters and light transports (e.g. for Special Forces operations) en route; and
   iii. Sealift, for the movement of heavy equipment to the theatre of operations, arguably including a requirement for some amphibious equipment as it is far from guaranteed that a secure port will always be available.
   iv. While the South African industry will not be in a position to supply long-range heavy transport or tanker aircraft, those requirements will generate DIP obligations that could be translated into long-term relationships with the relevant OEMs.
   v. While the South African industry will not be in a position – in the near- or medium-term – to provide sealift vessels, that requirement will generate DIP obligations that could be translated into long-term relationships with either the shipyard or the systems house, or both.

b. It further creates a clear requirement for:
   i. Equipment and vehicles (combat and logistic) that are sufficiently light and compact to be readily air-transportable, which is a segment that is not at this time being addressed by the industries of other countries.
   ii. Weapons (including artillery) that have the minimum impact on airlift (i.e. the lightest possible munitions for the required effect), which creates potential for:
      1) Long-range light artillery (105 mm ammunition weighs only about one third of the weight of 155 mm ammunition); and
      2) Precision munitions (including artillery and mortar ammunition), which reduces the amounts required.

c. There is also a case to be made for greater use of rail transport within the SADC and then in some cases within a theatre of operations, which creates a requirement for suitable rolling stock (e.g. cargo weight and
height, floor strength, self-contained loading/unloading ramps or dismountable cranes).

Space

331. Many theatres and areas of operations will be very large, bringing challenges of:
   a. Distances within a theatre or area of operations, in many cases coupled with inadequate and poorly maintained roads and bridges; and

   b. Operations under conditions of low force densities (or low force:space ratios).

c. The former will require:
   i. Deployable logistic vehicles able to handle poor roads;
   ii. Deployable bridging and road repair equipment;
   iii. Transport helicopters and light transport aircraft;
   iv. Potentially some amphibious equipment; and
   v. Emphasis on keeping equipment, vehicles, munitions, stores and deployable camp equipment both compact and light.

d. The latter will require:
   i. Combat vehicles suited to high-mobility operations over poor roads and cross-country, where some theatres will demand wheeled vehicles and others might have soil conditions that demand a tracked vehicle, in both cases light and compact enough for ready air transport;
   ii. Reconnaissance and surveillance equipment and systems to prevent opposing forces surprising own forces, and to locate ‘spoilers’ (situational awareness);
   iii. Fire support weapons with the greatest possible range, coupled with the lightest possible ammunition (either light munitions or precision munitions or both) for the required effect.

332. The challenges of low force density/force:space ratios create interesting opportunities for the industry to develop equipment, systems and vehicles suited to those conditions (and to the deployment airlift), to equip the Defence Force. That will also present some export and/or joint development opportunities:
a. That equipment, those vehicles and those systems will also be of interest to other forces faced with similar challenges; and

b. There is little work on such equipment, systems or vehicles being done elsewhere in the world, with most armed forces and industries focusing on heavier and larger equipment.

c. The new focus in Europe on rebuilding military capability to offset a resurgent Russia, will see most European industries focus on those requirements, for which they will develop equipment too complex, too support-intensive, and too costly in both acquisition and sustainment for most smaller countries.

333. The factors of distance and space must be considered together with the lack of general infrastructure and support facilities and capabilities in many likely theatres of operations. This presents the defence industry – and also other industry sectors – with an opportunity to develop the capability to support and sustain Defence Force operations in distant theatres, and perhaps also to support and sustain African Union or United Nations peace support operations on the continent.

THE INDUSTRIAL CONTEXT

334. As already discussed, the South African defence industry cannot function, let alone thrive and prosper, in isolation. In addition to the strategic context that will drive both Defence Force requirements and export opportunities, it must also operate within the context of what is happening in the defence industry globally.

335. That will require a clear-eyed analysis of the present situation when considering how to position the industry, and it will require that the international defence industrial context be understood and monitored on a continuous basis, to ensure that South Africa’s industry remains correctly positioned.

336. The end of the Cold War saw most of the major powers cut defence funding drastically from 1989/90 onwards, reducing force levels and cutting back or postponing acquisitions. Most smaller countries followed suit, although countries in the Middle East continued with high levels of defence spending, given the unstable security situation in that region.
337. Defence spending increased again from 2001, until the financial crisis of 2008 drove it back down in real terms, for example, seeing Western Europe’s defence spending decline by 6% between 2008 and 2015.

338. The impact of the decade of cuts during the 1990s on the defence industries of the major powers lingers, triggered two trends in their defence industries that also impacted on the industries of smaller players: Consolidation and internationalisation.

Consolidation

339. The cuts in acquisition funding triggered a wave of consolidation in the defence industry internationally, as companies and even groups merged, groups acquired divisions of other groups, and smaller companies were absorbed by larger companies or simply departed the defence sector. The focus of acquiring companies and groups has been on ensuring critical mass, ensuring the capability and technology spread to remain leaders in their respective fields, and casting their marketing net wider to pursue new contracts in smaller countries to keep turnover at least at minimum levels.

117 There were, of course, exceptions. Thus Russian defence expenditure grew by 12% year on year between 2012 and 2015, and Chinese defence expenditure continued to expand until very recently.
340. Another aspect of this trend towards consolidation has been an increase in collaboration and cooperation among defence companies when pursuing national defence requirements and also for export opportunities.

341. There has also been an increasing willingness to licence specific products to other companies or to acquire subsystems or technologies from other companies. The underlying cause here has been the combination of reduced acquisition funding and the rising cost of ‘high-tech’ defence equipment and systems, resulting in a need for maximum efficiencies within companies and groups.
342. One result of the latter trend has been that even large defence groups no longer have to – or practically can – develop a full product range or all the subassemblies and sub-systems of a major system. That has created market opportunities for those smaller, specialist, companies that have survived.

**Internationalisation**

343. The same pressures that led to that consolidation, also accelerated a process of greater internationalisation, with further impetus from the increasing cost of new technologies in the defence sector:

a. Some of the smaller countries with defence industries, found that their reduced acquisition funding did not allow them to complete new equipment projects alone within reasonable time scales, and sought other countries to join such projects\(^\text{118}\);

b. Medium-sized defence companies in smaller countries no longer had the turnover needed to sustain themselves, and needed to export and/or partner with companies in other countries or with one of the large international groups\(^\text{119}\);

c. Reduced R&D funding in some smaller countries meant that their defence industry companies were not able to effectively pursue new technologies to remain relevant, again driving them to find partners in other countries;

d. Large defence industry groups, needed to expand their activities, to retain critical mass and keep turnover at levels that would allow them to keep plants active and to pursue new technologies. One means of doing so was to acquire companies in smaller countries, to improve their chances of winning contracts in those countries and to remove competition there and in other markets.

344. An unexpected benefit to some of the large defence groups, was finding that the smaller companies and groups in smaller countries often had interesting products, technologies and concepts that could benefit them\(^\text{120}\). Some

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\(^{118}\) For instance, the A-Darter development between South Africa and Brazil.

\(^{119}\) For instance, Denel Munitions, which found local orders too few to sustain itself as an effective developer and manufacturer of heavy munitions, but in partnership with Rheinmetall has a growing export market.

\(^{120}\) For instance, Rheinmetall and Denel Munitions, Saab and the Grintek group and Zeiss and Denel Optronics.
cherry-picked the most interesting items out of the local company and then allowed it to wind down to little more than a presence, but others instead chose to invest in such companies and leave them under local management to keep their entrepreneurial and innovative edge alive\textsuperscript{121, 122}.

**Turning Point**

345. Defence spending would now, however, seem to have bottomed and to be moving up at an accelerating rate: Global defence spending increased at a low rate of 0.6\% in 2015 and at 0.9\% in 2016, but is expected to stabilise at around 2\% annual growth by 2020, having passed the 2010 level of spending in 2018\textsuperscript{123}.

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\textsuperscript{121} For instance, Rheinmetall with RDM, Saab with Grintek and Zeiss with Denel Optronics. Also Atlas Elektronik, which has found the local Cybicom Atlas Defence (60\% held by Cybicom) to have been a good investment, and has left local management free to manage and to innovate.

\textsuperscript{122} Such partnerships must be structured in such a way that both parties derive actual benefit, and that the small company does not become seen as a nuisance by the bureaucrats of the large group. That will require a carefully thought out contracting concept tailored to the particular partnership.

\textsuperscript{123} Jane’s Defence Weekly, 1 March 2017, Page 20.
346. Of specific relevance to the defence industry internationally, defence investment (which comprises acquisition, R&D and test and evaluation funding) grew by 5.1% in 2016 and there is no indication that this will slow down soon. One driving factor is that the armed forces of most major countries have very large equipment modernisation and replacement backlogs to make up after more than two decades of reduced defence funding\textsuperscript{124}. IHS Jane's expects defence acquisition spending to total some $2.1 trillion between 2017 and 2020.

\textsuperscript{124} The average age of US Air Force combat aircraft in 2016, for instance was 26 years; The US Army's Abrams main battle tank entered service in 1980 and the newest is 25 years old. The German Army's Leopard 2 main battle tank entered service in 1979, with the most recent variant entering service in 2001. The Tornado, which is the main strike aircraft of several European air forces, entered service in 1979, with the last aircraft delivered in 1998.
347. This trend towards increased defence funding is a result of geostrategic developments in recent years, notably:

a. China’s naval build-up, occupation and fortification of islets and reefs in the South China Sea, confrontation with Japan and South Korea in the East China Sea, and incursions into Indian territory, as well as the rapid growth of the Chinese defence budget, have triggered increased spending by many Asian countries.

b. Russia’s annexation of the Crimea and alleged support for rebel forces in the east of Ukraine, following onto its earlier invasion of Georgia and the excision of two regions from that country, and coupled with its military build-up, have caused the states of Eastern Europe accelerate modernisation of their forces, and the Nordic states to radically review their defence funding plans. There are also indications of some of the major Western European powers increasing defence funding under the influence of Russia’s actions. Added to that is the pressure by President Trump for NATO countries to increase defence spending to the agreed 2% of GDP, or risk the United States scaling back its support for NATO.

c. In the Middle East and North Africa the downtrend was never strong, only the oil price collapse in 2016 bringing some reviewing of acquisition projects. Continued instability in the region and the unexpected and surprisingly swift expansion of the Islamic State in the meantime contributed to a stronger focus on defence. Another factor has been the doubt in the Gulf countries as to the intentions of Iran, coupled with more recent fears that President Trump might scale back the US presence in the Gulf.

348. The exceptions to this trend of increasing defence expenditure have been Latin America and Sub-Saharan Africa. The former is expected to see some revival of defence spending in the near-term, while the flare up of intra-state and trans-national conflicts in parts of Sub-Saharan Africa has brought a new focus on defence requirements, which will see some increase in funding, albeit in most cases from very low levels and limited by poor economic performance. That said, there were major increases in the defence spending by a number of African states during the 2000s and the first half of the present decade, which only slowed with the recent decline of the oil price, and which seem likely to resume in due course.
Programme Management Trend

349. By the early 2000s many major acquisition programmes evolved from ‘mega projects’ to be executed as a single continuous acquisition with discrete start and end dates, to a series of spiral acquisitions, each securing and expanding capability on the basis of the previous acquisition.

350. This gave greater budget flexibility while still achieving required operational capabilities, albeit over a longer period. It also, however, produced a challenge in that the rapid pace of development in electronics and software overtook some of the spirals, forcing programmes into concurrent mid-life upgrades and new acquisition spirals. Added to this were requirements
evolving in response to operational and technological development, adding yet more risk.

351. This led to some countries adopting a system of defining a total required solution and then spinning off the development of different elements onto other programmes to be developed as a by-product of those programmes. Resulting advantages include greater interoperability, the availability of several variants to meet marketing opportunities, and some reduction in overall cost.

**Defence Industries in Africa**

352. Several developing countries, also in Africa, have begun to make the transition from simply buying equipment for their armed forces towards some level of self-sufficiency.

353. This is still mainly at the level of simple munitions and some of the simpler systems, such as light armoured vehicles and naval patrol craft, but it is clear that some countries are intent on moving further up the capability curve towards greater self-sufficiency. Among them are:

a. Algeria (broad capability being developed with German support; from small-arms and ammunition to armoured vehicles, patrol vessels and in the future frigates; also light training and utility aircraft).

b. Egypt (small-arms and ammunition, locally developed armoured vehicles).

c. Ethiopia (rifles, RPGs and small-arms ammunition).

d. Ghana (general equipment; plans to expand).

e. Kenya (small-arms and ammunition; some parts and tools; plans to expand).

f. Morocco (developing a defence industry with Spanish support).

g. Namibia (mine-protected vehicles, tactical radios).

h. Nigeria (light infantry weapons and ammunition, assembly of armoured vehicles; light training aircraft; patrol craft; plans to expand).

i. Sudan (light infantry weapons and ammunition; tanks, armoured vehicles and artillery pieces from Russian and Chinese designs; some local armoured vehicle variants).

j. Tanzania (small-arms ammunition).

k. Uganda (small-arms ammunition; assembly of armoured vehicles).

l. Zimbabwe (small-arms ammunition; mortar bombs).
354. While this can be seen as limiting future markets, it also offers an opportunity to partner with those countries towards meeting wider objectives.

THE TECHNOLOGICAL CONTEXT

355. As with the strategic and industrial context, the South African defence industry must keep abreast of developments in defence technologies and technologies that have potential for defence applications.

356. That is essential in order to enable the industry to:

a. Support the Defence Force effectively, by ensuring that:
   i. Its equipment optimally meets evolving requirements;
   ii. It notes early, or even anticipates, new technologies or applications and move quickly to exploit them to improve capabilities or counter new threats;
   iii. Move quickly to exploit new technologies or applications and advise the Defence Force;
   iv. It can provide, support and sustain equipment cost-effectively; and

b. Become and remain a close follower of technology, and a leader in applications;

c. Remain relevant in the international market as a supplier of equipment that makes use of the latest technologies in an affordable and supportable manner.

357. In addition to monitoring developments by perusing the technical journals and attending conferences, seminars and exhibitions, the industry must also work to establish and then build links with international defence groups and defence companies in other countries, to keep abreast of what they are doing and learning, and how they are working to meet the evolving threats and challenges facing the armed forces of their countries.

Spin-On and Spin-Off

358. For much of history, military technology has led the way in many fields, from computing to medicine, and it will continue to be the leader in some areas. But:
a. The long, sustained peace among the major powers has reduced the impetus and the funding for defence research; while

b. The civilian market has seen the opportunities offered by, for instance, the ‘digital revolution’ and new materials, and has moved ahead of the defence sector in some areas, partly as a result of more generous funding generated by revenues, and partly as a result of the accelerating consumer cycle, which sees products and even their underlying technologies become ‘old hat’ and being replaced within a few years, whereas defence equipment tends to remain in service for decades. This trend has been particularly notable in the fields of electronics and software.

359. The defence industry and Government must, therefore, be aware of the potential for both spin-off to the civilian market from defence research and development, and the potential to spin-on applications and technologies from civilian industry into defence applications\textsuperscript{125}, and seek to optimise the exploitation of both.

360. In addition, Government must be aware of and exploit the potential for technology spill-over from defence work into the civilian market.

**COTS and MOTS**

361. **Commercial-off-the-Shelf (COTS).** One aspect of the potential of spin-on is the use of commercial products, sub-assemblies and components in military equipment and systems and in their support and sustainment. That has obvious advantages of reducing costs as a result of not having to develop those items and, in some cases, not having to provide in-house support for them. There are also, however, some risks:

a. COTS software, products, sub-assemblies or components in electronic systems that are directly or indirectly linked to communications systems or receive data in any way, could present a real issue of ensuring security\textsuperscript{126} and could also present a risk of enabling an opponent to shut them down remotely;

\textsuperscript{125} This is an area of particular focus for the Philippines Department of National Defense, which has established a specific civil-military integration (CMI) programme for this purpose.

\textsuperscript{126} Consider the success of even amateur ‘hackers’ in breaking into US and other defence computer systems as one example of risk.
b. COTS items may not be as electronically hardened as required, which may not be immediately apparent, and which could result in unanticipated mutual interference and vulnerability to electromagnetic pulse weapons that are in development if not already in service in several countries;

c. COTS items may not be as physically tough – temperatures, humidity, vibration, shock, human abuse – as required, which may not be immediately apparent;

d. The high rate of change-over particularly the civilian electronics field could present a critical support and sustainment challenge for equipment that is to be kept in use for two decades or more. This can result in considerably higher than anticipated sustainment costs over the service life of equipment and systems.

362. This does not in any way diminish the logic or utility of using COTS items, but does mean that each application must be thought through clearly and that the Defence Force must be made aware of what COTS items are being incorporated in an equipment or system, of the potential implications and of measures that can be taken to counter such risk or threat.

363. **Military-off-the-Shelf (MOTS).** A related trend is to incorporate existing military sub-systems, sub-assemblies, components and software in new equipment and systems, again both to save on development cost and reduce development times. This does not carry the same risks as COTS in respect of military suitability, but can bring real risk in terms of:

a. Security, specifically in communications, command and control and electronic warfare systems;\(^{127}\)

b. Security of supply, both in the sense of a supplier country not being able or perhaps not willing to continue to deliver the items or to support them, and in a situation where the original equipment or system for which those items were developed being phased out by the parent armed forces.

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\(^{127}\) One can think here again of the Iraqi experience of having their air defence command and control system shut down remotely by the supplier nation, and France providing the United Kingdom of details of how to jam the Exocet missiles it had just previously sold to Argentina. It would be wishful thinking to believe that a supplier is not going to retain the ability to do this in a situation where its own interests are involved.
364. As with COTS, this is not to argue against the use of MOTS items, but to argue that this must always be done with a clear-eyed understanding of the potential implications and that the Defence Force must always be advised accordingly.

365. In both the case of using COTS or MOTS items, there will almost always be measures that can realistically and practically diminish the risk or threat:

a. In the fields of communications, command and control and electronic warfare there will be elements of equipment and software that present no real risk if there is local control over physical and remote access to the system, or if local software is used, or if the key algorithms or source codes are locally developed and controlled.

b. Security of supply can to a useful degree be ensured by:
   i. Ensuring adequate stock levels to provide a buffer in the event of supply being cut off or failing; and
   ii. Designing the equipment or system to allow the use of similar sub-systems, sub-assemblies or components from other suppliers.

**Technologies to Pursue**

366. The decision as to which technologies to pursue, either with an eye to leading or with an eye to being a close follower, with depend in the first instance on:

a. The requirements of the Defence Force, derived from its threat analysis;

b. Developments in defence and defence-related technologies and applications;

c. The existing or practicably attainable capabilities of the defence industry and the scientific establishment;

d. The potential for joint ventures, collaborative or cooperative development with the defence industries of other countries or with other sectors; and

e. The export potential of such technologies or applications.

367. The first decisions will be taken as part of the Defence Industry Strategy Implementation Plan that will be developed on the basis of this document.

368. Thereafter this will be a matter decided by the Chief Defence Scientist in collaboration with the Defence Force and the industry, considering the evolving strategic situation, evolving and new technologies and applications of technologies, and the wider defence industrial and general industrial
context. This will require constant monitoring of technology and application developments, as per paragraph 355 above.

369. The following paragraphs suggest some areas to pursue, but are not an exhaustive list, rather indicative in nature, and in addition to technologies in which the industry is already a leader or among the leaders, for instance long-range artillery, mine-detection and protection, tactical communications and elements of electronic warfare.

**Unmanned and Autonomous Systems**

370. The field of unmanned and autonomous systems is a rapidly growing area of technologies and applications, and such system will be required by the Defence Force for a range of applications. This is, therefore, an area on which the industry must focus.

371. That is not to say, however, that it must necessarily attempt to develop a system for every use. Rather, it should focus on:

a. Developing the tools that will enable the Defence Force to integrate unmanned and autonomous systems acquired from various manufacturers into its surveillance and reconnaissance systems, as well as in other applications;

b. Developing the command and control capabilities to enable the Defence Force to make use of multiple unmanned and autonomous systems of different types in the same battlespace without conflicting with each other or manned systems; and

c. Developing bespoke systems for the Defence Force where there is real utility to be derived from doing so.

372. **Air Force Systems.** The Air Force would benefit greatly from having available:

a. Strategic reconnaissance and surveillance unmanned aerial systems.

b. Tactical unmanned aerial reconnaissance systems to work with attack helicopters and to support air-assault operations.

c. Unmanned aerial systems for communications relay.

d. Air-launched loitering and swarming munitions

373. **Ground Forces Systems.** The Army would benefit greatly from having available:
a. Small and micro unmanned aerial systems for reconnaissance at the tactical level.
b. Medium unmanned aerial systems for enhanced command and control, and for communications relay.
c. Unmanned reconnaissance vehicles able to be deployed from and work together with armoured reconnaissance vehicles and infantry elements.
d. Small and micro unmanned ground vehicles for reconnaissance in built-up areas and inside buildings;
e. Unmanned IED and mine-detection and neutralisation systems, including systems suited to deployment by helicopter or parachute, and small systems for searching inside buildings.

374. **Naval Systems.** The Navy would benefit greatly from having available:

a. Shipboard long-range/high-endurance surveillance systems, to extend situational awareness, target recognition and targeting well beyond the radar horizon of the ship without over-utilising the integral helicopters of the larger ships, and giving smaller vessels vastly enhanced situational awareness. These would probably be suitably-sized fixed-wing UAVs.

b. Shipboard reconnaissance systems, to give the ship the ability to reconnoitre areas in which a surveillance UAV might too easily be compromised and perhaps shot down. These would probably be fast, low signature, fixed-wing UAVs, although a rotary wing type could also be useful.

c. Shipboard monitoring systems to provide overwatch during boarding and landing operations in the absence of a shipboard helicopter. These would probably be small rotary-wing UAVs.

d. Shipboard loitering weapons, i.e. UAVs able to acquire and confirm targets at long ranges, and to attack them if required, including radar-homing variants.

e. Shipboard loitering decoys.

f. Shipboard unmanned surface craft for reconnaissance, suspect craft inspection and patrol operations.

g. Shipboard and shore-launched mine-countermeasures systems.

**Unmanned Vehicle Countermeasures**

375. Unmanned systems, and particularly unmanned aerial systems are becoming a growing challenge and even threat for ground forces and will present a similar challenge and threat to naval forces, particularly in the
littoral. Such systems are even being used by irregular forces for reconnaissance, command and control and light attack missions in Iraq and Syria, in Gaza and in Lebanon. In Iraq the Islamic State has also used remotely-operated vehicle-borne IEDs, while Houthi forces in Yemen are believed to have used remotely-operated explosive-laden boats to attack a Saudi Navy frigate.

376. There is, thus, a clear requirement to develop means to protect forces against unmanned systems, be it by kinetic means (i.e. shooting down UAVs, stopping or destroying ground vehicles or sinking unmanned boats), or jamming their command links.

377. While the kinetic option is likely to be practical against ground vehicles and boats, it is likely to be prohibitively expensive against UAVs; and the smallest of those will be very difficult to detect in the first instance, let alone engage effectively. Laser systems seem to show some promise against small UAVs (larger UAVs would demand too long a dwell time that would be difficult to achieve), and should be studied and perhaps pursued.\(^\text{128}\)

378. Directional jamming, even using hand-held systems has been shown to hold promise and should be pursued, particularly as it offers the lowest-cost option against small UAVs.

379. A better solution is to ‘capture’ the UAV:
   a. Physically, forcing it to land in friendly territory and being able to download and analyse its on-board data to, in the case of some UAVs, reveal what is of interest to the opposing forces and possibly whence it came\(^\text{129}\); or
   b. Electronically, without interfering with its flight and control by its owners, but gaining access to what it is seeing and reporting\(^\text{130}\).

\(^{128}\) See the various US experiments and projects. A laser system could be developed synergistically with a directed infra-red countermeasures (DIRCM) aircraft self-protection system.

\(^{129}\) This may already have been done in the case of commercial UAVs used by irregular forces in the Middle East. There was also the report that a US UAV had been taken over by Iranian forces and forced down inside Iran, but that may actually have been a technical fault that caused it to land itself.

\(^{130}\) There have been reports of the Taliban being able to hack into the video downlink from UAVs, then being able to advise their own forces to evade effectively.
Simulation, Augmented Reality and Stimulation

380. The increasing lethality of the battlefield, coupled with the increasing cost of operating prime mission equipment and even some crew-served weapons, argue strongly for greater use of simulation for:
   a. Crew and team training;
   b. Individual training;
   c. Command staff training;
   d. Doctrine and tactics development; and
   e. Operational and tactical planning and plan evaluation and rehearsal.

381. Simulation at all levels is, therefore, a technology to be pursued, building on the expertise already existing in the industry.

382. A related technology field is that of augmented reality, which has clear potential in the simulation arena, but also at a tactical level, and is something to pursue, drawing on the existing civilian technologies in this field.

383. The lesser-known field of ‘stimulation’, or the simulation of threats to trigger alerting, warning and countermeasures systems during development and to test their effectiveness when deployed, is also a field that should be pursued.

Active and Passive Protection Systems

384. The threat to ‘platforms’ – armoured vehicles, ships, aircraft – has increased dramatically over a relatively short period of time. This has been the result of four trends:
   a. Developments in precision weapons, increasing the risk of being hit\(^{131}\);
   b. Developments in warhead technologies, increasing the risk of serious damage or destruction;
   c. The spread of guided weapons to irregular forces; and
   d. Innovation in the design of improvised explosive charges (IEDs), for instance ‘platter charges’.

385. There is, therefore, a clear need to develop better means of protecting such platforms, both passively and actively.

386. **Vehicles.** While armoured vehicles have long been vulnerable to dedicated anti-tank weapons – including light weapons such as the RPG-7 – their vulnerability has increased as a result of:

\(^{131}\) For instance, imaging infra-red (IIR) seekers, which render almost all flare systems ineffective.
a. The increased effectiveness of anti-tank weapons in terms of accuracy, penetration and attack profile, the latter including top attack by plunging weapons (some anti-tank missiles, laser-designated mortar bombs and artillery shells) and over-flight with downward firing shaped-charge or self-forging fragment warheads.

b. Irregular forces obtaining anti-tank missiles and in some cases using tanks; and

c. The increased use of armour in small numbers and in built-up areas and other close terrain, increasing vulnerability to close-range attack with light anti-tank weapons;

d. Greatly improved IEDs, including ‘platter charges’ and shaped charge weapons.132

387. None of these can be effectively countered with conventional passive armour concepts.

388. At the same time, modern armoured vehicles have become so expensive that they are at a cost point not long ago occupied by combat aircraft.

389. There is, therefore, clearly going to be a major increase in the requirement for active protection systems for armoured vehicles, and particularly for systems that are effective in very close-range engagements. That suggests pursuing the LEDS concept and related technologies.

390. The same threats will also affect static targets like the buildings at the gate of a base, and the bunkers at corners or in the perimeter walls.

391. In addition to these threats that demand active protection systems, there is the growing threat of improvised plate- and shaped-charge weapons used by irregular forces, which will require a revision of passive protection concepts.

392. Ships. Warships face an expanding range of guided and homing weapon threats in both the ‘blue water’ and littoral battlespace, with irregular forces increasingly able to source and use such weapons.133 In the littoral, threats

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132 For instance, as encountered in Iraq.
133 For instance:

- The Israeli Navy corvette INS Hanit was hit and badly damaged, with four killed, on 14 July 2006 while 16 km off southern Lebanon by what is believed to have been an Iranian-supplied Chinese C-802 missile fired by Hezbollah guerrillas. There are also some sources that believe the attack involved two missiles, one flying high to draw the ship’s trackers, and the other in a sea-skimmer profile. The first
will range from heavy machineguns able to engage at perhaps 3 000 m, through tanks\textsuperscript{134} (5 000 m) and anti-tank missiles (typically 4 000 m but some longer-ranged) to mortars\textsuperscript{135}, artillery, both tube and rocket. The latter can include systems with ranges of 30 km and in some cases beyond, which range could be used to engage a ship far offshore, using an observation post on high ground, or close inshore from a position so far inland as to be safe from counter-fire.

393. Vessels engaged in riverine or lake operations face the same range of threats but in a much more constrained and dangerous environment, with less room to manoeuvre and less time to react.

394. Protection systems will have to include:
   a. Armour protection of critical spaces against weapons up to 14.5 mm or 23 mm, probably using a combination of armour, void space and spall liners.
   b. Armour protection against fragments from near-misses and airbursts above the ship.
   c. Active protection against anti-ship missiles, anti-tank missiles, artillery shells, mortar bombs, artillery rockets and tank shells, against which it will be impossible to armour the ship.
   d. Electronic and optical (e.g. distraction, jamming, laser) protection against guided weapons.
   e. In the case of riverine and lake operations, and close inshore operations, automatic deployment of smoke could make the difference between survival and loss.

395. While the concepts of armour protection and defence against anti-ship missiles and guided bombs are widely and well-known, protection against anti-tank missiles, tank fire, mortars, artillery and artillery rockets and anti-tank rocket launchers are less well known in the naval context. There would seem to be an opportunity here for adaptation to this role of the technologies employed in:

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\textsuperscript{134} An Israeli Navy fast attack craft was hit in the aft gun bay by a tank while offshore Lebanon in the 1980s (personal information from an SAN officer then attached to the IN).
\textsuperscript{135} The Ghanaian Navy’s 57 m fast attack craft GNS Yogaga was hit and badly damaged, reportedly by a mortar bomb on 14 September 1990, with the loss of five killed and several wounded, during ECOMOG operations in Liberia.
a. Active protection systems developed for armoured vehicles\textsuperscript{136}, and
b. Base counter-rocket/artillery/mortar (C-RAM) systems\textsuperscript{137}.

396. **Aircraft.** The threats to aircraft and the various methods of self-protection are widely and well-known. But the advent of imaging-IR seekers has presented a new challenge in that flares are unable to distract or seduce such missiles.

397. There is, thus, a requirement to develop protection systems to counter this threat, and there seems to be some potential for innovative thought in this area. The options being explored and in some cases already in service but still with potential for new approaches, include:
   a. Directed Infra-Red Countermeasures (DIRCM) to damage or destroy the missile’s seeker head, some work on which was done in South Africa in the past\textsuperscript{138}, and
   b. Rapid-blooming, short-duration smoke/flare-screening to break the missile’s view of the target long enough for the aircraft to manoeuvre out of its field of view\textsuperscript{139}.

398. Simple machineguns and even small-arms can be lethal to aircraft in some situations. A radar-based hostile fire indicator system would allow the crew to react promptly, potentially avoiding a lethal hit.

**Precision-Guided and Contained Effects Munitions**

399. Precision-guided munitions have become increasingly a weapon of choice, because they:
   a. Can drastically reduce the time required to produce the desired effect;
   b. Reduce the risk to firing platforms and personnel by reducing overall engagement time, and particularly so in the case of non-line of sight weapons;
   c. Drastically reduce the risk of collateral casualties and damage, particularly when used instead of artillery fire or unguided aerial bombs, making them particularly suited to operations ‘amongst the people’;

\textsuperscript{136} Such as the Saab Grinek Defence LEDS.
\textsuperscript{137} Such as the Denel Dynamics proposed Cheetah system.
\textsuperscript{138} By the former Grintek Avitronics.
\textsuperscript{139} Rheinmetall in Germany.
d. While considerably more expensive than ‘dumb’ weapons, they will be used in far smaller numbers and the logistic effort (and cost) required to move munitions up to the combat troops will be greatly reduced.

400. One present trend is towards much smaller precision weapons, down to a size that a single soldier can carry and use\(^\text{140}\). These will be of particular value in peace-support operations against opposing forces fighting from inside buildings and using vehicles, both armoured and ‘technicals’, given the combination of precision and small warhead that drastically reduces the risk of collateral casualties and damage. Some also offer non-line of sight capability, reducing the risk to the firer and increasing the surprise effect at the target.

401. A related area of importance is the development of warheads with ‘contained effects’ or ‘tuneable effects’, to reduce the risk of collateral casualties and damage. This can be achieved by means of different casings, different explosive fillings\(^\text{141}\) and different fuze systems.

402. Looking forward, the utility of laser weapons should be evaluated: While engaging large targets is for now impractical because of the power and dwell time required, they should be useful against UAVs and to dazzle optical seekers (as in the DIRCM application).

Data Management, Distribution, Fusion and Analysis

403. The continuing rapid development in both information technology and sensor technology (electronic, optronic, optical) presents opportunities to revolutionise planning at tactical and operational level, as well as command and control. While recognising the risk of an unintended slide into counter-productive ‘micro command’, it is worthwhile pursuing the related technologies, and particularly integration with other fast-developing technologies such as in the field of autonomous and unmanned equipment and systems.

404. Particular area of focus should include data fusion, dissemination, analysis, interpretation and quickly and efficiently accessed data storage.

\(^{140}\) Such as the 2.7 kg AeroVironment Switchblade, Denel Dynamics’ similar FISM concept, Raytheon’s 800 gm Pike concept, and MBDA’s 900 gm Sniper and larger but still light 7 kg, 2 000 m range Enforcer.

\(^{141}\) For instance, dense inert metal explosives (DIME) filling which produce a very fast shockwave, combined with a projectile casing of carbon or similar material rather than steel, the latter reducing the fragmentation effect beyond 4 or 5 m of the detonation point.
405. The technologies involved in this field overlap the defence, intelligence and commercial sectors, and the research and basic development should be handled as collaborative and cooperative venture among the Defence Force, intelligence services, Police, Home Affairs, research institutes and commerce and industry.

Cyber Operations

406. While ‘cyber’ espionage has been a factor for many years, active cyber-operations and attacks are something relatively new but there is a clear trend for such operations to become a part of state and non-state actions (see Paragraph 251 above).

407. Attacks such as these have the potential to cause damage similar to a conventional attack by military forces, and considerably greater than what can normally be achieved by either guerrillas or terrorists. That makes such attacks a defence issue rather than merely a criminal matter.

408. South Africa is eminently vulnerable to such attacks, with its centralised power grid and highly computerised financial systems, as is the Defence Force. This potential threat is being addressed by the Defence Force (Defence Intelligence), which is establishing a Cyber Operations Centre, and there will be a requirement for locally developed systems and software.

409. There have also been various lower-intensity denial of service attacks by political and criminal groups, one example being the attacks on South Korean government web sites in 2009, another the attack on the New York stock exchange and several banks in 2012 by the Cyber Fighters of Izz Ad-Din Al Qassam. Such attacks might be more of a criminal matter.

410. The overall control of cyber defence should, however, rest with a single organisation and, given the potential for destructive attacks to cause serious and even critical damage at the national level, that organisation should be the Defence Force. That implies that this will be an area of interest for the Chief Defence Scientist, with the aim of developing some local countermeasures. In the longer term consideration should also be given to an offensive capability, which will again require industry support.

411. In addition to defensive measures, consideration also needs to be given to developing at least some fall-back systems that are less vulnerable to cyber-attack, both within the Defence Force and for national infrastructure.
412. The technologies involved in this field overlap the defence, intelligence and commercial sectors, and the effort to develop protective and defensive measures will need to be dealt with as a collaborative and cooperative programme among the Defence Force, the other relevant government agencies and departments, the research community and commerce and industry.

**Artificial Intelligence**

413. Artificial intelligence is a field that overlaps with several others in the defence technology spectrum. It will be of increasing importance in the future, in applications ranging from guided weapons and autonomous systems, through data management and dissemination, to logistic support management, training (simulators) and access control, both physical (i.e. access to facilities) and electronic (i.e. access to command and control systems, communications systems and databases).

414. This is, therefore, a field deserving serious interest, and will be an area of focus for the Chief Defence Scientist. Fortunately, it is also a field in which civilian technology is making great and swift strides, bringing the potential for useful ‘spin-on’ applications in defence.

**Materials Sciences**

415. The Defence Force has a clear interest in the development of new materials and in their applications. The Chief Defence Scientist will, therefore, collaborate and cooperate with research institutes and commercial entities in researching and developing new materials, applications for those materials, and the relevant manufacturing processes.

416. In addition to materials as such, the Chief Defence Scientist will also support research in the field of nano-technologies.

**Manufacturing Processes**

417. Additive manufacturing is a technology in a steep development curve, and holds very considerable promise for:

a. More cost-effective manufacturing, particularly of complex components; and
b. Quick ‘repair by replacement’ of equipment in the field, manufacturing the new component on-site instead of having to have it moved up from the rear, or having to move the vehicle, ship or aircraft back to a rear base.

418. The potential for quick ‘repair by replacement’ in the field can be a very valuable force multiplier for all three combat services, and this is an area well worth pursuing to the point where such equipment can be issued to:

a. **Army:**
   i. Depots; and
   ii. Field workshops at brigade level.

b. **Navy:**
   i. Naval bases, naval stations with workshops and deployable support units;
   ii. Large warships for installation aboard (also to support on-board helicopters and UAVs);
   iii. Support ships, for installation aboard for own use as for large warships, and to support smaller vessels when deployed.

c. **Air Force:**
   i. Depots;
   ii. Air bases and air stations with workshops, with a deployable element that can be deployed with a Tactical Airfield Unit (TAU);
   iii. Tactical Airfield Units, to support their own equipment.

d. **Military Health Service:**
   i. Military hospitals;
   ii. Forward deployed theatre-level field hospitals.

**NATIONAL CONTEXT**

419. In the national context the Defence Force and the defence industry first and foremost serve the purpose of ensuring South Africa's security against foreign threats, military and in some cases also paramilitary.

420. But both must also, within what is practicable, be aligned with the wider national context.

421. The key issues of the national context relevant to the defence industry strategy, include:
   a. Expanding employment and improve the nature of employment;
   b. Expanding the national skills base in both the artisan and professional categories;
c. Expanding the economy and moving from a commodities base to a knowledge and manufacturing base;
d. Transforming the economy to be inclusive of all South Africans, with a particular focus on the youth.

422. As discussed at the beginning of this document, one of the main purposes and effects of the defence industry is to reduce the negative impact of defence spending. It does this by:
a. Generating employment within the defence companies and in upstream suppliers in general industry;
b. Expanding the skills base, with migration to other sectors;
c. Establishing new technologies, with spin-off and spill-over to other sectors;
d. Reducing hard currency outflows by reducing defence imports; and
e. Generating hard currency earnings from defence exports.

423. These are all natural outcomes of a growing defence industry, and all are aligned with the key issues of the national context and the imperatives of the National Development Plan and other Government initiatives.

**The National Development Plan**

424. The defence industry is potentially well placed to support the drive to meet some of the key stated objectives of the National Development Plan 2030\(^{142}\):

a. **Uniting South Africans around a common programme**: While defence may hardly seem suited to this goal, the fact is that defence equipment and systems are ‘high-tech’ and the development of such systems in South Africa demonstrably creates a feeling of national achievement and pride across racial and gender lines\(^{143}\).

b. **Citizens active in their own development**: The defence industry is well-suited to the development of small, medium and micro-enterprises (SMMEs), the expansion of which will generate employment and give the entrepreneurs and their staff both pride in their achievement and the self-confidence to venture further. This is further enhanced by the

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\(^{142}\) The themes are taken from the published executive summary of the National Development Plan to illustrate the potential alignment between the NDP and the development of the defence industry. The potential for the defence industry to support the NDP will be discussed in more detail in the defence industry implementation plan.

\(^{143}\) This has been clearly visible at every African Aerospace and Defence exposition, with particularly the Rooivalk attack helicopter engendering those feelings,
education and training that defence companies must provide for their staff in order to remain competitive, education and training that is exportable to other sectors of industry and the economy.

c. **Faster and more inclusive economic growth:** Expanding defence development and production will generate employment, establish new technologies and bring hard currency export earnings, all of which will help accelerate economic growth. With the defence industry having to expand from a small base and being well suited to SMMEs, it can easily become a vehicle for more inclusive economic growth.

d. **Building capabilities:** The defence industry must conduct continuous research and development to remain viable, and will establish new technologies and processes, and in some cases invent them, most of which are applicable in other sectors of industry, thereby building overall industrial and economic capability\(^\text{144}\).

e. **A Capable and Developmental State:** While this goal focuses mainly in the public service, the fact is that defence projects are often large and almost always complex, and develop people who can tackle other complex projects effectively, for instance the Square Kilometer Array telescope project. At the same time, by virtue of being well-suited to the development of SMEs and dependent on high-quality education and training, the defence industry lends itself to supporting targeted development.

f. **Leadership and responsibility throughout society:** The defence industry works in an environment where errors or sloppiness cost not just large amounts of money, but also lives. That, together with the size and complexity of many projects, breeds people with a sense of leadership and an understanding of personal responsibility, which they can carry over into their private lives and into later careers.

425. The defence industry may not always be among the big players towards achieving these goals of the National Development Plan, but it can make a key contribution.

\(^{144}\) For instance, the head of the Square Kilometer Array project came from the defence industry (the Rooivalk project); the structure that moves the telescopes was developed and is manufactured by a defence company (Reutech Radar Systems), and the computer that controls its precise pointing was developed from the fire-direction computer of the Olifant main battle tank.
National Industrial Policy Framework

426. The National Industrial Policy Framework (NIPF) of the Department of Trade and Industry is intended to provide strategic direction for development of the South African industrial economy. Its intent is translated into regularly updated and adapted Industrial Policy Action Plans (IPAP).

427. The fundamental vision of the NIPF for the economy comprises:
   a. Diversification away from commodities and non-tradable services.
   b. Long-term intensification of industrialisation and movement towards a knowledge economy.
   c. Promotion of a more labour-absorbing industrialisation path.
   d. Promotion of a broader-based industrialisation path, both across groups and regions.
   e. Contributing to industrial development on the African continent.

428. The defence industry is well placed to contribute towards those goals, particularly in respect of what the NIPF terms “medium technology sectors” and “advanced manufacturing sectors”.

429. The potential alignment between the defence industry and the NIPF will be analysed in the defence industry strategy implementation plan, with an eye to developing a concrete, synergistic link between the NIPF, defence policy and defence industrial policy and strategy.

Industrial Policy Action Plan (IPAP)

430. The Industrial Policy Action Plan (IPAP) of the Department of Trade and Industry is one of the national plans developed – and continuously refined – to support the NDP in both its aim to expand and transform the economy and its aim to make the economy inclusive.

431. Considering the intentions and concepts of the IPAP and the capabilities and needs of the defence industry, there is considerable potential for synergy.

432. This is clear from the foreword by the Minister of Trade and Industry to the 2016/17 IPAP, in which he sets out “four main pillars” for the envisaged

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145 From 2014 NIPF documents.
146 Outline analysis of the synergy between the IPAP and the defence industry, based on the DTI website outline of the intent of the IPAP. This matter will be addressed in detail in the defence industry implementation plan.
147 This will become particularly clear when considering the recommendations in Part 4 of this document.
national industrialisation project, which mesh with the requirements of the defence industry if it is to be developed and expanded, and to which it can then itself contribute:

a. “Policy coherence and policy certainty across government”, which is something that is required for the defence industry to develop and which, if provided, in the context of defence and defence industry policy, will enable it to develop coherently and expand its export sales on the back of Defence Force requirements.

b. “A close collaborative effort between government, business and labour”, which is again something essential to the development of the defence industry.

c. “A commitment to ensure that the linkages between the primary and secondary productive sectors of the economy are maximised”, which would fit well with the development of a broader defence industry incorporating SMMEs in its supply chain.

d. “A combined and constructive drive to overcome the key constraints to manufacturing-led, value-adding growth”, which is quite clearly something well-aligned with the defence industry.

433. The fourth pillar also emphasises labour-intensive sectors, which does not immediately seem to be an attribute of the defence industry. But the defence industry works in several of the sectors that “backward indirect impacts” employment table in the IPAP 2016/17 document reveals to have a high knock-on employment effect: Electrical machinery and apparatus; rubber products; motor vehicles, parts and accessories; basic iron and steel; professional and scientific equipment; metal products excluding machinery; other transport equipment; machinery and equipment; plastic products; television, radio and communications equipment. Almost all of these sectors have an employment multiplier of 1.5 or higher.\textsuperscript{148}

434. A key element of the IPAP is to help South Africa move from being heavily dependent on commodity exports to having a diversified ‘knowledge economy’. To that end, the IPAP is focused on, among others:

\textsuperscript{148} This aligns well with the actual employment in the feeder companies of Rheinmetall Denel Munition and Hensoldt Optronics, the figures for which take into account only their direct and indirect suppliers, not the wider knock-on employment effect.
a. “Greatly enhanced and enforced” compliance of government procurement with the localisation targets developed by the DTI. This is clearly aligned with developing a greater local capability to support, manufacture and develop equipment for the Defence Force.

b. “A strong focus on spill-over and labour-intensive sectors”. While much of defence industry is not very labour-intensive, there is immense potential for spill-over and spin-off of technologies, processes and individual skills to other sectors. And the defence sector can be a major employer, generating knock-on employment, as is clear from the fact that during the 1980s it employed some 130 000 people directly.

c. “Carefully targeted industrial financing and incentives”, including:

   i. “Much stronger export credit and export credit insurance support”, which can greatly improve the export potential of the defence industry, particularly to developing countries for whose needs South African defence equipment is well-suited.

   ii. “Energetic implementation of the recently launched Black Industrialists Incentive”, which could be used to draw black industrialists into the defence sector and, more creatively and usefully, to help budding black entrepreneurs to establish and build up SMMEs in the defence sector, gaining experience and skills they can later apply in other sectors, and giving meaning to the ‘broad-based’ element of BBBEE policy.

d. “Leveraging the devaluation of the Rand to make South African manufactured products more globally competitive and create opportunities for the expansion and further development of SA’s domestic manufacturing capabilities”, which is exactly aligned with the potential of the defence industry, given sufficient support in the form of local orders to demonstrate that its equipment is in service.

e. “Growing exports”, with the focus on four main pillars:

   i. “Building partnerships with global Original Equipment Manufacturers (OEMs) focused on transferring technologies and growing our exports in OEM value chains”, which is perfectly aligned with what the defence industry can and must do in its own
interests, and what it has, in fact, already been doing to some extent. 

ii. “Partnering with national export champions to catalyse increased national technology absorption for the development of high value exports”, which is perfectly aligned with what the defence industry can do, as is demonstrated by the high-value/high-tech exports of Denel, Reutech and Saab Grintek Defence.

iii. “Strengthening existing industry Associations and Export Councils, including establishing a dedicated new Export Council for Africa”, which will fit perfectly with what the defence industry needs and towards which it can make a major practical contribution.

iv. “Developing export-orientated production hubs in SEZs and Regional clusters and fostering industrial decentralisation”, to which the defence industry can contribute usefully as it expands to meet Defence Force needs.

e. “Automotives”: A large portion of the defence industry is in the automotive sector, and many other defence technologies relate to that sector and can be harnessed to support development in that sector.

435. Another aim of the IPAP is to achieve greater decentralisation of industrial development. This will not be easy to achieve within the defence industry as it stands, other than at the support of equipment level, where decentralisation can mirror the location of relevant Defence Force units. But a growing defence industry will be able to accommodate some decentralisation of component and sub-assembly developers and manufacturers, which could also be combined with the DTI’s development of Special Economic Zones (see Paragraphs 677 to 679 below).


436. The Preferential Procurement Policy (PPPFA) is intended to use government expenditure to boost local economic and industrial development by designating suitable sectors for minimum local content requirements. Its Section 9 Paragraph 9(1) empowers the DTI to “designate” specific industries

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149 For instance, Cybicom Atlas Defence, Hensoldt Optronics, Rheinmetall Denel Munition and Saab Grintek Defence.
150 Note: Saab Grintek Defence has repeatedly won the DTI’s Exporter of the Year prize.
where (state) tenders should prescribe that only locally manufactured products with a prescribed minimum threshold for local production and content will be considered.

437. The local production and local content requirements cover the full range of factors from development and materials through manufacture and sustainment to disposal, vary by sector and will be adjusted from time to time.

438. This act and its regulations can be to the benefit of the defence industry, both directly and indirectly:

a. **Directly**, by focusing the Defence Force on local manufacture and development in all cases where that is practicable, in preference to importing equipment or paying for development by a foreign company; and

b. **Indirectly**, by:
   i. Designating selected components and sub-assemblies required for Defence Force systems or equipment, requiring other government departments to preferentially specify those items for their acquisitions; and/or
   ii. Designating defence industry companies as preferred developers/suppliers to meet the relevant requirements of other government departments.

439. **Primacy of Military Requirements**: This act must, however, be applied with due regard for the nature and role of the Defence Force, which is entirely different to that of other government departments:

a. The PPPFA must not be allowed to override the key military requirements of the Defence Force: Systems and equipment must be ‘fit for purpose’, and it may not always be practical or even possible to ensure that and meet the requirements of the PPPFA.

b. Some systems and equipment will be required in numbers too small to justify local development or even local manufacture.

440. The Defence Force will, therefore, have to be granted waivers in the respect of such systems and equipment, and the granting of such waivers must be handled promptly and quickly.
441. In addition:
   a. The Special Forces must be declared exempt from the requirements of the PPPFA: They have very specialised requirements and will often need a particular item of equipment quickly, and taking the time to obtain a waiver could endanger the outcome of an operation and the lives of operators.
   b. The same exemption must, for the same reasons, be provided to the Special Task Force of the Police Service.

Military Veterans Act

442. The Military Veterans Act 18 of 2011\textsuperscript{151} and the related regulations published in 2014 are relevant to the defence industry for three reasons:
   a. Military veterans are well-suited to employment in the industry, bringing with them practical experience of using equipment and systems operationally as well as insights regarding maintenance and training;
   b. Military veterans will be able to interface with the military of a potential client at a particularly useful level, understanding the practicalities of soldiering and of employing the equipment better than any civilian engineer;
   c. The Act specifically requires the Minister and Department of Military Veterans to assist both veterans in their individual capacity and businesses owned by veterans in securing business opportunities, making for obvious synergy (see Paragraph 443 below).

   a. “The Minister must establish a business vehicle through which business opportunities can be pursued by the State on behalf of all military veterans”; and
   b. “All existing and potential military veterans’ business entities that are partially or wholly owned by military veterans and that are benefiting military veterans qualify for facilitation of business opportunities”.

444. The only provisos in this respect are that:

\textsuperscript{151} Government Notice 1015 in Government Gazette 34819 dated 5 December 2011. Commencement date: 1 April 2012 [Proc. No. 26, Gazette No. 35221].
a. “To qualify for facilitation of business opportunities, a military veteran's business entity must be registered on the military veterans’ business entity register”; and
b. “The Department must determine the conditions for the inclusion of a business entity in the military veterans’ business entity register”.

445. Given the importance of SMMEs in the defence sector, as discussed in this paper, there is a clear opportunity here for the industry to assist and support military veterans in cooperation with the Minister and Department.

446. For purposes of clarification, the Military Veterans Act defines a “military veteran” as “any South African citizen who –
(a) rendered military service to any of the military organisations, statutory and non-statutory which were involved on all sides of South Africa’s Liberation War from 1960 to 1994;
(b) served in the Union Defence Force before 1969; or
(c) became a member of if the new South African National Defence Force after 1994, and has completed his or her military training and no longer performs military service, and has not been dishonourable discharged from that military organisation or force: Provided that this definition does not exclude any person referred to in paragraph (a), (b) or (c) who could not complete his or her military training due to an injury sustained during military training or a disease contracted or associated with military training”.

152 See Paragraph 107 on Page 31 and Paragraph 730 on page 176, as well as Footnotes 35 on Page 21, 45 on Page 31, and 285 and 286 on Page 175.
PART IV: THE DEFENCE INDUSTRY OF THE FUTURE

OVERVIEW

442. The defence industry strategy will need to be implemented with due regard for three key aspects, which will have to be aligned with each other to ensure coherence:

a. The Defence Force development Planning Milestones as set out in Chapter 9 of the 2015 Defence Review\textsuperscript{154};
b. The Defence Review Policy Options\textsuperscript{155}; and
c. The phases for the development of the industry as set out in Chapter 15 of the 2015 Defence Review\textsuperscript{156}.

443. As a rule, meeting the requirements arising from the implementation of the Defence Force Planning Milestones as and when funded, will take priority over implementation defence industry development phases.

444. There are two possible exceptions to that general rule:

a. Measures required to be taken immediately or urgently to ensure the survival of critical or key defence industrial capabilities; and
b. Where major export potential may require earlier focus on a particular capability than otherwise foreseen.
c. In addition, should rapid or revolutionary technological changes or developments overtake Defence Force requirements as they stand at the time, that may trigger a change in priorities, after appropriate briefing to the Defence Force.

DEFENCE FORCE DEVELOPMENT

445. The Defence Review set five Planning Milestones marking the development trajectory of the Defence Force from its current state to the strength and capabilities required to meet the demands that are expected to be made of it:

a. Planning Milestone 1: Arrest the decline in critical capabilities through immediate, directed interventions.

\textsuperscript{154} 2015 Defence Review, Chapter 9, Pages 9-15 to 9-30.
\textsuperscript{155} 2015 Defence Review, Chapter 9, Pages 9-30 to 9-32, Paragraphs 103 to 110.
\textsuperscript{156} 2015 Defence Review, Chapter 15, Pages 15-17 to 15-20.
b. **Planning Milestone 2**: Rebalance and reorganise the Defence Force as the foundation for future growth.

c. **Planning Milestone 3**: Create the sustainable Defence Force that can meet current ordered defence commitments.
   - This is seen as the interim state of the Defence Force that will allow it to execute the present set of missions without undue risk or damage to itself. It is to be attained as soon as possible, with the timeframe set primarily by the available funding.

d.

e. **Planning Milestone 4**: Enhance the Defence Force's capacity to respond to nascent challenges in the strategic environment.
   - This is seen as the appropriate ‘end state’ of the development of the Defence Force, providing South Africa with the military capability to handle existing and likely missions, deal with foreseeable contingencies, and provide the basis for expansion should the evolving strategic situation so require.

f. **Planning Milestone 5**: Defend the Republic against insurgency and/or armed conflict to the level of limited war.
   - This reflects the force levels and capabilities that would be implemented in the event of the strategic situation presenting a threat of limited war.

446. The timeframes envisaged for attaining these milestones have slipped since the finalisation of the Defence Review, largely as a result of inadequate funding, and the implementation must be accepted as likely to be ad hoc at least for the near-term future.

447. Each of the milestones in effect also sets requirements for certain equipment and systems, and thus impacts on what will be required of the defence industry in the relevant timeframe. Those requirements are indicatively outlined in the following paragraphs, but by the nature of things, the timing, phasing and scale will change as the process unfolds.

**Planning Milestone 1**

448. The implementation of this milestone has few direct implications for the industry, but is intended to develop clearly articulated military strategy and doctrine, a revised force structure and force design, and related capability strategy and capability and technology plans. Those must form the basis for
the future defence industry strategy and focus, setting out the types of equipment, systems and supplies the Defence Force will require in the future, and which items it will wish to source locally.

449. The elements of this milestone that will impact on the industry include:

a. Expanding/enhancing Special Forces capability, which will bring requirements for specialised equipment and weapons, vehicles and insertion craft.

b. Optimising border safeguarding capability, which will bring requirements for sensors, communications equipment, protected patrol vehicles and perhaps patrol/surveillance aircraft.

c. Establishing a permanent forward base in Africa to facilitate a quick response to crises, which will bring the requirement for a full set of major base equipment, from catering to security and including facilities for the safe and secure storage of equipment and perhaps munitions.

d. Establishing a revitalised Tactical Airfield Unit capability, which will bring the requirement for the relevant equipment, which should include compact, lightweight equipment suited to being deployed by air to a forward airfield or airstrip.

e. Establishing a naval port operating capability, which will bring requirements for equipment to enable port facilities to be repaired and brought into use as may be required, but also for harbour patrol and protection equipment.

f. Acquisition of field support equipment, for forces deployed in various climatic, geographic and security conditions.

g. Rejuvenation of support facilities, including workshops, depots and magazines.

h. Rejuvenating the Naval Dockyard.

i. Reworking, restocking and disposal of munitions.

j. Restocking and disposal of spares and general stores.

450. This milestone also provides for:

a. Identifying and taking steps to preserve capabilities that are at extreme risk of being lost, which must then be addressed together with industry to develop programmes to retain those capabilities at a minimum practicable and credible level. While those capabilities are yet to be identified by the services, one example will be the main battle tanks of the Army, which are well beyond their useful lives.

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157 Defence Review 2015, Chapter 9, Pages 9-19 to 9-20, Paragraph 77; expanded here.

158 Defence Review 2015, Chapter 9, Page 9-19, Paragraph 77.b.
b. Establishing a “stock level policy and strategy” for Milestones 2 to 5,\(^{159}\) which must inform the procurement of attrition reserves of vehicles, weapons and equipment, as well as of munitions, spares and stores.

c. Establishing and coordinating “capability and technology strategies and programmes with the defence industry appropriate to the Defence Strategic Trajectory.”\(^{160}\)

451. This milestone further envisages the establishment of an “integrated defence enterprise information system”.\(^{161}\) While this falls outside the ambit of the defence industry as such, it will be necessary to take into account and plan for the impact on this on systems and equipment and on their management and sustainment.

452. In addition, this period will bring a need to prepare the industry to meet the requirements of the following milestone as and when it can be funded.

**Planning Milestone 2**

453. This milestone envisages the enhancement and expansion of certain Defence Force capabilities, which will result in a range of requirements, many of which will lie within the capabilities and capacities of the defence industry at its desired levels of capability and capacity.

454. The underlying assumptions for this milestone include:

a. That the defence industry will be able to respond “in a coordinated matter” to the Defence Strategic Trajectory.\(^{162}\)
   - For this to be achieved, the NDIC will have to be fully briefed on the planned implementation of the Defence Strategic Trajectory in terms of phasing and envisaged timescales, and then *jointly* with the Defence Force develop a plan to meet the requirements as they will arise.
   - For this to be achieved may require investment to establish or re-establish the necessary industrial capabilities and capacities. This will require the industry to have sufficient confidence in defence

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\(^{159}\) Defence Review 2015, Chapter 9, Page 9-18, Paragraph 76.j. and Page 9-19, Paragraph 77.h.

\(^{160}\) Defence Review 2015, Chapter 9, Page 9-19, Paragraph 76.k.

\(^{161}\) Defence Review 2015, Chapter 9, Page 9-18, Paragraph 76.i.

planning to make that investment, or may require investment by
government, either in the form of loans or taking an equity share. 
It will also be imperative to make all elements of the Defence Force 
fully aware of this inclusive approach to capability planning.

b. That the defence acquisition system “is responsive to those 
programmes specified in the long-term defence capability strategy and 
is able to deliver required defence capabilities within shorter 
timeframes”. 163

⇒ A first step towards achieving this was taken during 2016 with the 
revision of the current Defence Acquisition Handbook (DAHB 
1000) and the current defence technology Defence Acquisition 
Policy (DAP 5000). A procurement policy and handbook are in the 
process of being drafted. Industry must study these documents 
and provide its inputs to ensure that the policies and procedures 
are practicable.

455. The elements of this milestone that will impact the industry include 164:

a. Development of a special operations joint rapid response intervention 
capability with the rejuvenation of airborne 165 and air-landed 166 and 
sea-landed 167 assault forces and associated equipment.

b. Simultaneous and critical renewal of the medium 168 and light airlift 
capability 169, the in-flight refuelling capability and the military air-
ambulance capability and the enhancement of the rotary-wing 
capability.

163 Defence Review 2015, Chapter 9, Page 9-21, Paragraph 81.q.
164 Defence Review 2015, Chapter 9, Pages 9-21 to 9-22, Paragraph 82.
165 Airborne. This refers to parachute operations at unit (battalion group) or at least sub-unit (company or 
combat team) level at the tactical, operational and strategic level.
166 Air-Landed. This refers to the deployment of forces by transport aircraft into an airport, airfield or airstrip 
in the area of operations, ready for combat immediately on landing. It must not be confused with air assault 
operations, which generally involve the tactical deployment of troops into combat by helicopter and in some 
select circumstances, for instance to seize an airfield, by fixed-wing aircraft.
167 Sea-Landed. This refers to the deployment of forces into an area of operations by sea, through a small 
port, or ‘over the beach’, by means of helicopter and landing craft, but not in the face of any determined 
opposition. It must not be confused with a sealift operation, which would involve deploying forces to a theatre 
of operations by sea, through an existing friendly port.
168 This refers to the replacement of the C-130 Hercules, which were acquired in the early 1960s. Assuming 
that South Africa intends to develop a true regional crisis response capability, however, this should fall behind 
the acquisition of a heavy/long-range airlift capability, as the C-130 lacks the payload/range performance for 
regional operations.
169 This refers to the replacement of the C-47TP (‘Turbo Dak’) aircraft, which were acquired in the 1940s and 
 fitted with turboprop engines in the 1990s.
c. Enhancement of aerial reconnaissance capability, including acquisition of suitable UAV systems.\textsuperscript{170}

d. Enhancement of air domain awareness, including static, mobile and airborne surveillance and tracking systems together with associated interception\textsuperscript{171} capabilities.

e. Enhancement of maritime domain awareness and the extended maritime protection capability inclusive of patrol vessels, reconnaissance aircraft, unmanned surveillance systems as well as static, shipborne and airborne surveillance and tracking systems.

f. Renewal of the hydrographic survey capability\textsuperscript{172}.

g. Extended maritime protection capability, inclusive of inshore and offshore patrol capability with organic combat-enhanced maritime helicopters able to repel symmetric and asymmetric threats.

456. Airborne, Air-Landed and Sea-Landed Intervention Operations: The development of this capability set will require the acquisition of:

a. Combat and logistic vehicles, artillery and other equipment suited to air transport (i.e. fitting the capacity of transport aircraft in terms of mass and dimensions);

b. Limited numbers of vehicles, artillery and equipment suited to parachute delivery; and

c. Equipment to operate a beachhead, be it at a small port or literally on a beach.

1. Most if not all of the equipment required for this capability set could be developed in South Africa

457. Airlift: South Africa’s regional security role may require prompt and rapid deployment of forces into semi-prepared airfields along the northern edge of the SADC. That implies a requirement for:

a. Heavy/long-range airlift suited to such operations (e.g. Airbus A400M, Antonov An-70); and

b. In-flight refuelling capability for fighter aircraft, light or medium transport aircraft engaged in special forces operations and, ideally, also for helicopters engaged in special forces operations.

458. The “enhancement” of the rotary-wing transport capability here refers to the expansion of the medium lift (i.e. Oryx) helicopter fleet to enable support for

\textsuperscript{170} This is not raised in the Defence Review, but the rapid developments in this field suggests urgent action to exploit the potential inherent in these systems.

\textsuperscript{171} The Defence Review actually says ‘interdiction’, but that must be assumed to be a typographic error as this is clearly referring to air defence and, therefore, the interception of intruding aircraft.

\textsuperscript{172} Currently in hand.
several deployed units, a crisis response/intervention operation and border safeguarding, with a heavy-lift type to be acquired later.

459. **Air Domain Awareness**: The requirement for airborne surveillance/tracking capability arises from:
   a. The sheer size of the theatre of operations, which makes effective coverage by means of static or ground-mobile systems impossible;
   b. The growing use of air transport and even air reconnaissance by guerrilla, terrorist and criminal groups; and
   c. The potential requirement to conduct ‘deny flight’ operations in the course of a major intervention or conflict containment mission.

460. **Maritime Domain Awareness and Protection**:
   a. This includes the requirement for ships and aircraft to monitor and patrol:
      i. South Africa’s mainland EEZ (to 200 nm)\(^{173}\);
      ii. The waters of Marion and Prince Edward Islands (1 920 km southeast of Cape Town); and
      iii. The requirement to meet South Africa’s search and rescue obligations in the SASAR region, which stretches from the Angola/Namibia border to 10° west and from the South Africa/Mozambique border to 75° east, and southwards to the coast of Antarctica. In different terms: out to 3790 km west of Cape Town, 3 900 km south of Cape Town and 4 850 km east of Cape Town.
   b. The reference to “extended” maritime domain awareness and protection refers to South Africa’s:
      i. Need to ensure security of maritime traffic in the Mozambique Channel, which is the route along which most of the country’s imported oil is delivered; and
      ii. South Africa’s regional security responsibilities, given that several other SADC nations lack the economic strength to acquire and operate ships and aircraft suited to deep sea patrols of their EEZs

461. The requirement for “maritime domain protection” calls for four ships to be at sea at any one time in South African, Mozambique Channel and Namibian

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\(^{173}\) 3 offshore patrol vessels and 3 inshore patrol vessels have been ordered to partly meet this requirement.
waters, which translates into a requirement for twelve ships suited to distant patrols\textsuperscript{174}.

462. This milestone further envisages the implementation of the stock-level policy developed during the previous phase.

463. This milestone also envisages initiation of “the processes to attain the defence capabilities required in Milestone 3.

**Planning Milestone 3**

464. This Milestone envisages the Defence Force having reached an interim end state in which it can meet the demands of South Africa commitments without overstretch, and creates the basis for moving on to Milestone 4.

465. The elements of this Milestone that will impact the defence industry include:

a. **Renewal of Army “heavy combat capability”** to a core level, which will require acquisition of battle tanks in sufficient numbers to equip an armoured brigade\textsuperscript{175}.

b. **Renewal of Army “medium combat capability”,** which will require upgrading or replacement of the Rooikat armoured car and G6 gun system and the acquisition of additional Badger infantry combat vehicles and mobile anti-aircraft systems.

c. **Renewal of the Army’s logistic vehicle fleet,** which should base on developing a ‘family of vehicles’ to provide most of the general-purpose logistic vehicles and which shares mechanical components with the armoured personnel carrier fleet, as well as more specialised logistic vehicles to support the armoured and mechanised forces.

d. **Establishment of a rapidly deployable indirect fire support capability,** which will require acquisition of a suitable light artillery system\textsuperscript{176}.

e. **Enhancement of the air combat capability,** which is envisaged as comprising:

\textsuperscript{174} This is based on the rule of thumb of one ship at sea, one working up/training but available in a crisis, and one in refit or preparing for refit. Here it is important to also take into account the transit time from South Africa to a patrol station in the Mozambique Channel and in Namibian waters.

\textsuperscript{175} Viz Army Future Strategy, which envisaged an armoured brigade with three tank regiments.

\textsuperscript{176} This would logically be the long-range 105 mm gun in development at Denel Land Systems, which would also have good export potential.
i. Acquisition of beyond-visual-range air-to-air missiles\textsuperscript{177}, precision air-to-ground weapons (bombs\textsuperscript{178} and missiles) and anti-ship weapons for the fighter force (Gripen); and

ii. Acquisition of close range air-to-air\textsuperscript{179} and air-to-ground\textsuperscript{180} capabilities for the lead-in fighter-trainer (Hawk).

f. **Full integration of the combat helicopter capability** into the landward and allied roles inclusive of aerial weapons, and not limited to:

   i. Long- and short-range anti-tank/anti-bunker weapons\textsuperscript{181}; and

   ii. Self-defence air-to-air capability.

g. **Expansion of airlift capability** with heavy and long-range fixed-wing capabilities for force projection and sustainment over extended distances\textsuperscript{182}.

h. **Establishment of a heavy rotary-wing lift capability**, particularly for Special Forces support and to support sea-landed operations and the deployment of tactical medical elements, as well as for combat search and rescue and disaster aid missions.

i. **Extension of the current maritime combat support capability**, to support frigate and OPV operations in distant waters\textsuperscript{183}, and including the establishment of forward depot and technical support capability\textsuperscript{184}.

j. **Establishment of a joint sealift capability** to project and sustain medium combat forces over extended distances, for instance in the context of an intervention mission\textsuperscript{185}.

k. **Renewal of the rail transport capability** as a cost-effective means of deploying and sustaining forces\textsuperscript{186}.

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\textsuperscript{177} This could be based on the present BVR missile technology project, sharing technology with the medium-range/long-range surface-to-air missile for the Navy and Army.

\textsuperscript{178} This could be the Umbani guided bomb system.

\textsuperscript{179} This is envisaged as being the A-Darter air-to-air missile.

\textsuperscript{180} This would include guided bombs (e.g. Umbani), guided rockets and potentially a light missile (e.g. Mokopa).

\textsuperscript{181} The long-range weapon would logically be the Mokopa missile; the shorter range weapon could be a guided rocket and/or, depending on the sight system, also the Ingwe beam-riding missile.

\textsuperscript{182} If South Africa intends to continue to play a regional role, this acquisition may have to be moved forward, being exchanged with the renewal of the medium transport capability.

\textsuperscript{183} The Navy recognises the need for at least two combat support ships to ensure that one is available at all times and to provide capability on both seaboards at some times.

\textsuperscript{184} This could take the form of a dedicated depot ship, and might also include a tanker to support the combat support ships during extended deployments.

\textsuperscript{185} This refers to the postponed project to acquire landing platforms capable of operating both helicopters and landing craft, and with the capacity to deploy the combat elements of a battalion group in a single lift (by two ships). It may also require acquisition of a cargo ship, depending on the design of the future combat support ships.

\textsuperscript{186} It would be possible to deploy forces as far north as Kindu in the DRC by rail, and to supply a forward base set in Zambia or Tanzania.
466. This milestone envisages the Navy being able to sustain five ships at sea simultaneously over extended periods, which essentially requires a surface fleet of fifteen ships capable of operations in all weathers in South African waters and twelve of them capable of extended patrol missions in SADC waters.

467. This milestone envisages the Air Force as able to sustain four\(^{187}\) maritime reconnaissance aircraft available for operations at all times, which would translate into a requirement for between eight and twelve aircraft, depending on expected availability and serviceability rates of the selected type.

**Planning Milestone 4**

468. Milestone 4 envisages the Defence Force having developed a set of capabilities that will enable it to execute all standing missions, deal with foreseeable contingencies and serve as the core of a stronger, war force should the strategic situation require a build-up to that level.

469. The elements of this milestone that will impact the industry include:
   a. Enhanced and expanded ground-based air defence capability to protect the mobile forces, military bases and other static installations, which will require acquisition of additional radar systems, surface-to-air missile systems of several types, and anti-aircraft guns, including mobile and mechanised systems\(^{188}\).
   b. Expanded heavy armour and medium capability above that achieved for Milestone 3, which implies the acquisition of tanks and tank transporters, as well as additional medium artillery systems.
   c. Enhanced combat engineer capability, which implies additional or replacement mine-detection and clearing equipment, bridging, earth-moving equipment and mine-laying equipment.

470. The Navy is now envisaged as having the same patrol capability as for Milestone 3, which is to say five ships at sea, plus the ability to deploy a naval task force of frigates and a support ship. This implies that the ships required for patrol missions cannot be the four frigates, and therefore implies a further fleet expansion.

\(^{187}\) The actual text of the Defence Review (Page 9-26, Paragraph 91.c.iii.) says “two maritime reconnaissance aircraft on patrol along the east and west coasts of South Africa, expandable to the SADC maritime zone”, which suggests a total of four available at all times.

\(^{188}\) Mobile implies readily moveable on a truck or towed by a truck; mechanised implies self-propelled systems able to move with high-mobility mechanised forces.
Planning Milestone 5

471. This Milestone is intended purely as an indication of the force level to be developed if the strategic situation suggests real risk of limited war or other threat of similar gravity. It is not discussed in any detail in this document, as the force to be developed from which the Defence Force would expand, is covered in the first four milestones, and the industrial capability necessary for that expansion would already exist in the industry, except in such areas that the South African industry will in any event not enter directly, such as fighter aircraft, heavy airlifters and submarines.

472. The one impact on the defence industry that is inherent in this Planning Milestone is the need to develop and maintain a surge capability in some areas, particularly munitions, batteries and certain spares, to be able to support extended medium-intensity or short-duration high-intensity operations by the Defence Force at its full war strength.

DEFENCE REVIEW: POLICY OPTIONS

473. The Defence Review sets out three policy options for government189:
   a. Policy Option 1: Maintain the Status Quo.
   b. Policy Option 2: Implement the Defence Strategic Trajectory Independently.
   c. Policy Option 3: Implement the Defence Strategic Trajectory in Partnership.

474. Maintain the Status Quo: Discarding the recommendations of the 2015 Defence Review and continuing as before, perhaps pending a further review. It would require the Defence Force to urgently begin to scale down in terms of strength and capabilities to a level that allows effective training and equipment maintenance within the budget. If that is not done, the Defence Force's ability to operate at all will quickly deteriorate as a result of the inadequate maintenance and training possible at current strength and funding levels, resulting in it becoming irrelevant as a military force. The government would have to curtail its continental and regional level of ambition commensurately and in step with the scaling down of military capability, to the level where it gives up any external capability beyond, perhaps, limited anti-piracy and special forces operations.

189 Defence Review 2015, Chapter 9, Pages 9-30 to 9-32, Paragraphs 103 to 110.
475. The impact on the defence industry would be that the Defence Force would lack the funds to acquire equipment or support research and development at levels sufficient to sustain the industry. The government would, therefore, have to choose between a planned shut down or letting the industry wind down in an unplanned and unstructured way. The exception might be the mainly export focused companies, although it is open to question how long they would continue to operate in South Africa.

476. **Implement the Defence Strategic Trajectory Independently**: Implementing the recommendations of the 2015 Defence Review drawing on only South Africa’s own resources. It would require the government to provide a sustained and guaranteed steady increase in defence funding to a level that can sustain the Milestone 4 capability set with regular modernisation, upgrade and replacement of equipment and systems thereafter.

477. The impact on the defence industry would be positive, in that the Defence Force would be funded to at least a level that would allow sufficient local acquisition to implement the ‘stabilise and sustain’ option for the defence industry, sustaining present capabilities and capacities, as well as some research and development. This would only not apply were government willing to accept a growing dependence on foreign suppliers. Given accelerating growth of the economy, this approach could later make the ‘stabilise and develop’ option practicable.

478. **Implement the Defence Strategic Trajectory in Partnership**: Implementing the recommendations of the 2015 Defence Review together with one or more “strategic partners” with an eye to reducing the cost, and to shortening the timeframe within which to reach Milestone 4. While this at first glance seems to be a logical and attractive option, the challenge would be to find the right partner or partners:

a. **African countries** would be an attractive option and could offer economies of scale for equipment manufacture, but none south of the Sahara have the funds to make a meaningful contribution to such a partnership. That would leave South Africa in a situation similar to that of the United States vis a vis NATO – as the partner funding the rest.

b. **The BRICS countries** would hardly be interested, with the possible exception of Brazil. Russia, India and China are all competitors for influence and for defence sales in Africa, so a ‘partnership’ would inevitably mean a subordinate or client role for South Africa. Also, all
three are supplying equipment to some countries at what might be termed ‘friendship prices’ that entirely undercut anything South Africa could offer, so such a ‘partnership’ would hold no benefit for the industry and could, instead, fatally undermine any chance of major defence sales into Sub-Saharan Africa.

c. **The United States** is unlikely to be interested, unless extremist Islamist groups are expected to gain influence within the SADC, in which case the US might well seek a partner to contain their activities. The US is, however, in any event hardly going to be a favoured choice of government, given South Africa’s foreign policy stance.

d. **One or more European powers** could be a practicable option if convinced that South Africa is serious: It is in Europe’s strategic and economic interest to have a stable Africa as a neighbour; apart from France in its existing sphere of influence, they are not seeking major influence in Africa that they could not achieve by acting in concert with South Africa; among them they the ability to provide any equipment South Africa cannot manufacture; and some South African equipment could find niche markets in Europe, as is the case today.

e. **A Country in Transition** from a resource-based economy to manufacturing and becoming knowledge-based, as is South Africa. An analysis of such countries may show one or more with similar strategic requirements that could make it a partner.

479. As things stand, the indications are that government intends – or would prefer – to choose the second option, implementing the Defence Review independently.

480. It is not clear, however, how this will be funded over any reasonable period of time – i.e. a period that allows re-equipping the Defence Force and developing the required new capabilities before all existing equipment has become obsolete and the entire enterprise becomes unaffordable short of war-level funding.

**DEFENCE INDUSTRY STRATEGY: STABILISE AND SUSTAIN**

481. As noted at the beginning of this document, this strategy is based on the assumption that it remains government policy to ensure that South Africa retains “a defence industry to support sovereign capabilities and maintain an
essential level of strategic independence”\textsuperscript{190} and, indeed, “a vibrant defence industry”\textsuperscript{191}.

482. This presents an immediate challenge: A quarter century of under-funding, aggravated by a decade of operational over-stretch and pressing domestic social priorities, has meant that the Defence Force has lacked the funding to acquire equipment, fund the development of equipment or fund research into relevant fields at a level that could sustain an “effective”, let alone “vibrant” industry.

483. This strategy must, therefore, provide first for immediate and near-term interventions to ensure the survival of the existing defence industrial capability, before considering how to stabilise and sustain the industry.

484. The Defence Review set out four phases for ensuring the future of the defence industry, which will all overlap to some extent as the various parts of the industry are addressed at different levels at different times, plus one entirely overarching phase\textsuperscript{192}:
   a. Phase 1: Secure Existing Capabilities;
   b. Phase 2: Sustain Existing Capabilities;
   c. Phase 3: Support the Turn-Around;
   d. Phase 4: Support Future Development; and
   e. Phase 5: Reposition Sovereign Capabilities.

485. The first two of those phases concern the steps needed to ensure the survival of existing defence industrial capability. They must, therefore, be implemented both promptly and quickly if the existing capabilities are to be stabilised and retained, and for that reason are addressed in some detail in this document.

486. The second two phases are more concerned with the longer term development of the industry, and the fifth is more a programme than a phase, in that it is independent of the other in respect of timescales. They are addressed here in concept and outline, and will be addressed in more detail in the implementation plan that is to be developed from this document, although they will in fact have to be developed over time in step with the roles and missions of the Defence Force and the evolving export climate.

\textsuperscript{190} Defence Review 2015, Chapter 15, Page 15-2, Paragraph 8.
\textsuperscript{191} Defence Review 2015, Chapter 15, Page 15-2, Paragraphs 8 and 9.
\textsuperscript{192} Defence Review 2015, Chapter 15, Pages 15-18 to 15-20, Paragraphs 124 to 135.
Phase 1: Stabilise and Secure Existing Capabilities

487. The first step towards achieving the desired defence industrial capability is to secure the existing capabilities and capacities as a base from which to expand. This phase will centre on placing short-term contracts locally that are focused on:

a. Ensuring the retention of maintenance, repair and overhaul capabilities, as well as modernisation and upgrade capabilities insofar as that is practicable.

b. Ensuring the immediate retention of capabilities and capacities identified as ones to be retained.

c. Ensuring the immediate survival of companies that are sole or primary custodians of such capabilities.

d. Meeting identified urgent or already contracted requirements of the Defence Force.

e. Underpinning pending and potential export orders that will enable the companies involved to sustain relevant capabilities and capacities.

488. Such contracts will include orders for:

a. Refurbishing existing equipment and systems that it is intended to keep in service.

b. Upgrading and modernising equipment and systems that it is intended to keep in service.

c. Replenishing stocks of ammunition and spares.

d. Continuing existing research and development projects.

489. The Defence Review further provides that the Department of Defence “may also assist key companies financially to ensure their immediate survival and/or to upgrade (their) facilities”.

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194 This may not, for instance, be practicable in respect of the full range of work to be done on fighter aircraft or submarines, although elements of MRO work certainly will be.
195 ‘Capabilities’ – the ability to develop, manufacture and support/sustain equipment and systems; ‘capacities’ – the ability to produce/support/sustain equipment, systems and munitions in sufficient numbers or amounts within strategically useful timescales.
490. Implementing these measures will require the Defence Force and the Chief of Acquisition - in consultation with Armscor and the defence industry\(^ {198} \) – to urgently determine:
   a. Capabilities and capacities that are at imminent risk of being lost, but that can be retained given prompt and decisive action;
   b. Companies that are at risk of having to close down or refocus away from defence but that can be kept within the industry, given prompt and decisive action; and
   c. Capabilities that have already been lost but can be resuscitated given prompt and decisive action.

491. A key point here is that this requires addressing the risk at three levels:
   a. Manufacturing;
   b. Design and development; and
   c. Research and development.

492. The retention of identified manufacturing capabilities and/or capacities can be ensured by means of placing multi-year production orders for equipment already in production or ready for production, and planning for longer production runs in the future. This can be supported by means of focused export marketing support from government where relevant.

493. The retention of design and development capabilities depends on keeping the design and development teams in the identified parts of the industry engaged. They cannot be kept engaged simply by placing production orders for equipment, they must be tasked with new design and development projects.
   a. To an extent this could involve modernising or upgrading existing equipment or the development of new variants, but if the interest of the design and development engineers is to be held and the teams kept together, they must be given new projects on which to work, based on the capability requirements envisaged in terms of the Defence Review milestones.
   b. In the short term such projects could be design studies towards meeting operational requirements likely to arise from evolving risks and threats and the potential arising from developments in relevant technologies.
   c. Some projects could then be taken further to develop a technology demonstrator to serve as a basis either for production as funding

\(^ {198} \) Perhaps by means of a Defence Industrial Prioritisation Committee established by the NDIC to provide this guidance and later to monitor the industry to provide early warning of risk and notice of opportunities.
allows, with further development implemented in the interim as new technologies impact on the particular equipment or system.

494. The research and development teams will similarly have to be given challenging work if they are to be retained. Logically, there should be a flow of projects from the research and development environment to the design and development environment. That would also ensure constant refreshing of the thinking of both groups.

495. Manufacturing. Finding the funding to keep existing production lines active and initiate new production will be something of a challenge. But there are several opportunities to ‘trickle buy’ that would enable the companies concerned to remain active and to prepare for better times, and there are products in which investment has real potential to generate export earnings.

496. Some of equipment that should be considered in this broad category is set out below. Clearly there will not initially be funding for everything, and not everything will be either optimal or practical, but a selection should be made that addresses each capability area.

a. Combat Vehicles:
   i. Badger: In production, with sufficient orders to keep the line active for some time, although it would be good to be able to extend the order to cover a third battalion group set of vehicles and a higher production rate would be more cost-effective.
   ii. Casspir: The Casspir NG2000 is perfectly adequate to meet most of the future APC requirement and, being in production for export, could be ‘trickle acquired’ as funds allow, gradually equipping battalions currently lacking a proper APC.\(^\text{199}\)

b. Artillery: The G6 and less so the G5 are among the best artillery systems available today. But both could be improved by converting to the L52 barrel, giving them a tactically valuable increase in range and also making them more readily exportable in that form.

c. Infantry Weapons:
   i. Continued production of existing support weapons.
   ii. Order the 20x42 iNkunzi family of weapons for Special Forces, the airborne forces, the Maritime Reaction Squadron and some infantry battalions.

\(^{199}\) As noted under logistic vehicles, the Casspir can be acquired in a configuration that would allow commonality of sub-assemblies and components with the bulk of a future logistic vehicle fleet.
iii. Order the belt-fed iNkunzi weapon as a turret-top weapon for armoured combat vehicles (integrated with the Denel SD-ROW).

d. Engineer Equipment:
   i. Refurbish the ‘Chubby’ mine-detection system.
   ii. Manufacture additional systems as required for the force design.

e. Unmanned Systems: Acquire locally developed unmanned aerial and ground systems in small numbers to provide relevant capabilities and to enable the Defence Force to develop its thinking and doctrine to provide the basis for an unmanned systems doctrine and strategy
   i. Seeker 200, mainly to operate in support of ground forces.
   ii. Seeker 400, mainly for border and EEZ surveillance and COMINT.
   iii. UGVs. One of the locally developed unmanned ground vehicles, to explore the potential of such systems for reconnaissance, surveillance and some armed missions, as well as for countering IEDs.

f. Logistic Vehicles:
   i. Confirm the suitability of the 4x4 and 6x6 logistic variants of the Casspir vehicle family to replace the mine-protected Kwêvoël Samil-50 and Samil-100 trucks at unit level, then acquire on a trickle basis as funding allows.
   ii. Acquire 4x4 and 6x6 trucks using the same driveline as the Casspir. in soft-skin and protected cab variants to replace the Samil family at formation level.

g. Field Equipment: Continue or begin acquisition of the various items of equipment required to support deployed forces, including camp equipment, generators, tactical logistic equipment, etc.

h. Naval Equipment:
   i. Order the Rogue remotely-operated weapons station for fitting to the Navy’s frigates (in addition to the two per ship already in service), SAS Drakensberg and the new patrol and survey vessels, and as a primary weapon for small craft, such as the Namacurra harbour patrol boats and the new riverine patrol craft, which would particularly benefit from a mounting that can be operated from an armoured position without exposure of the gunner to hostile fire.
   ii. Order the iNkunzi 20x42 mm weapon for carrying aboard naval vessels as an additional close-in protection weapon for stanchion mounting, and as a self-defence weapon for submarines when surfaced.

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200 This is a practicable option, as these vehicles are being produced ‘on demand' for export.
i. **Helicopter Door Guns**: Order the iNkunzi as an alternative door gun for the Oryx and Super Lynx helicopters of the Air Force.

j. **Electronic Systems**:
   i. Acquire radars of the StealthRad family for various applications, particularly for intervention and stabilisation operations.
   ii. Acquire the RSR 210N naval radar for the new patrol vessels ordered for the Navy.
   iii. Acquire passive self-protection warning systems for the armoured vehicles of one complete mechanised battalion group and one complete motorised battalion group.

k. **Command and Control Systems**: Acquire the single-console, stand-alone command and control system developed by Cybicom Atlas Defence, to enable integration of maritime missions among ships and aircraft of different services and countries with no risk of compromising the combat management systems of warships and aircraft.

l. **Guided Weapons**:
   i. Bring the A-Darter into production.
   ii. Order additional Umkhonto SAMs to provide each operational frigate with a 50% or higher load-out or more.
   iii. Order the Mokopa missile to arm the Rooivalk and the Super Lynx.
   iv. Order sufficient Ingwe missiles to complete the planned reserve stock.
   v. Bring the Umbani guided bomb system into production for the Gripen and the Hawk.

m. **Unguided Munitions**: Begin restocking munitions, placing initial orders as funding allows.

n. **Spares**: Begin restocking spares, placing initial orders as funding allows.

497. There is also a requirement for a high-capacity fixed ammunition disposal plant and for a number of mobile systems, which could be manufactured or even developed locally.

498. **Design and Development**. There are two sets of opportunities open to ensure the survival of design and development capability:
   a. Taking existing designs up to production standard for the Defence Force and perhaps export; and
   b. New designs to meet known Defence Force requirements or known export opportunities.

499. There are several opportunities in each of those categories, and some possibilities are set out below. As with manufacturing, it will not be possible
to fund each of these and some may not be optimal or practical solutions, but every effort should be made to fund at least one project in each capability area in each of the two categories.

500. **Development to Production Standard**: Taking a project that has already gone through most of its design and development phases, bringing that equipment or system to production standard, industrialising it and taking into production. That will require at the very least a guaranteed order that will enable the company concerned to justify the investment – and perhaps borrow the funds – needed to industrialise the product and set up the production system, or financial assistance from the Defence Force or, where there is major export potential or technology spin-off/spill-over potential, from the Department of Trade and Industry.

501. There are several examples of projects that could to good effect be supported in this way. The Defence Force and Government will identify those with the greatest potential, either to meet Defence Force requirements or (and) in the export market, and seek to make the necessary funding available for acquisition or industrialisation support. Potential options for this include:

a. Bring the long-range 105 mm gun and its ammunition family into production and service. This weapon system will also have outstanding export potential.

b. Develop a further Rooikat upgrade, perhaps including up-gunning to 105 mm for some cars to be used for combat rather than reconnaissance.

c. Resume development of the diesel-electric drive on the Rooikat demonstrator, for later implementation across the future combat vehicle fleet.

d. Upgrade the Ratels of the mechanised infantry, primarily by upgrading their turrets with power drives and night-sights, and with an engine replacement.

e. Upgrade the existing ‘Chubby’ mine-detection system to a new standard for mine and IED detection.

f. Complete the development of the LEDS-150 hard-kill active self-protection system for armoured vehicles and its Mongoose munition, and bring it into production for at least one mechanised and one motorised battalion group.

g. Develop the Oribi truck into an air-transportable logistic vehicle family.

h. Complete development of the course-correcting fuze for artillery and mortar systems.
i. Bring the Umkhonto ground launcher to production status for both the Army (mobile) and the Air Force (airbase/airfield defence).

j. Bring the FORT tracker and DBR X/L radars to production standard.

k. Integrate the new Airbus Optronics Argos ZT turret with the Rooivalk to enable it to employ both the Mokopa (laser-homing) and Ingwe (beam-riding) missiles as well as being able to employ laser-homing rockets and to designate for laser-homing bombs.

l. Develop a Rooivalk Mk 2 combat helicopter on the basis of the Rooivalk airframe and propulsion systems and, as a phase of this project, implement the full Rooivalk user requirement on the existing aircraft.

m. Develop an Oryx Mk 2 tactical transport helicopter on the basis of the Oryx and with maximum commonality with the Rooivalk Mk 2.

n. Complete development of the Cybicom Atlas Defence King Air simulator for SAAF use and for export.

502. New Design and Development Projects: There is considerable potential in some Defence Force requirements for the design and development of new equipment or systems that would give the Defence Force additional or improved capabilities, and that would also have real export potential. Potential opportunities include:

a. A light combat vehicle family to meet the Armoured Corps’ reconnaissance vehicle requirement, but also to provide a complete family of combat vehicles suited to rapid deployment by air for intervention and stabilisation operations. This could be done on the basis of existing driveline/powertrain elements to keep the cost affordable. There is currently no vehicle in development in the sub-10-ton class that is needed for effective air-deployment operations, so there should be useful export potential in addition to what is needed to provide the Defence Force with a rapidly deployable armour/mechanised capability.

b. Expand the Badger turret family (Medium Combat Turret) to provide a range of additional weapons options, mainly with an eye to export potential.

c. Develop a combat reconnaissance variant of the Badger (i.e. with optical, electro-optical and perhaps radar sensor systems).

d. Complete development of the turreted long-range 105 mm gun and integrate the turret with the Badger platform, as well as with other platforms for export.

e. Develop a compact/light mine-detection vehicle system that can be delivered by medium (sling load) or heavy-lift helicopter, light transport aircraft (e.g. C27J, C295) and, ideally, by parachute or by means of low
altitude parachute extraction. Such a system would allow, for instance, airfields to be checked quickly before flying in transport aircraft during an intervention operation, and would allow clearing routes by segments, considerably speeding up the process. This would provide an extremely useful capability for the Engineers and would have export potential. Note: Such a system was trialled in the 1980s using the Jakkals DZ vehicle as a basis.

f. Develop light (e.g., up to 12 ton vehicle weight) and medium (e.g., up to 30 tons vehicle weight) tactical bridging systems.

g. Develop and acquire uniforms and personal equipment suited to the various theatres and areas of operation, including tropical and mountain operations uniforms and equipment.

h. Resume development of the directed infrared countermeasures system (DIRCM).

i. Develop an integrated coastal surveillance system to support patrols and marine resource management as per Operation Phakisa201.

j. Develop the alternative seeker heads for the Mokopa missile and Umbani guided bomb system.

k. Expand the operational envelope of the Umkhonto SAM (surface attack with various seeker options) and A-Darter AAM (air-to-ground and anti-radar).

l. Develop anti-radar variants of the Umbani guided bomb system.

m. Complete development of the Cheetah counter-artillery, rockets and mortars (C-RAM) system and expand its envelope to include engagement of UAVs.

n. Develop the Impi missile for UAVs and light aircraft, as well as ground use.

o. Develop the Future Infantry Support Missile (FISM).

p. Develop a universal UAV command and control system that will allow the Defence Force to acquire various UAVs from different manufacturers and integrate them into a coherent reconnaissance/surveillance system.

q. Build on the existing naval combat management system capability (e.g., that held in Cybicom Atlas Defence) to develop an enhanced local integration capability and export potential.

r. Develop additional simulators and simulation systems for training purposes, including linked command and control simulation systems to allow units in different centres to train together in real time.

201 Note: In 1945 there were some 45 coastal radar stations to provide a picture of inshore movements.
s. Develop new-generation communications systems with a focus on security and sustained links under cyber-attack\textsuperscript{202} and on data dissemination.

t. Continued development of COMINT and information operations systems to access mobile communications (for instance cellular telephone systems) and social media that are being used for communications by both irregular and regular forces.

503. **Research and Development.** As is the case with design and development, there are two sets of opportunities, one comprising research and development focused on a particular product or system, in some cases in respect of work already being done or that was done in the past but was deferred for lack of funding, and which may have been overtaken by new technologies, and the other comprising research and development in a field rather than on a product of system. The possibilities might include:

504. **Product/System R&D:**
   a. Resume work on the diesel-electric drive Rooikat technology demonstrator, with an eye to adopting diesel-electric drive for the future generation medium combat vehicle family.
   b. Continue work on the technology development for a medium range SAM and BVR AAM.
   c. Resume work on the Future Infantry Support Missile (FISM) concept, with an eye both to providing the Army with this capability and having an export product for countries that do not wish to be dependent on either the United States or France.
   d. Resume work on a ramjet-powered missile for long-range applications.
   e. Develop a successor or a successor variant for the Raptor stand-off weapon system.
   f. Develop a new generation of artillery rocket, including a loitering munition in various forms including an anti-radar weapon. This might be a joint project with Avibras in Brazil.

505. **Research-Focussed R&D:** Pure research and technology development could to good effect be conducted in the areas of:
   a. Laser systems, both defensive and as weapons, for instance against missiles and UAVs.
   b. UAV detection and classification systems.

\textsuperscript{202} This might involve incorporating older-generation technologies to provide at least an uninterrupted backbone capability immune to cyber-attack.
c. UAV defeat systems, be they kinetic or electronic (e.g. jamming or taking control).

d. Non-cooperative target recognition, using optical/optronic or radar processing.

e. Unmanned and autonomous systems.

f. Information operations.

g. Cyber defence and cyber operations.

A Long-Term Naval Programme

506. Given the regional security role assigned to the Defence Force by Government, and the importance of maritime trade and the coastal economy of South Africa, the SADC and other African countries, it would seem to be particularly important to develop effective naval forces.

507. That, in turn, presents an opportunity to re-establish the ship-building and marine engineering industry, using a long-term fleet plan and ship-building programme as its backbone. This is the approach taken by Canada\textsuperscript{203} and more recently by Australia\textsuperscript{204}, and the Navy required to perform the missions outlined in the 2015 Defence Review will take some thirty years of continuous ship-building to develop, and then a continuous ship-replacement programme to sustain.

508. That would seem sufficient to provide a base workload for this industry, from which it could leverage entry into other maritime sectors, particularly the offshore diamond, gas and oil industry. Given, further, the high rate of knock-on job creation of the ship-building industry, this would seem ideally suited to the Government's industrialisation intentions and plans, with many of the technologies also relevant to other industries.

509. For this approach to be truly efficient, however, the Navy will need to focus on a fleet design using the smallest possible number of basic platforms\textsuperscript{205}. This was, in fact, envisaged in the “Multi-purpose Hull” (MPH) and “Multi-Mission OPV” (MMOPV) concepts developed by the Navy, which finally led to

\textsuperscript{203} Canada's National Ship-Building Strategy centres on establishing strategic relationships with two shipyards with an eye to sourcing all Navy and other government vessels from them over the next thirty years. Smaller vessels and the support and sustainment of the large vessels will be put out to bidding. See the Government of Canada Website for an overview.

\textsuperscript{204} Australia's strategy is focused on a “Continuous Build” programme that will provide the industry with steady workloads over the next twenty years (Defense News, 8 August 2015). In support of this ship-building strategy, Australia is also establishing a Naval Ship-Building College (Australian Naval Institute, 7 May 2017).

\textsuperscript{205} See, for instance, 'Naval Shipbuilding', published by Defence South Australia Advisory Board, particularly Part 3.10, “Rolling-Build Programs” (pages 46 to 54) and the subsequent parts.
the current patrol vessel acquisition project that, however, has diverged and split what could have been a single ‘family of ships’ into three different hulls and machinery packages.

**Phase 2: Sustain Capabilities**

510. The second step is to ensure the sustainability of the identified defence companies. This will be done by means of\(^{206}\):

a. Placing multi-year contracts for identified items that are required for training (e.g. munitions, spares) or to replenish the reserve stocks of the Defence Force. Placing multi-year contracts for the support of defence materiel in service.

b. Placing multi-year contracts to meet immediate and near-term defence materiel needs of the Defence Force, in some cases in phased batches (see Paragraphs 515 and 516 below), to enable the Defence Force to coherently rebuild certain capabilities while simultaneously providing industry with an extended order book.

c. Adopting an acquisition strategy that makes maximum use of common systems and sub-systems to achieve greater interoperability and easier support in the field on the one hand, and greater economies of scale on the other. This strategy will not, however, be allowed to place commonality above mission utility (see Paragraphs 517 to 519 below).

d. Informing local companies of planned acquisitions and likely budgets, to enable them to plan ahead and invest appropriately.

e. Placing multi-year development contracts leading to acquisition if the requirement is met, which approach is particularly suited to sovereign and strategic capabilities\(^{207}\).

f. Expanding the present levels of research and development (R&D) funding and ensuring alignment of R&D projects with Defence Force priorities and, insofar as is practicable, with wider national R&D imperatives and goals.

g. Actively supporting exports of defence materiel in production and upgrading of systems and equipment already in service with other forces.

h. Establishing and supporting relevant ‘centres of excellence’.

i. Supporting relevant undergraduate, post-graduate and technical courses and research at South African universities and other tertiary educational establishments.


\(^{207}\) It is relevant to note here, in respect of 486 d and e, that the Royal Norwegian Navy ordered the Reutech RSR 210N radar on the basis of a specification and the company's capabilities, not pre-existing hardware.
511. **Munitions.** Rebuild stocks of munitions to the level deemed appropriate to allow for foreseeable contingencies. Those stocks could be backed up with component stocks held by the manufacturers, which can quickly be filled and delivered when usage exceeds expected levels, reducing the problem of munitions becoming ‘time expired’ while in store.

512. **Munitions: Access for Export.** Once stocks reach a level that allows this, the Defence Force should allow local munitions companies to draw on the component stocks held on behalf of the Defence Force and on the stocks of the Defence Force to meet large, urgent export orders, provided that:
   a. Such munitions are not in high operational demand;
   b. There is no looming crisis that would require such munitions in large quantities; and
   c. The manufacturer can replenish stocks promptly and within an agreed timeframe, perhaps by utilising stocks of unfilled munitions.

513. **Precision Munitions.** A similar approach could be taken in respect of precision munitions but only in respect of ‘wooden rounds’ and such munitions that can be quickly restocked.

514. **Spares.** A similar approach should also be taken in respect of spares (e.g. components, sub-assemblies, power packs, gun barrels) required to ensure serviceability of exported equipment, provided that:
   a. Such spares are not in high operational demand;
   b. There is no looming crisis that would require such spares in large quantities; and
   c. The manufacturer can replenish stocks promptly and within an agreed timeframe.

**Unit Sets/Phased Batches**

515. Prime mission equipment and similar items should be acquired in ‘unit sets’ where that is practicable, to enable the Defence Force to fully equip a particular unit with all of its prime mission equipment and related and similar items in one project executed over a short period of time.

   For instance: A mechanised infantry battalion should simultaneously be equipped with its new infantry combat vehicles, new armoured personnel carriers and new tactical logistic vehicles. That will ensure that the unit is equipped as a coherent system, with vehicles that have

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208 i.e. Munitions requiring no maintenance at unit level.
similar operational, tactical and critical mobility, protection and day and night-fighting capability.

516. While this may inconvenience industry to some extent by staggering deliveries of those various vehicle types – e.g. ICVs, APCs, trucks – this can be ameliorated to an extent by staggering the equipping of different unit types to result in a reasonable steady production flow of all the types involved.

For instance: Alternate between re-equipping mechanised and motorised infantry battalions, which would ensure a balance between ICV and APC deliveries, while the trucks might be common equipment. This will enable industry to plan phased production batches of the different vehicles.

**Commonality and Standardisation**

517. The Defence Force will seek to reduce the number of different platforms, systems, sub-systems, sub-assemblies and weapons in order to:
   a. Improve tactical coherence during operations;
   b. Simplify training;
   c. Simplify maintenance, repair, overhaul, modernisation and upgrade;
   d. Reduce and simplify spares holdings;
   e. Obtain economies of scale in respect of acquisition and support cost; and
   f. Assist industry by providing extended, more cost-effective production runs.

518. One example might be to acquire tactical logistic vehicles that are based on the standard APC, as was envisaged for the Samil and Casspir replacement projects, which would, for example, allow a motorised infantry battalion to have only one basic vehicle type in its inventory as APC, weapons carrier, command vehicle, ambulance, cargo truck (in general cargo, diesel tanker and water tanker configurations), recovery vehicle and repair vehicle. The benefits are obvious.

The smaller number of heavy tactical logistic vehicles required for the mechanised forces might use the mechanical elements of the ICV to arrive at similar benefits.

519. Another example would be to standardise on a hull and machinery ‘package’ for offshore patrol vessels and other vessels requiring roughly similar
volume, deck area, seakeeping, speed and range/endurance\textsuperscript{209}. This was the original concept for what later became the present patrol and survey vessel projects.

**Forward Planning**

520. The Defence Force should now give the industry insight into the envisaged force design and the force development timescales, in order to enable industry to:

a. Understand what equipment and systems will be required in the near-to medium-term, and to begin planning to ensure the necessary capabilities and capacities.

b. Understand what capabilities will be required in the medium- to long-term, and to begin planning to ensure the necessary capabilities and capacities.

c. Work with the Defence Force to consider how different and/or new technologies might optimally provide those capabilities or how an alternative approach might offer a better or more cost-effective means of producing the same effect.

521. Planning must also be realistic, particularly in the numbers/quantities to be acquired, as industry's experience of actual orders falling short of planned orders makes companies reluctant to make investments that would allow truly cost-effective production\textsuperscript{210}.

**DEFENCE INDUSTRY: TURN-AROUND AND DEVELOPMENT**

522. Phases 3 and 4 are concerned with the development of the defence industry once it has been stabilised at current levels of capability and capacity.

523. These two phases are discussed here specifically, but are also addressed by the more general ‘Ways’ section of this document, which follows.

524. Further development of the industry as envisaged in Phases 3 and 4 will require a careful analysis of the industry, the situation and the potential in terms of the strengths and weaknesses of the industry, the opportunities and the threats.

\textsuperscript{209} See, for instance, ‘Naval Shipbuilding’, published by Defence South Australia Advisory Board, particularly Part 3.10, “Rolling-Build Programs” (pages 46 to 54) and the subsequent parts.

\textsuperscript{210} 2006 RAND study in the United States focused on ship-building, but logically a factor for all defence industry sectors.
Strengths, Weaknesses, Opportunities, Threats

525. The mix of strengths, weaknesses, opportunities and threats relevant to the industry will evolve over time, and the analysis must be continuous if the industry is to have the agility to be successful in a market dominated by extremely large commercial players and also by governments using gifts of armaments or ‘friendship prices’ to win influence.

526. Logically the industry must play to its strengths and seize opportunities, while finding partners to ameliorate weaknesses and side-stepping the threats. But it must be kept in mind that the primary purpose of the industry from the government point of view, is to support the Defence Force, so there will be times when it is not possible to be entirely logical in deciding what to do.

Strengths

527. The South African defence industry has a number of real strengths compared to those of other countries, some of which strengths have not been fully recognised and exploited:

a. South Africa is a neutral country that is politically and diplomatically acceptable to most governments, free of the concerns attached to acquisition from the major powers or their allied and client states.

b. It is intimately familiar with the needs of a medium-sized defence force, which are in some respects quite different to those of large or very small forces.

c. It is intimately familiar with the needs of a defence force that must operate under conditions of low force densities and over extended distances.

d. It is intimately familiar with the geographic and climatic challenges of large parts of Africa, which are similar to those in several other theatres.

e. It is intimately familiar with the needs of a defence force of a developing country, which South Africa is in most respects.

f. It is intimately familiar with the potential of a defence industry in a developing country, having in fact been an instrument of South Africa’s industrialisation.

g. It has a well-deserved reputation for innovation.

h. It has a well-deserved reputation for developing equipment that works as intended.

i. It has a well-deserved reputation for tough equipment.
j. It has over the years often produced effective equipment at substantially lower cost than in other countries - in effect offering western-style equipment at affordable acquisition and sustainment cost.

k. It is able to deal with small orders and to meet bespoke requirements.

l. It is able to move quickly to meet a requirement.

m. It is largely independent of the whims, policies and strategies of the major powers, which makes it potentially much more responsive to the needs of smaller power.

n. It can deliver equipment and systems not subject to ITAR restrictions, albeit within South Africa’s own arms export policy and the country’s international obligations.

528. Many, perhaps most, of these strengths are, however, perishable commodities and will be lost if the industry does not begin to again develop new equipment and the Defence Force does not take that equipment into service.

Weaknesses

529. The South African defence industry also has some very real weaknesses, not all of which are within its power to address independently:

a. Inadequate government political, diplomatic, industrial and financial support.

b. An export permit system that is perceived by clients as erratic and slow.

c. It is small, so it lacks the financial muscle and the sheer numbers of engineers and technicians that larger industries can bring to bear on a project. This must be offset by innovation, agility and efficiency.

d. It is poorly funded, both in terms of the order flow from the SANDF and in terms of research and development funding. This can only in part be addressed within the industry, and government will have to find the funds to ensure steady development and manufacture, as well as to support research and development.

e. The Defence Force’s requirements are relatively small in most cases, which makes it difficult to keep items in production long enough to fully exploit their potential in the international market. This will have to be addressed by ensuring that Defence Force orders are sufficiently large and are so phased, for instance alternating among different equipment types as per the ‘phased batches’ discussed above (Paragraphs 515 and 516 above) as to allow longer production periods.
f. The Defence Force's lack of funding means that it is not able to order development of new prime mission equipment and bring that into service, which restricts export opportunities as many countries will not buy equipment that is not in service in the home country and, therefore, assured of full through-life support, including mid-life upgrades.

g. The country lacks the number of scientists, engineers, technicians and artisans needed to fully support the industry at its envisaged level and execute infrastructure projects and support the wider economy. This can to an extent be addressed by the by means of industry bursaries and in-house education and training, as was done by Armscor in the past and is already being done to some extent by Denel and some private companies. But government will have to play a direct role in expanding the education of people in those groups.

h. The industry is and will for the foreseeable future be hampered by certain social engineering policies of government which, if not rationally applied, could hamper development, deter investment and put off foreign clients, who want the assurance of experienced engineers developing and upgrading equipment and systems, and which add to the cost of developing and manufacturing local equipment.

i. South African companies have also at times priced themselves out of the market, in some cases a factor of low production runs\(^{211}\).

j. Lack of sufficient language skills and cultural understanding to be effective in some markets.

**Opportunities**

530. There are many opportunities for the industry to enter the international market, albeit not always as a supplier of prime mission equipment or systems:

a. Some opportunities do exist at the prime mission equipment level, mainly in areas in which South Africa is known to have particular expertise, such as long-range artillery, wheeled combat vehicles and mine-detection vehicles, or where South Africa can provide a more cost-effective system (e.g. potentially Rooivalk).

b. Other opportunities exist in the fields of electronic warfare and communications systems, where the fact of being different already provides a real edge to the using defence force. This is the area in which Reutech, Saab-Grinntek Defence and GEW Technologies are proving very successful.

\(^{211}\) This has also at times been a result of a disconnect between local inflation and exchange rates.
c. The area of providing ‘after-market’ enhancements of equipment manufactured by the larger groups to suit it to the needs of a particular defence force is another one of potentially interesting opportunity (e.g. LMT’s retractable weapons mounting).

d. There would seem to be considerable potential in becoming a supplier to the major international OEMs, as shown by Aerosud, Airbus Optronics and Denel Aviation among others.

e. Guided munitions, as many countries would prefer not to depend on the major powers in this field and often cannot afford their products.

f. General Munitions.

g. Maintenance, repair and overhaul support for smaller armed forces.

531. Those opportunities do exist around the world, with the obvious areas being:

a. Sub-Saharan Africa (supply, support and sustainment).

b. Central Asia (supply, support and sustainment, moving to local production).

c. Middle East (supply and increasingly local production and partnerships or JVs).

d. South and South-East Asia (local production, partnerships and JVs).

e. South America (supply, local production, partnerships and JVs).

f. Central America (supply, support and sustainment).

g. Central Europe (supply, local production, perhaps partnerships and JVs).

h. Western Europe and North America (niche products, supplier to OEMs).

i. The United Nations, particularly for operations in Africa.

j. The European Union, particularly for operations in Africa.

k. The African Union, especially in the form of sustainment support for operations.

**Threats**

532. The primary threat facing the industry is continued underfunding of the Defence Force, which will restrict its ability to acquire new equipment and systems and its ability to support new research and development. While several companies have done well in the export market, much future potential will be lost if the industry does not have new products with which to compete.

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212 These areas are discussed in more detail Annexure 4 – Comments on Potential Markets).
533. A related risk lies in the Defence Force’s past and continuing loss of personnel with both the skills and experience to evaluate and fully understand development and technological risk. If not stemmed, this runs the risk of the Defence Force becoming a buyer of only in service equipment, which would largely eliminate local development.

534. This is accompanied by a major risk in that export controls that are perceived to be both slow and erratic. This can discourage repeat orders and even deter potential clients.

535. The other major threat lies in the efforts of China, Russia and India to use sales of arms at friendship prices and even donations of arms as a means of buying influence in Africa and other developing nations.

536. An interim threat continues in the form of some Central European powers dumping equipment from their large Cold War era holdings.

537. A further threat lies in those countries developing their own defence industries and now actively seeking export markets, Turkey and South Korea being two examples.

**Phase 3: Support the Turn-Around**

538. The third phase envisaged by the Defence Review will support the turn-around of the defence industry to ensure the long-term viability of the parts of the industry identified for retention. This will be achieved within identified existing capabilities and capabilities that can be quickly and efficiently established or re-established\(^\text{213}\), taking due account of the result of a thorough SWOT analysis of the relevant sector.

539. This phase must also be used to inspire the next generation of scientists, engineers and technicians if the industry is to survive and prosper. This will require a specific, focused effort, and at its centre will have to be a number of high profile projects – as, for instance, the Rooivalk was in its day – and some ‘blue sky’/‘clean sheet of paper’ research and development projects that can grab and hold the imagination of the bright young people who will be essential to the future of the industry.

540. Key elements will be:

\(^{213}\text{Defence Review 2015, Chapter 15, Page 15-19, Paragraph 130}\)
a. A clear and confirmed Defence Force requirement;
b. Defence Force funding to support the development;
c. Cooperation with universities to assist with research and to provide the scientists and engineers (over time); and
d. Infrastructure and mentors, from within industry.

541. Specific measures to be implemented during this phase will include:

a. Giving the Defence Force medium- and long-term authority to commit funds for multi-year equipment projects and programmes.
b. Standardising on platforms in production or about to enter production (see paragraphs 517 to 519 above), both to achieve economies of scale and to facilitate the through-life support of those platforms. This will not, however, be at the expense of mission-suitability.
c. Adopting a half-generation change-over for equipment, whereby the Defence Force will as a rule always have half of any one fleet of equipment or vehicles comprise proven equipment or vehicles, and the other half being replaced by new-technology equipment or vehicles.\(^{214}\)

That will:

i. Ensure that the Defence Force always has proven equipment to hand and keeps up to date with technological developments.

ii. Ensure that the Defence Force avoids problems of block obsolescence as are currently being experienced.

iii. Ensure long, over-lapping production runs for the industry.

iv. Ensure that design and development teams are kept active.

d. In line with the ‘half-generation’ concept, the Defence Force will extend orders for items in production or about to enter production to cover approximately half of the existing fleet that is to be replaced or the envisaged fleet where a new capability is being acquired.\(^{215}\)

e. Active support for the export of equipment in production for the Defence Force to the extent of allowing the sale of batches intended for the Defence Force where that does not present undue risk or any cost to the Defence Force but will facilitate an order.\(^{216}\)

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\(^{214}\) The Air Force has, in fact, done this in the past: Vampire and Sabre, Sabre and Mirage III, Mirage III and Mirage F1, Mirage F1 and Cheetah C, only dropping this approach in the 1990s for lack of funding.

\(^{215}\) This might, for instance, see extension of Badger production to equip three of the planned five mechanised infantry battalion groups, the remaining battalion groups retaining upgrade Ratels until replacement by a new generation ICV to follow onto the Badger programme. Similarly, the Navy might extend the acquisition of OPVs to meet half of the envisaged OPV fleet, the remainder being built later to a new or improved design.

\(^{216}\) One can consider here the sale and transfer by France of a FREMM class frigate to Egypt before the French Navy's own requirements had been met.
f. Making visible to industry the Defence Force's medium- and long-term equipment and modernisation/upgrade requirements to enable industry to plan efficiently.
   ⇒ This might be done by means of a Capital Acquisition and Expenditure Statement issued as a public document, covering all but particularly sensitive projects, setting out the capabilities to be acquired, the numbers required and the envisaged funding levels and timescales.

g. Supporting the local development of equipment and systems to meet identified and defined requirements, insofar as this is offers an optimal, practicable and affordable solution.217

h. Supporting joint ventures with foreign governments and defence companies218.

i. Guiding and supporting industry-funded research and development to meet future requirements and to pursue some potentially relevant ‘blue sky’ concepts.

**Phase 4: Support Future Development**

542. The fourth phase will be intended to establish a base from which the industry will be able to develop into the future and expand its capabilities.219

543. This will be achieved by the Defence Force and the industry jointly identifying those areas into which the industry can logically expand and then supporting that expansion:

   a. To meet identified sovereign and strategic independence requirements.
   b. To meet other requirements where they are sufficiently substantial to justify local development.
   c. Where there is sufficient identified joint venture or export potential.
   d. Where there is substantial potential for spin-off, spill-over and knock-on benefits for other parts of the industry and/or for the wider economy.

544. Opportunities for joint ventures and/or exports might be found in several fields, among them guided weapons, artillery systems, electronic warfare and communications systems.

217 Local development of a new armoured car to replace the Rooikat, for instance, could meet all three of those requirements, whereas local development of a submarine or fighter aircraft would be difficult to justify.

218 As is being done in respect of the A-Darter AAM.

545. Areas of potentially substantial economic benefit might be in software development and the local manufacture of ‘commercial-off-the-shelf’ (COTS) and ‘military-off-the-shelf’ (MOTS) items for the Defence Force.

546. This phase should also see careful analysis of the potential for and of joint ventures and even partnerships with:
   a. Defence companies in countries with similar needs or a similar level of defence technology;
   b. International defence groups; and
   c. Governmental defence research, development and manufacturing entities in other countries.

547. The successful implementation of this phase will depend on a careful and thorough analysis of the industry and its potential in the continental and defence world markets, and the identification of areas – general or niche – in which there is real potential for the South African industry to take a leading role.

**Phase 5: Reposition Sovereign Capabilities**

548. This phase is an overarching one that will be implemented over the timescale of the entire programme as and when it is practicable to do so. It is intended to ensure that capabilities that have been identified as requiring sovereign control are in fact controlled by either a state-owned company or a private South African-owned company.

549. Where such capability is controlled by a foreign company, government will as and when strategic considerations dictate or as and when it is practicable in business terms, either:
   a. Acquire those capabilities from their owners at a mutually agreed market value and in accordance with the relevant legislation; or
   b. Establish or re-establish the necessary capabilities within Denel and/or one or more South African owned companies.

550. Government will, however, give due and fair consideration to investment and technology development that has been carried out by the foreign owners not just in determining with them the market value, but also in working with

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220 i.e. 51% South African ownership and South African executive management; see Paragraphs 138.a. and 141 above, which summarise the formulation in the 2015 Defence Review, Chapter 15, Page 15-4, Paragraph 17 and Pages 15-11 and 15-12, Paragraphs 70 to 75.

them to find a way to enable the company to continue to operate in and export from South Africa where that is practicable and both parties desire it.

551. Also, establishing or re-establishing such capabilities within Denel or a South African owned company does not, insofar as that does not compromise the purpose of sovereign control of the capability:
   a. Preclude procuring components, sub-assemblies or software from the original company; or
   b. Engaging in joint development of future equipment or systems.

552. Whichever option – buy out or capability establishment/re-establishment – is chosen, it will be accompanied by a focused programme to develop the necessary skills base, which could include drawing back into the industry persons with expertise and experience who may have moved to another industry or retired, so mentor the future generation of engineers and scientists.

LONG-TERM SUPPORT FOR THE DEFENCE INDUSTRY

553. The various measures introduced during Phases 2, 3 and 4 will form the basis for future cooperation between the Defence Force and the defence industry, taking the form of an optimised Defence Force acquisition concept, policy and strategy.

554. It is recognised that maintaining a defence capability, developing defence equipment, systems, weapons and munitions and maintaining a defence industrial capability are all long-term endeavours\textsuperscript{222, 223} and that, therefore, government will take a long-term view in respect of the development and support of the defence industry.

555. The National Defence Industry Council will, on the basis of the above and this present initial strategy, develop and regularly update the Defence Industry Strategy\textsuperscript{224}, taking into account:
   a. Requirements arising from the evolving strategic situation and the missions falling to the Defence Force;

\textsuperscript{222} White Paper on Defence 1996, Chapter 4, Paragraph 6.2.
\textsuperscript{223} Development of a new system can take up to ten years (it can be done vastly more quickly when necessary, but at some risk), and that system will be in service for between twenty and thirty years, requiring support, modernisation and upgrading through its life.
\textsuperscript{224} Note, for instance, the similar role of the planned Self-Reliant Defense Posture (SRDP) project office of the Philippines Department of National Defense; IHS Jane's Defence Weekly, 18 January 2017, page 23.
b. Emerging export opportunities and potential;
c. Developments in defence and other relevant technologies;
d. Developments in the international defence industry; and
e. The evolving national economic and industrial policies, strategies and related regulations; with
f. Prioritisation of defence industry capabilities determined by a Defence Industrial Prioritisation Committee appointed by the Minister of Defence.

556. The defence industry will be further supported by other government departments as may be relevant from time to time.

557. The NDIC will also work towards achieving a fully integrated and coherent national approach to the defence industry. This will be done in parallel with a Department of Defence initiative to fully acquaint other government departments, services and agencies with the importance of the industry, with its range of capabilities, and with the need for an integrated national approach to defence. The NDIC programme will additionally set out the potential inherent in utilising the industry's capabilities optimally.

558. A key factor in ensuring the survival and future success of the defence industry will be to ensure its full integration into the mainstream of national industrial policy as a distinct and supported sector of the industrial base.

559. A further key factor will be for the government and the industry to clearly communicate South Africa's defence industry capabilities, capacities and potential.

DEFENCE FORCE ACQUISITION STRATEGY

560. The acquisition of equipment and systems for the Defence Force will be based primarily on the attainment of the Defence Capability Strategy, once finalised, in terms of:
   a. The types and numbers of equipment and systems to be acquired, with selection based primarily on performance and through-life cost;
   b. The phasing of that acquisition in step with the development of the required defence capability sets; and

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226 Defence Review 2015, Chapter 15, Page 15-23, Paragraph 157. This Committee will be focused on defence requirements and export opportunities.
c. The linked development of support and sustainment capability.

561. The fundamental, underlying, concept is to continuously:
   a. Equip the Defence Force cost-effectively in terms of both acquisition cost and through-life cost;
   b. With equipment and systems optimised as far as possible for its specific needs;
   c. That is locally supportable and sustainable; and
   d. To do so in such a way as to reduce the impact of defence funding on the economy by means of:
      i. Local sourcing, support and sustainment insofar as that is practicable and cost-effective; and
      ii. Support for defence exports.

562. The acquisition policy, therefore, is focused on:
   a. Developing and executing a Defence Capital Acquisition Plan to coherently meet the requirements of the Defence Capability Strategy;
   b. Maintaining identified key technologies, capabilities and capacities, including the vesting of such in identified industry partners;
   c. Timely and efficient acquisition, with a focus on risk reduction;
   d. Sustaining and further developing the defence industry by providing an identified and agreed long-term core workload that will enable industry to focus on sustaining and developing identified and agreed capabilities\textsuperscript{228};
   e. Setting the parameters within which Armscor will support the defence acquisition process.

563. The Defence Force will, accordingly, develop and implement:
   a. A Defence Capability Strategy;
   b. A prioritised Integrated Defence Capital Acquisition Strategy; and
   c. A prioritised Integrated Defence Capital Acquisition Plan; all three of which
   d. Will be regularly updated to be aligned with the Defence and Military Strategies as they evolve in the light of the evolving strategic situation; and
   e. Will be based on the concepts of efficient through-life capability management.

\textsuperscript{228} This workload to be planned in alignment with the Defence Force Capability Reference Model and the Military Strategy, as updated from time to time.
564. The Defence Capital Acquisition Strategy will be designed to:
   a. Ensure synchronised joint capability development and sustainment, to avoid any imbalance in overall defence capability or within a service;
   b. Ensure interoperability within and among the services;
   c. Address prime mission equipment as complete systems or ‘capability packages’ by means of synchronised projects or sub-projects that enable a service to field a complete capability at one time (Capability-Based Acquisition);
   d. Allow long-term, coherent and integrated modernisation and upgrade plans to be developed and implemented within the services and across the Defence Force; and
   e. Provide for the reconfiguration of equipment to other roles as it is replaced in its original primary role, flowing equipment through successive, less-demanding roles until it is finally phased out altogether.
   f. The latter two aspects will form part of a wider introduction and application of a full through-life capability management strategy.

565. Those strategies and plans will, except in respect of exceptionally sensitive matters be made visible to:
   a. The companies of the defence industry, together with updates or changes, to enable the companies of the industry to plan effectively and efficiently.
   b. To the Department of Trade and Industry to facilitate alignment and coordination with national industrial development strategy and plans where that is practicable;
c. The Department of Science and Technology, to facilitate alignment and coordination of research and development programmes.

566. Several key principles will govern the acquisition process, and are set out below.

**Capability-Based Acquisition**

567. Acquisition of equipment and systems will as far as may be practicable be conducted on the basis of acquiring a complete, integrated capability, rather than in the form of discrete equipment items or sub-systems.

568. The required capability will be clearly and fully defined prior to commencement of the acquisition process, with all necessary approvals in place.

569. A capability can in this context be described as comprising:
   a. The prime mission equipment in question (e.g. a combat vehicle, ship or aircraft);
   b. Attrition replacement and reserve (e.g. items in the maintenance cycle) equipment;
   c. Specific, direct support equipment;
   d. The relevant technical and logistic support equipment;
   e. The relevant training equipment and simulators;
   f. Adequate stocks of munitions and spares;
   g. Trained personnel, including specifically trained instructors; and
   h. The requisite facilities, including accommodation, workshops, magazines, stores, classrooms, training areas and firing ranges.
570. For Example:

a. A new combat vehicle will be acquired as a complete capability package to ensure that the unit as a whole is coherently equipped and can make effective use of its prime mission equipment, not being hampered by less capable support equipment and vehicles. Such a capability package would include:
   i. All variants required by the user units;
   ii. All major support equipment and vehicles;
   iii. All training simulators and equipment;
   iv. All equipment/system-specific maintenance equipment;
   v. Munitions and spares to set levels; and
   vi. The buildings and other facilities required by the unit.

b. A new warship will be acquired as a complete capability package, including:
   i. Its shipboard helicopter(s);
   ii. Any integral unmanned systems;
   iii. Boarding boats or other integral small craft;
   iv. The training simulators and equipment for the ship and its sub-systems;
   v. Munitions and spares to set levels; and
   vi. The base support facility.
571. Capability-based acquisition further implies acquiring a ‘partial full’ capability set rather than all of one element of the overall capability, i.e. acquisition of a complete unit set of combat vehicles and all related items, rather than all of the vehicles and only then all of the other related equipment. This ensures that the Defence Force has at least one unit that is fully equipped with the new system and available for operations at the earliest possible time. Additional units can then be equipped as funding allows.

Through-Life Costing and Opportunity Cost

572. Acquisition projects will be approved primarily on the basis of operational needs, but will be evaluated prior to approval and final prioritisation on the basis of an analysis and comparison of the capability in question in terms of:
   a. Predicted through-life cost, individually and as a component of a wider capability set;
   b. Value for money in terms of operational importance and effectiveness on the one hand and cost (acquisition and through-life) on the other, individually and as a component of a wider capability set;
   c. Opportunity cost, both in financial terms and relative to other capabilities; and
   d. Opportunity potential (e.g. potential for export sales or further development to meet other requirements, as demonstrated by the export of Rooivalk subsystems and the Badger turret system, and as in the case of Denel’s long-range 105 mm gun).

573. In a case where the opportunity for export sales is particularly good, the decision may be to accept a higher initial development investment and acquisition cost, but this should be funded separately, and perhaps from general government funds as an export development allowance.

574. In cases where it is a practicable option, the Defence Force will consider contracting for operational availability of an equipment or system, rather than acquisition, support and sustainment (‘power by the hour’).229

Smoothened Acquisition

575. The Defence Capital Acquisition Plan will be a long-term, regularly updated, plan that is aligned with the defence industry’s capabilities and capacities in respect of items that are to be acquired locally, and that is designed to:

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229 As the Royal Navy has done in respect of offshore patrol vessels.
a. Avoid block obsolescence, for instance by means of ‘half-generation’ replacement of prime mission equipment (e.g. replace half of the Ratel fleet with Badger, the remaining half to be replaced by a Badger Mk 2 or a new vehicle later)\textsuperscript{230};

b. Avoid the ‘boom or bust’ syndrome by synchronising acquisition projects among the services. The Army, for instance, generally acquires large numbers of relatively cheap equipment, whereas the Navy and Air Force acquire small numbers of very expensive systems. The acquisition programme will, therefore, seek to implement a continuous flow of Army acquisition projects, with Navy and Air Force projects alternating to make optimal use of smoothed defence acquisition funding;

c. Retain project management skills within the services and their constituent corps or branches;

d. Achieve long production runs, for instance by means of standardisation of vehicles and other equipment across several applications, to achieve economies of scale and to keep manufacturing capabilities and capacities functional;

e. Retain design and development capabilities and capacities within the industry, for instance by means of overlapping half-generation replacement of equipment and systems;

f. Integrate refit, upgrade and modernisation programmes with the acquisition plan, to make optimal use of design and development and manufacturing capabilities, and to provide additional, practically phased, work load for the industry;

g. Allow properly planned through-life management of equipment and systems, which may include availability- or performance-based support and sustainment contracts placed with industry to complement the Defence Force’s own capabilities and capacities; and

h. Enable the companies in the industry to plan properly.

576. The advantages and benefits of long and overlapping production runs can be further increased by adopting a ‘rolling build’ approach in which a basic system is acquired over an extended period, but is continuously upgraded as batches succeed each other, with upgrades being retrofitted to earlier batches as they enter major maintenance cycles. This will integrate

\textsuperscript{230} This was, in fact, in the past the practise of the Air Force, e.g. Vampire and Sable, Sabre and Mirage III, Mirage III and Mirage F1, Mirage F1 and Cheetah. Where large numbers of equipment are involved, replacement could also be handled in thirds of the fleet.
production with design and development work between half-generation change-overs.\textsuperscript{231}

577. In this respect the Defence Force will consider, and where the potential justifies it, seek government approval of extended multi-year contracts, both to enjoy economies of scale and to ensure a steady work load for the industry. This approach could be applied most beneficially to projects involving large numbers or smaller numbers of items that have a long build time, for instance:

a. A family of vehicles that includes variants for multiple roles within the Army, with the potential for a 20-year production programme, introducing improvements along the way and then refitting earlier vehicles; and

b. The local building of surface vessels of several types for the Navy, based on an agreed long-term fleet design and plan.\textsuperscript{232}

c. A combined Rooivalk and Oryx replacement programme.

578. The Defence Capital Acquisition Strategy and Plan will, as far as it is practicable without detriment to required defence capability, be aligned and coordinated with the industrial development plans of the Department of Trade and Industry, including:

a. Coordinated education and training programmes;

b. Geographic distribution of manufacturing capabilities and capacities; and

c. Optimal exploitation of spill-over\textsuperscript{233}, spin-off\textsuperscript{234} and knock-on\textsuperscript{235} effects of defence acquisition projects.

579. The Defence Capital Acquisition Strategy and Plan will be complemented by an aligned Defence Procurement Strategy and Plan based on the same objectives, including making use of defence procurement to boost local economies where that is practicable.

\textsuperscript{231} A ‘rolling build’ programme will, however, require regular renewal of performance targets.

\textsuperscript{232} In this regard one can consider Canada’s National Ship-Building Strategy and its 30-year ‘umbrella contracts’ awarded to two yards, and also Australia’s commitment to local ship-building and the US Navy’s approach of ‘design a little, test a little, build a little’ as applied to the Arleigh Burke class destroyers, which has allowed a long, uninterrupted build programme while introducing with east succeeding ‘flight’ of ships.

\textsuperscript{233} Spin-Off: The direct effect of new skills, processes and technologies within a sector, leading to new products or better ways of manufacturing or supporting products.

\textsuperscript{234} Spill-Over: The indirect effect of new skills, processes and technologies ‘spilling over’ into another sector of the economy, leading to new developments or innovation. This can take the form of a technology transfer, but also of engineers and technicians moving to other sectors and applying their knowledge and skills there.

\textsuperscript{235} Knock-on: The effect of the general expenditure associated with a major project, much of which goes outside the defence sector, and the effect of the employment generated, in terms of the purchasing power of the employees.
**Standardisation: Families of Vehicles and Systems**

580. Wherever practicable, the Defence Force will acquire ‘families’ of vehicles and systems, with variants developed for different roles as required. This will:

a. Ensure tactical coherence (for instance identical protection and off-road mobility);

b. Simplify maintenance and support in the field;

c. Reduce the required spares holdings;

d. Simplify training;

e. Simplify and reduce the cost of through-life sustainment and upgrades;

f. Extend production runs (perhaps incorporating batch-wise upgrade as a ‘rolling’ production programme);

g. Achieve economies of scale in manufacture; and

h. Simplify the initial design and development effort.

581. The Army has, in fact, gone some way towards adopting this concept in the past with, for instance the Ratel and Badger ‘families’ for the mechanised infantry, and the Casspir ‘family’ for the motorised infantry.

582. The concept can, however, be taken further in some cases, for instance by using identical platforms for all vehicles of a motorised infantry battalion, including the logistic vehicles of the battalion. The existing Casspir family of vehicles, for instance, includes 5-ton and 10-ton logistic variants in addition to the basic APC, the weapons carriers and command and ambulance variants. This concept could readily be taken to its logical extent for the future APC and, to an extent, also with the Badger platform for mechanised forces.

583. Vehicles are just one example, the Navy could develop a standard medium-size hull for a range of patrol and other roles, and the same concept can be applied to other systems.

584. While adopting a ‘family’ approach will often reduce overall acquisition cost, the real gains will be in the reduced support and sustainment costs over the

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236 See Annexure 5 - The Family of Vehicles Concept.
237 The Royal Australian Navy conducted a study of the respective acquisition costs of either a single fleet of 11 Air Warfare Destroyers (a very ‘high-end’ ship), a single fleet of 11 simpler frigates and mixed fleets of 3+9 and 6+11 respectively. The outcome was that the less capable 6+5 mix would cost the same as 11 destroyers, while the other two options offered acquisition savings of only some 7%. The mixed fleet options would also bring higher through-life sustainment cost (differing training, spares and maintenance requirements) and, in the case of a local design the additional design and development cost of the second type. See: Naval Shipbuilding, Defence SA Advisory Board, December 2009.
20- to 30-year service life of the equipment or system, which is widely considered to amount to at least double the initial acquisition cost. The aggregate saving can, thus, be substantial.

**Standardisation: Sub-Systems, Sub-Assemblies, Components**

585. A related concept is that of sub-system, sub-assembly and component standardisation across parts of a service's equipment, for instance:

a. Standardising a wheel size for tactical vehicles, as the Army has done, or perhaps standardising on one engine in different states of tune for various vehicles;

b. Using the same engines in helicopter types that will generally work together and be collocated, as was partly achieved with the Rooivalk and Oryx (they in fact use slightly different variants of the same engine as a result of differing development timescales); or

c. Standardising on compressors, generators and pumps across ships of the fleet.

586. While in some cases this approach may be more expensive per specific item, it will in most cases generate savings overall, by allowing the achievement of economies of scale, by simplifying training and maintenance, and by reducing required spares holdings.

587. While this may appear to be primarily a matter of logistics, it will also bring operational and tactical advantages by reducing spares and tools that must be carried at unit-level and by facilitating speedy repair in the field.

**Single-Source Acquisition**

588. As a principle the Defence Force will manage acquisition by means of open competition (open tender) and, where practicable and beneficial, multi-source contracting.

589. There will however be some items that it is not practicable or desirable to acquire in this way, be it for security or security of supply reasons, or because the requirement calls for local manufacture but is not sufficient to allow splitting. In such cases the Defence Force may opt for single-source acquisition, using careful contracting and performance and price benchmarking to protect its interests.238

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238 This is the approach adopted by Canada in respect of the 30-year ‘umbrella’ contracts awarded to two ship-yards under the National Shipbuilding Strategy. The Australian ‘Continuous Build’ programme will, in effect, also take this approach.
590. In some specific cases it may be preferable to establish (or maintain) a local monopoly:
   a. To establish and maintain a local centre of expertise in a particular field; and/or
   b. To ensure security or security of supply, again using contracting and benchmarking to protect the interests of the Defence Force.

591. In both the case of a single-source acquisition and that of a deliberate monopoly, the Defence Force will, through Armscor as its acquisition agency and through the contracted supplier, endeavour to develop multiple sources as sub-contractors to supply subsystems or components. This will provide a measure of redundancy and facilitate the development of SMMEs within the defence industry and its wider supply chain.

592. It is important to remember that the past innovative successes achieved by the industry were mostly the result of deliberate and focused single-source contracting with a prime contractor that was developed by means of support and contracts to become a dedicated system house for a particular capability. The interests of the Defence Force were secured by means of ensuring:
   a. Full visibility of the entire development and supply chain; and

593. For this approach to be viable and to the benefit of the Defence Force, it will be necessary to guarantee – by means of multi-year contracts – an agreed flow of work to the company or companies concerned, to enable them to establish, sustain and further develop the requisite industrial capabilities and capacities.

594. The key element is to establish, develop and maintain a long-term strategic partnership with the company or companies concerned, based on mutual trust, open communication and mutually agreed development targets.

**Industry Sustainment**

595. When a sector of the defence industry is faced with a lack of production orders and that sector has been identified for retention as part of South Africa’s defence industrial capability, the Defence Force will support its sustainment by means of:
   a. Phased refit, upgrade and modernisation work;
b. Research and development contracts; and 
c. In some cases, the production of ‘technology demonstrators’\textsuperscript{239} to serve as the starting point for a future development to production standard.

596. The investment required for the latter two can be as low as 10% of what would be required to actually take something into production, and will ensure that capabilities are not lost.

597. Developing technology demonstrators in key capability areas will also allow defence spending to be kept at acceptable levels while ensuring that South Africa can ramp up quickly to bring new equipment and systems into production should the strategic climate deteriorate.

\textit{Focused Defence Industrial Participation}\textsuperscript{240}

598. All foreign OEMs will be required to submit a viable and binding DIP plan as part of their tender for Defence Force contracts, with effective management and measurement, and effective penalties for non-compliance.

599. Defence Industrial Participation (DIP) requirements will in future be focused on:
   a. Ensuring the effective and efficient through-life support of the equipment or system being acquired, including future modernisation and upgrades, by establishing the necessary capabilities in South Africa;
   b. Ensuring support for identified key sectors of the defence industry;
   c. Establishing identified key technologies within the defence industry\textsuperscript{241}; and
   d. Facilitating linkage with related government initiatives (IPAP, NDP, PPPFA, etc)\textsuperscript{242}.

600. Within these areas, the additional focus will be on:
   a. Human capital development;

\textsuperscript{239} Technology Demonstrator: An item of equipment or a system developed to a pre-industrialisation stage to keep design and development teams engaged, retain contact with developing technologies in the particular field, and to have a system close to production-ready should it be required, without committing to the cost of series production. This can also help avoid obsolescence.

\textsuperscript{240} Defence Review 2015, Chapter 15, Pages 15-8 and 15-9, Paragraphs 52 to 54.

\textsuperscript{241} Linking to the Localisation and Indigenisation programmes of the Department of Trade and Industry.

\textsuperscript{242} In this respect companies may be permitted to meet their DIP obligations by means of an investment in the Defence Industry Fund. The Indian government is considering a similar arrangement in terms of which up to 25% of an offset obligation may be invested in government approved funds that will channel those funds into the industry and particularly to medium, small and micro enterprises (HIS Jane’s Defence Weekly, 19 April 2017, Page 20).
b. Technology development;
c. Advanced manufacturing processes;
d. Participation in direct or indirect manufacturing of selected defence equipment; and
e. Targeted transfer of in-service support capabilities to a South African company or to the Defence Force, to be achieved during the execution of the supply contract; and
f. Support for SMEs, and particularly SMEs owned by military veterans or persons of other designated groups, to expand their roles within South Africa, become part of the supply chain of the foreign OEM, and to enter the export market.  

601. Export facilitation and access to the OEM supply chain will remain considerations, but secondary to the aspects set out in the above paragraph.

602. Every effort will be made to align the DIP commitments and the related NIP obligations to the Department of Trade and Industry, to achieve optimal benefit from the overall IP programme.

603. The Minister of Defence will further seek cabinet agreement to merge NIP obligations that arise from defence acquisitions with the DIP programme. This will:
   a. Serve to obtain best value for the Defence Force; and
   b. Obtain a better outcome overall, by enabling the supplier companies to meet their industrial participation obligations within the sectors with which they are familiar, rather than having to enter unfamiliar sectors.
   c. That merged DIP/NIP programme will, nevertheless, still be aligned with national development objectives.

The Defence Force/Industry Team:
Making Defence Requirements Visible to Industry

604. Effective and efficient support to the Defence Force by the defence industry depends on the industry knowing and understanding the requirements of the Defence Force, and on the Defence Force knowing and understanding the capabilities, capacities and limitations of the industry.

243 South Korea has recently amended its offset regulations to allow a higher multiplier for SMEs compared to major companies – a standard x1.5 multiplier for SMEs, and a x2 for exports (x1.5 for major companies).
605. That can only be achieved by familiarising the industry with the Capability Strategy, the Capital Acquisition Strategy and the Capital Acquisition Plan. The industry will then be able to:
   a. Assist the Defence Force with detailed development of its capability requirement;
   b. Advise the Defence Force as to how it can most efficiently meet requirements;
   c. Propose alternative equipment/system options better suited to its capabilities and capacities or made possible by new technologies or processes;
   d. Warn the Defence Force of gaps in existing or envisaged industry capabilities and capacities; and
   e. Plan its investments in plant and technologies efficiently.

606. It is, therefore, essential that the Defence Force and the defence industry operate as an integrated team with full visibility of each other’s requirements and capabilities.

607. The Defence Force will, therefore, develop and make visible to the defence industry:
   a. A coherent long-term acquisition vision, based on its assessment of requirements in the context of the evolving strategic situation, for instance a Navy fleet design and 30-year conceptual shipbuilding plan to achieve that fleet design, adapted over time to align with strategic developments;
   b. A ten-year ‘rolling’ acquisition plan, based on that vision; and its view of what capabilities should be sustained or developed within the industry.
SUPPORT FOR INTERNATIONAL ENGAGEMENT

608. If the South African defence industry is to meet the requirements of the Defence Force effectively and efficiently it will have to establish some level of integration with the wider international defence industry:

a. It is not possible to meet all requirements from local development and manufacture, but if the industry establishes good relations with defence companies in other countries, it will be in a better position to meet a greater proportion of requirements:
   i. Directly, by virtue of technologies and procedures gained from its exposure to those companies; or
   ii. Indirectly, by manufacturing in South Africa under licence from an OEM and gradually establishing additional capabilities in South Africa.

b. It is not possible for a relatively small defence industry to alone keep abreast of all relevant technology developments, but close links with companies in other countries – and particularly with the large

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244 See the 1996 White Paper on the Defence-Related Industries, Chapter 8 Paragraph 4 (Note: The version on the DoD Website, not the printed version). This view is also strongly propounded by Australia, Finland, Sweden and Singapore among others in their national documents pertaining to the defence industry. The Singapore view is that “as a small country with limited resources, we must collaborate nationally and force partnerships internationally to develop the defence and commercial technologies we require”. Australia has a specific ‘Global Supply Chain’ policy to promote Australian companies to international and foreign defence companies and groups as a supplier of components, sub-assemblies and sub-systems.
international OEMs – will enable the South African industry to develop a sound understanding of new developments and then to apply them to local equipment development where relevant.

609. It will also be to the benefit of the South African industry to:
   a. Work with defence companies in other countries on joint development projects, which will broaden its insight and experience base; and
   b. Win development or just manufacturing sub-contracts from major international OEMs, which can provide a valuable base-load of work, as well as establishing a relationship for future cooperation at higher levels.

610. Similarly, it is accepted that current and likely medium term defence funding levels will not be sufficient to allow local development of equipment in all classes where that might be desirable\(^{245}\). The solution here will in some cases be to initially opt for local assembly and then partial manufacture under licence, with modifications as required to suit the Defence Force's most important specific requirements for the particular equipment.

611. This is also in line with the 1996 White Paper on Defence, which stated that the “DoD will engage in cooperative ventures with its counterparts throughout the world in such fields as....and procurement of arms and equipment”.\(^{246}\) To this end Government has entered into defence cooperation and defence industrial cooperation agreements with a number of countries, and will:
   a. Revisit the existing agreements to ensure that they are being followed up to the maximum benefit of the Defence Force and the defence industry and present real ‘value for money’ relative to the cost of routine meetings;
   b. Ensure greater focus on these matters during ‘bilaterals’ with other countries; and
   c. Enter into further such agreements with countries whose defence requirements and/or defence industrial profiles suggest that there would be mutual benefit.

612. Such initial agreements with foreign OEMs helped lay the foundation for the industry in the 1960s and 1970s, and can serve the same purpose today,

\(^{245}\) Even India, with its vastly larger defence budget has struggled to implement its 'build in India' programme, so South Africa's defence industry strategy must remain realistic and pragmatic, focusing on what is practicable and cost-effective.

\(^{246}\) White Paper on Defence 1996, Chapter 4, Paragraph 6.3 (Note: The version on the DoD Website, not the printed version).
leading to a later move to full local manufacture and then local design and development.

613. The Defence Force will, therefore, in conjunction with the Department of International Relations and Cooperation, support the industry in entering international defence supply chains, with the National Defence Industry Council as the agency to develop a programme to achieve and expand the international footprint of the industry\textsuperscript{247}.

614. The Defence Force will, therefore, also:
\begin{itemize}
\item[a.] Support the use of research, test, proving and evaluation facilities and ranges by South African defence companies to develop and qualify their products for export;
\item[b.] Encourage making those facilities and ranges available for use by foreign defence companies and foreign armed forces, thereby:
\begin{itemize}
\item[i.] Improving the visibility of the South African defence industrial and test and evaluation capabilities; and
\item[ii.] Enabling the industry and the Defence Force to gain insight into doctrinal and technological developments in other countries; and
\end{itemize}
\item[c.] Provide such direct support for development, test and evaluation projects or campaigns as may be necessary, insofar as this:
\begin{itemize}
\item[i.] Does not impinge on readiness; and insofar as
\item[ii.] The cost incurred can either be recovered or is deemed acceptable for the benefit gained by the industry, which is a core element of defence capability, or by the Defence Force itself through the insights gained.
\end{itemize}
\end{itemize}

**DEFENCE TECHNOLOGY POLICY AND STRATEGY**\textsuperscript{248}

615. The rate at which technologies relevant to defence are developing and evolving requires that any country that desires to have an effective defence industry must keep abreast of those developments, and also of developments in the underlying sciences. This applies to both the Defence Force and its supporting industry.\textsuperscript{249}

\textsuperscript{247} Note that some countries, for instance the Philippines (IHS Jane's Defence Weekly, 18 January 2017, page 23) and India (IHS Jane's Defence Weekly, 7 December 2016, page 23) offer tax breaks and other incentives to encourage foreign defence companies to establish themselves in the country, India going so far as to allow 100% foreign ownership of local companies.

\textsuperscript{248} Defence Review 2015, Chapter 15, Pages 15-9 to 15-11, Paragraphs 57 to 68.

\textsuperscript{249} This is specifically recognised in the White Paper on Science and Technology 1996, Section 8.2.5, which states that a strong technology base is a prerequisite for the Defence Force's strategy and that it is necessary
616. Further, it is necessary for economic and industrial efficiency to recognise where there is potential for technology ‘spin-off’ from defence technologies into civilian industry, and where there is potential for useful ‘spin-on’ from civilian technologies into defence.\\(^{250}\)

617. To achieve this, the Department of Defence will appoint a Chief Defence Scientist with a broad defence research remit and with specific responsibility for defining, establishing and maintaining the defence technology base\\(^{251}\) and the defence research and development requirement.

618. Maintaining an up-to-date defence technology database will:
   a. Provide the Defence Force with the technical support to be a knowledgeable buyer, by ensuring understanding of evolving technologies and their implications;
   b. Provide the Defence Force with the technical support to be a knowledgeable user, among others by facilitating operations research, test and evaluation, and technical intelligence interpretation;
   c. Ensuring effectiveness and cost-effectiveness of equipment by updating planned maintenance and support procedures and optimising modernisation and upgrade;
   d. Facilitating the development of optimised equipment; and
   e. Facilitating the updating/adaptation of doctrine or development of new doctrine by providing a full understanding of evolving and new defence technologies and their implications.

619. The Chief Defence Scientist will adopt a focused approach to prevent duplication of and seek to achieve synergy among, the capabilities, capacities and efforts within the defence sector and those in the civilian sector. To this end, he will:
   a. Work with the Department of Trade and Industry (DTI) and the Department of Science and Technology (DST) to harmonise innovation and innovation support programmes across government;
   b. Establish links with the Technology Innovation Agency and the various relevant Technology Stations at Universities and Universities of Technology; and

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\(^{250}\) See the White Paper on Science and Technology 1996, Section 8.2.5.

\(^{251}\) See the 1999 White Paper on the Defence-Related Industries, Page 41.
c. Participate where relevant in the DTI's R&D programmes in respect of:
   i. Titanium metal powder manufacturing;
   ii. Fuel cell development;
   iii. Additive Manufacturing; and
   iv. Other relevant projects in the future; and will

d. In addition, advise the Department of Defence and the Defence Force on:
   i. The optimisation of defence technology agreements with other countries; and
   ii. The potential value of such agreements with additional countries.

620. He will direct long-term funding to meet defence technology requirements to public and private defence institutes, research bodies, companies in industry and universities, with preference accorded to capabilities and technologies:
   a. Of specific strategic importance;
   b. Of other particular importance or value; and
   c. With dual-use (military and civilian) potential.

621. He will further also fund:
   a. The development and regular updating (to when it is replaced) of technology demonstrators in key fields, to enable the Defence Force and the industry to keep abreast of practical applications of new technologies and to de-risk future acquisition projects.
   b. The pursuit of ‘blue sky’ research and development in selected fields to be set out in the Defence Technology Strategy, with in principle at least 10% of R&D funds being allocated to that purpose.

622. The strategy to be followed will be for South Africa to seek to:
   a. Be a leader in technology development where:
      i. There is an overriding need to do so;

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253 The Indian Ministry of Defence in early 2017 established a Technology Development Fund (TDF) under the Defence Research and Development Organisation (DRDO), to provide “micro, small and medium enterprises with up to $ 1.5 million per agreed technology project”, with the focus on projects that introduce “significant” improvements in equipment or manufacturing processes, lead to the development of “futuristic technologies” or “facilitate import substitution of components whose technologies do not exist within Indian industry” (IHS Jane’s Defence Weekly, 15 February 2017).
254 In April 2017 the Indian government additionally established a Defence Innovation Fund (DIF), funded by the state-owned Hindustan Aeronautics Limited and Bharat Electronics Limited with $ 15.5 million. Additional funding will be sought from the public and private sector. The fund is intended to “foster innovation and technology development in defence”, to which end it will engage with R&D institutes, universities and industry, to “carry out innovative development, which has the potential for future commercialisation” (IHS Jane’s Defence Weekly, 19 April 2017, Page 20).
ii. South Africa is already a leader or has potential to become a leader; and

iii. There is potential for real strategic advantage;

b. Be a leader in the application of new technologies where there is advantage to that;

c. Be a ‘close follower’ in other technology fields where there is advantage to that.

623. The Defence Review has identified the technology domains that will be the focus of the science and technology programme, with the prioritisation among them to be determined by the Chief Defence Scientist in line with the Defence Force’s capability requirements and the potential as recognised by his team and industry:

a. Command and control.
b. Information warfare.
c. Systems integration.
d. Secure communications.
e. Information technology, including data fusion.
f. Intelligence-gathering, sensor, analysis and evaluation.
g. Target acquisition and identification.
h. Unmanned systems.
i. Missiles and other guided munitions.
j. Night and poor visibility observation and engagement.
k. Electronic warfare, including ECM and ECCM.
l. Rugged tactical vehicles optimised for the likely theatres.
m. Mine and IED detection and protection.
n. Artillery precision bombardment and point target engagement.
o. Chemical, biological and radiological defence, including military carbons.
p. Battlefield medical care, optimised for the likely theatres.
q. Modelling and simulation.

624. It is important to understand that, while the cost of new equipment and systems will lead to them being kept in service longer, the rapid evolution and development of technologies that form part of that equipment or system will require frequent upgrades if it is to remain effective. Much of that upgrading will be in the broad IT field, and all of it will require the capability to execute complex system integration, including cross-generation system integration.
625. The Chief Defence Scientist will, further, support operations research to support:
   a. Strategic decision-making.
   b. Acquisition and procurement.
   c. Through-life management of equipment and systems.
   d. Doctrine development and the integration of new equipment.
   e. Development of sustainment techniques and procedures.

**INTELLECTUAL PROPERTY**

626. The intellectual property resulting from research and development wholly or partly funded by the Defence Force, clearly belongs wholly or partly to the Defence Force, and its rights in this respect will be managed by Armscor. There are two considerations to be addressed here: Security and possible royalties.

627. **Security**: The Defence Force will decide what restrictions may apply to the use of such IP where its use for export or civilian purposes might compromise the security of Defence Force operations.

628. **Royalties**: Royalties will be levied, if at all, only with due consideration for the fact that such a royalty charge would be added to the prices of any resulting equipment, which would:
   a. Increase the cost to the Defence Force, thereby defeating the purpose of such a charge, unless sales to the Defence Force are specifically exempt;
   b. Increase the price of the resulting equipment, rendering it less attractive on the export market, undermining the potential of the industry; and
   c. That the long-term negative impact will in most instances outweigh the short-term financial benefit of levying a royalty.

629. It is instructive to note that the National Defence Intellectual Property Office of China’s Central Military Commission’s Equipment Development Department has declassified 3,000 defence technology patents, and

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255 A scan of other countries policies suggests that the general trend is to retain ownership of defence-funded IP, but to allow free use of it – subject to security considerations – by the company concerned. The underlying principle here is that such free use will enable the company to develop other products, export successfully, etc, ensuring its future ability to carry out work for the military, and that that benefit outweighs any potential short-term benefit of levying a royalty.
released 2,346 of them for public use. This has been done to promote “civil-military integration” in the defence industrial sector. The People’s Liberation Army Daily newspaper has reported that it is the intention of the Minister of National Defence to release further documents, and to establish a dedicated internet portal for this purpose.\textsuperscript{256}

630. The intellectual property resulting from self-funded research and development by a company, clearly belongs entirely to that company, and may, in principle, be exploited by it in any way it deems fit. The Defence Force may, however, choose to impose some restrictions on the use and exploitation of such IP, if that would undermine the security and therefore effectiveness of equipment based on that IP that is in service with or being acquired for the Defence Force. In such an event the Defence Force would negotiate with the company to acquire that IP for an agreed amount, which would depend on the specific terms limiting its use and exploitation.

**GOVERNMENT SUPPORT TO THE DEFENCE INDUSTRY**

631. The primary support that government will provide to the industry will take the form of the new, focused and optimised defence acquisition strategy (Paragraphs 560 to 607 above), which will provide industry with a visible, planned and smoothed flow of both orders and Defence Force funded R&D projects.

632. The second main form of support will be support for defence exports (Paragraphs 638 to 669 and Paragraphs 677 to 679 below).

633. In addition to that support, the Department of Defence will work with other government departments and agencies to provide support to the industry in the form of:

a. Focused capital investment allowances or grants for the acquisition, adaptation or development of production technologies, production equipment and infrastructure;

b. Focused training and education allowances or grants for work force development, coupled with practical training opportunities within the Defence Force; and

c. Exemption from paying customs and excise duties and value added tax on certain imported technologies, sub-systems, sub-assemblies or components and necessary manufacturing equipment;

\textsuperscript{256} IHS Jane's Defence Weekly, 15 March 2017, page 23.
d. Exemption from or deferment of the application of legislation or regulations that would hamper the development of required defence industrial development.257

e. Some of this support might fall within the ambit of Special Economic Zones (see Paragraphs 677 to 679 below), but additional support will be provided where necessary.

634. Given the cost of some manufacturing plants and the necessarily on/off nature of some defence acquisition, government will consider the establishment of ‘government-owned/ contractor-operated’ (GOCO) plants where that seems likely to benefit the defence Force.

635. In order to achieve the necessary support for the industry, the Department of Defence will draw on the assistance and support of other relevant government departments and agencies, including:
   a. The Department of Public Enterprises, as the owner of Denel;
   b. The Department of Trade and Industry;
   c. The Department of Economic Development;
   d. The Department of Small Business Development;
   e. The National Treasury;
   f. The Department of Higher Education and Training;
   g. The Department of Science and Technology;
   h. The Department of Labour;
   i. The Department of Planning, Monitoring and Evaluation; and
   j. The Department of International Relations and Cooperation.

636. The government will, further, encourage relevant government departments and agencies to focus their acquisition projects and programmes on the defence industry where that is practicable. This will apply particularly to:
   a. The intelligence services;
   b. The Police Service;
   c. Correctional Services;
   d. The Border Management Agency; and
   e. Emergency services (e.g. fire and rescue).

**Alignment**

637. In addition, Government will seek to align the defence industry with the wider national development plans in the economic, industrial, science and technology and social fields, including to ensure national-level coherence.

257 As provided for in the 1999 White Paper on Defence-Related Industries (Page 10).
and also to leverage developments in other sectors for the defence industry. This will see continuous alignment of the defence industry strategy with:

- a. The National Development Plan 2030;
- b. The National Industrial Policy Framework;
- c. The Industrial Policy Action Plan (IPAP) of the Department of Trade and Industry, as updated from time to time;
- d. The DTI Black Industrialist Policy of 2015.
- g. DTI notice 721 of 2016 Codes of Good Practice on BBBEE.
- j. Defence Sector BBBEE Charter gazetted.
- k. Public Finance Management Act No 1 of 1999 as amended.
- l. Foreign policy in respect of defence exports.

### Support for Defence Exports

638. The 1996 White Paper on Defence expressly states that the defence industry must access the international market to facilitate cost-effective performance and to reduce the unit cost of items produced for the Defence Force.\(^{258}\)

639. Defence exports serve to:

- a. Reduce the cost to the Defence Force of development and of sustaining production facilities by spreading the costs over longer production runs (economies of scale), partly paid for by export sales;
- b. Generate earnings that can be applied to research and development;
- c. Give insight into other armed forces’ requirements, which can lead to enhancement of equipment or development of new items; and
- d. Reduce the financial impact of defence on the economy by the cost reduction effect and by foreign currency inflows.

640. At the strategic level, defence exports can help achieve inter-operability among the armed forces of allied or friendly states, for instance the countries providing force elements for the SADC Standby Brigade.

641. Defence exports are also a valuable tool of foreign policy, as a means to support friendly governments and demonstrating that support.

642. Defence exports are, therefore, more than just a matter of economics. They are also one of strategic and political import, and will be considered and handled with that clearly in mind, after which will come considerations of economic and industrial factors. They key factor will be the strategic effect or impact, followed by the political and economic factors. The question of the importance of the particular export to the defence industry will be considered in the light of these and, where the export in question is important or even vital to a sector of the defence industry considered to be strategic, may override political and economic factors:

a. **Strategic Considerations**: Will the particular export and the long-term links with the country concerned be in South Africa's strategic interests; and what might be strategic implications and opportunity costs?

b. **Political Considerations**: Will the particular export have any impact on South Africa's foreign policy posture and how South Africa is perceived, and what will be the impact of this?

c. **Economic Considerations**: What will be the economic benefit of the particular export, or will there be economic opportunity cost because it might alienate other countries?

d. **Industrial Considerations**: What is the importance of the particular export to the defence industry, and what positive (or negative) potential does it hold?

643. It is also important to understand that in almost all countries with a defence industry, there is strong government support for that industry's export efforts, precisely because of the benefits outlined above. In the case of the major arms producing nations, that support is centred at the highest levels – the cabinet and the prime minister or president.

644. In addition, most major arms producing nations have established government agencies, departments and/or systems specifically to facilitate and support arms exports, as have some smaller countries. Examples include:

a. **United States**: There are several export programmes managed by the Department of Defense:

   i. The Foreign Military Financing (FMF) programme finances the purchase of US equipment by friendly countries;

   ii. The Foreign Military Sales (FMS) programme manages government-to-government defence equipment transactions, and
sometimes also company-to-government ‘direct commercial sales’;

iii. The Excess Defence Articles (EDA) programme makes surplus equipment available to friendly countries;

iv. Department of State’s Bureau of Political-Military Affairs sets the policy for the FMF and FMS programmes.

v. The Defense Security Cooperation Agency (DSCA), implements the FMS system together with the services, and is also responsible for assisting US companies in foreign countries.

b. **United Kingdom**: The Defence and Security Organisation of the Department for International Trade (DSO DIT).

c. **Russia**: Rosoboronexport is a wholly government-owned enterprise that manages all defence export activities.

d. **France**:

   i. The Direction du développement international (DI) in the Defence Ministry\(^{259}\), which is responsible for relations with other armed forces and for defence export support\(^{260}\), working closely with French defence attachés through the MoD’s Delegation for International Relations (DRI); and

   ii. The Défence Conseil International (DCI), a 49.9% government-owned body that serves as a consultant to foreign armed forces buying French equipment.

e. **Spain**: The Directorate-General of Armaments and Equipment (DGAM) of the Ministry of Defence has a dedicated export support organisation (OFICAEX – Oficina de Apoyo Exterior) that liaises “constantly” with Spanish defence attaches worldwide, and advises companies of export opportunities\(^{261}\).

f. **Sweden**: The Swedish Defence Matériel Administration (FMV) is also tasked with supporting defence exports as a means to support and sustain the industry, and serves as the government representative in government-to-government transactions and supports companies in their export efforts.

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\(^{259}\) The Extra-EU defence exports' effects on European armaments cooperation; EU Directorate-General for External Policies, Policy Department; 2015.

\(^{260}\) The DI will subsidise smaller defence companies to cover the cost of attending international exhibitions.

\(^{261}\) Jane's Defence Weekly, 8 April 2015, Page 29.
g. **Turkey:** The Undersecretariat for Defence Industries “attaches utmost importance to international cooperation in the field of defence industry, and supports the participation of Turkish defence industry in joint procurement programmes”. The Undersecretariat’s Department of International Cooperation has the responsibility, among other matters, to:

i. “Coordinate offset and the export of defence industry products”, to “enable Turkish Defence Industry to reach a significant export and cooperation potential in international market(s)”; and

ii. Represent the Undersecretariat “as a specialized organization in both national and international platforms in the frame of collaboration in defence procurement programmes and industrialisation activities of the Undersecretariat”.

iii. “Research of potential international project opportunities”.

h. **Australia:** The Australian Military Sales Office is a directorate in the Capability Acquisition and Sustainment Group of the Ministry of Defence. It is responsible for:

i. Supporting Australian defence industry exports, serving as a “one stop shop” for defence companies seeking to promote and export their products, which role it has taken over by incorporating the former Defence Export Unit;

ii. Disposals of surplus equipment, which role it has taken over by incorporating the former Defence Disposals Agency;

iii. The Global Supply Chain Programme, which assists defence companies to market their components, sub-assemblies and sub-systems to international defence system OEMs; and

iv. International matériel cooperation agreements.

i. **Israel:** The Defence Sales Administration of the Ministry of Defence is responsible for promoting defence exports by general promotion and assistance to defence companies.

645. In many countries the Foreign Ministry and the diplomatic service are specifically tasked to support defence exports as part of their wider economic role, for instance in Italy and Poland.

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262 The website of the Undersecretariat for Defence Industries.
263 Established in July 2012.
646. The major European arms exporters, France, Germany and the United Kingdom provide export credit guarantees to support defence exports.

647. With these considerations in mind, Government will provide support to the defence industry to expand its international market share, with particular focus, developed on the basis of existing links, strategic and political considerations and market analyses on:
   a. Countries that are established clients of the industry;
   b. Africa, especially Sub-Saharan Africa;
   c. The Middle East;
   d. South-East Asia; and
   e. Latin America.

648. **The Commonwealth Opportunity.** Government will, in addition, take specific steps to leverage benefit for the defence industry from South Africa’s membership of the Commonwealth, seeking to persuade the other countries of this grouping of the advantages of joint research and development and joint acquisition on the one hand, and acquiring specific equipment from member countries that have particular expertise, capabilities and capacities in a given type of equipment.

649. Defence exports and defence industry cooperation will be a subject for discussion at all bi-national forums that include a strategic or defence component.

650. **The African Union.** South African equipment is well-suited to many of the missions in which African Union forces are engaged or are likely to become engaged. In addition, South African companies are better placed than others

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264 See Annexure 4 – Comments on Potential Markets.
to support equipment employed in the various peace and stabilisation missions in Africa. That suggests that the African Union should turn to South Africa in the first instance when equipment is required for such missions.

651. One challenge here is that most African Union missions are funded by the European Union and/or the United States, and it will be difficult to argue against the provision of equipment by one of the funding countries. This opportunity will, therefore, be pursued both at the African Union and in discussions with the European Union and the countries most involved in supporting such missions.

652. In addition, the Government will explore the opportunity of providing equipment and in-field support for deployed equipment (South African or other) in lieu of the annual cash contribution to the African Union and up to that value. This would enable South Africa to meet its financial commitment to the African Union while at the same time securing work for and employment in the defence industry.

653. **The United Nations.** Much the same argument as above applies in the case of United Nations missions in Africa, but also some missions elsewhere. Some South African companies are already contracted by the United Nations, but Government will seek to expand this opportunity for the defence industry. Apart from the provision of various types of equipment and stores for such missions, the possibility of establishing a hub in South Africa for the maintenance, repair and overhaul of equipment employed in long-term missions in Africa will also be explored.

654. The government as a whole will provide direct and substantive support for defence exports, including the development and implementation of a system for government-to-government sales of defence equipment, similar to the systems used by several of the major arms exporting countries.

655. To this end, Government will establish an inter-departmental defence export support body involving all of the departments with an interest in this matter, including:
   a. The Department of Defence (perhaps through the NDIC);
   b. The Department of International Relations and Cooperation (in recognition of the fact that defence exports are an act of foreign policy);
   c. The Department of Public Enterprises (as owner of Denel);
   d. The Department of Trade and Industry (as the custodian of industrial policy); and
e. The National Treasury (to support financial measures that may be required), and

656. This body might be the National Defence Industry Council or a subset thereof. In the event of a stand-alone body being decided upon, the NDIC will provide the secretariat services and liaison with the industry.

657. **Treaty Obligations:** Defence exports will be permitted only within the framework of any international agreements to which South Africa is party, among them:
   a. The Convention on Prohibitions or Restrictions on the Use of Conventional Weapons that are Excessively Harmful or have Indiscriminate Effects (CCW);
   b. The Missile Technology Control Regime (MTCR);
   c. The Chemical Weapons Convention (CWC);
   d. The Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological and Toxin Weapons (BTWC);
   e. The Treaty on the Non-Proliferation of Nuclear Weapons (NPT);
   f. The Africa Nuclear Weapons Free Zone Treaty (ANWFZ);
   g. The regulation of the International Atomic Energy Agency (IAEA);
   h. The Comprehensive Nuclear Test Ban Treaty (CTBT);
   i. The decisions of the Zangger Committee (Nuclear Exporters Committee);
   j. The decisions of the Nuclear Suppliers Group (NSG); and
   k. The Wassenaar Arrangement on Export Controls for Conventional Arms and Dual Use Goods and Technologies (Wassenaar Arrangement);

658. **Export Control:** The export of defence equipment will be controlled by:
   a. The National Conventional Arms Control Committee (NCACC), which will issue marketing, contracting and export permits in terms of its guidelines and regulations\(^{265}\), and the Regulation of Foreign Military Assistance Act\(^{266}\) and the Anti-Personnel Mines Prohibition Act\(^{267}\); and
   b. The South African Council for the Non-Proliferation of Weapons of Mass Destruction (NPC), which must issue a permit for the export of such items in addition to the permit issued by the NCACC.

\(^{265}\) The National Conventional Arms Control Act, No 41 of 2002 as amended.
\(^{266}\) Regulation of Foreign Military Assistance Act, No 15 of 1998.
\(^{267}\) Anti-Personnel Mines Prohibition Act, No 36 of 2003.
Defence Force Support for Defence Exports

659. A key factor for the success of defence exports when it comes to complex equipment or systems will often be for the equipment or system to be in actual operational service with the Defence Force. That assures potential clients that:

a. The equipment or system in question actually functions;
b. It will be supported over its service life;
c. It can be upgraded by the original equipment manufacturer when required; and
d. Attrition replacement will be possible.

660. The Defence Force will seek to support and facilitate the export sales of South African equipment by:

a. Providing equipment and personnel for demonstration purposes.
b. Providing training and advice to clients.
c. Assisting the industry with the development of adaptations and modifications that might be required by an export client.
d. Making equipment in production for itself available for export, providing that there is no urgent requirement to bring that equipment into service.
e. Providing equipment, munitions, spares and stores from stock to facilitate urgent exports, as long as:
   i. This does not result in any impairment of capability or readiness at the level required from time to time; and
   ii. The manufacturer credibly undertakes to, and is able to, replace the items released for export within a timeframe set by the Defence Force.
   iii. That timeframe may, at the discretion of the Defence Force, be extended if the released items can as a result be replaced by a later variant of the item or by a new item.
f. In some cases, agreeing to adapt its own requirements to better suit an equipment or system to the requirements of potential export clients, as long as this does not result in:
   i. Any impairment of capability; or
   ii. Any increase in cost.

661. Market Analysis and Marketing Support. The Defence Force and the Department of Defence, primarily through Armscor, will support the defence industry with market analysis and marketing support:
a. **Defence Diplomats.** Defence Attachés and Defence Advisors at all South African embassies and at South African missions to international organisations such as the African Union, the European Union and the United Nations, will be specifically tasked to:

i. Monitor evolving requirements that might offer opportunities for the South African defence and security industry;

ii. Keep the Ministry of Defence informed of potential opportunities in order that it may inform the NDIC and through it the industry;

iii. Promptly respond to any relevant enquiries from the armed forces or ministry of defence of the relevant country, and forward those enquiries to the relevant companies and the Ministry of Defence;

iv. Respond promptly to relevant enquiries from the industry; and

v. Facilitate contacts for the industry.

b. **Foreign Visits by the Minister of Defence.** The planning for any foreign visit by the Minister of Defence will include consideration of potential opportunities that might exist for the South African defence industry in the country/countries to be visited, and relevant NDIC officials or industry representatives should be included in the delegation.

c. **Armscor.** As an acquisition agency of the DOD, Armscor is mandated by the Armscor Act to provide support to the defence industry. Such support includes market development for the defence industry, participation in defence industry exhibitions and shows, and interacting with the United Nations and the African Union Commission on matters of defence procurement.

d. **Foreign Visits by Senior Defence Officials.** The planning for any foreign visit by the Secretary for Defence or a senior Department of Defence official travelling on his behalf, will include consideration of potential opportunities that might exist for the South African defence industry in the country/countries to be visited, and should be preceded by a relevant briefing from the NDIC to the travelling official.

e. **Foreign Visits by Senior Officers.** While serving officers should not engage in marketing, senior officers visiting foreign countries will take note of potential opportunities for the industry, and report those on their return, through the Ministry of Defence to the NDIC. In the event of a travelling senior officer being approached by an officer or official of the host country regarding possible defence purchases from South Africa, that enquiry will be passed to the Defence Attaché or Defence...
Advisor or responsible official in the Embassy, and will also be reported on return to South Africa.

**General Government Support for Defence Exports**

662. The wider government will additionally support the export efforts of the defence industry by:

a. Ensuring that defence- and defence industry-related matters are given a measure of prominence in ‘bilaterals’ with other countries, with an eye to identifying and following up export potential;

b. Ensuring that existing defence and defence industry agreements with other countries are followed up and managed to best effect;

c. Supporting the industry with market analysis and marketing;

d. Streamlining the process for awarding contracting and export permits;

e. Establishing a system for export financing, and possibly establishing arrangements for barter trade in some cases; and

f. Establishing a system for government-to-government defence sales, managed in concert by the Department of Defence and the Department of International Relations and Cooperation.  

663. **Marketing Support**: Government will support the defence industry by assisting with the identification of potential markets, market analysis and support in countries identified as potential markets:

a. **Embassies**: All South African missions in other countries and those at international organisations, such as the African Union, the European Union and the United Nations, should be specifically tasked to:

i. Monitor evolving requirements that might offer opportunities for the South African defence and security industry;

ii. Keep the Ministry of Defence informed of potential opportunities in order that it may inform the NDIC and through it the industry;

iii. Promptly respond to any relevant enquiries from the armed forces or ministry of defence of the relevant country, and forward those enquiries to the relevant companies and the Ministry of Defence;

iv. Respond promptly to relevant enquiries from the industry; and

v. Facilitate contacts for the industry.

vi. Ensure that staff are fully trained in respect of End User Certification.

vii. This function will fall primarily – but not only – to the Defence Attaché or Defence Advisor stationed at the Embassy.

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268 For example, the US government’s Foreign Military Sales (FMS) programme.
viii. Where there is no Defence Attaché or Defence Advisor, a senior official of the Embassy will be tasked with this role.

b. **Foreign Visits by Cabinet Ministers.** Consideration of possible opportunities for the South African defence and security industry will form part of the planning for all such visits. When information from the mission in the relevant country/countries suggests that there is potential, the delegation will include relevant representatives of the industry – be it NDIC officials for general opportunities, or officials from companies active in an identified field.

c. **Foreign Visits by the President.** The same considerations as above will apply in the case of foreign visits by the President.

664. **Export Marketing Support:** The Department of Trade and Industry will work with the NDIC to develop an export marketing scheme optimised for the requirements of the defence industry.

665. **Investment Assistance:** The Department of Trade and Industry will, further, develop an investment assistance system to support companies of the defence industry in developing products with particular export potential. This support could take the form of:
   a. An ‘add-on’ to Department of Defence funding, where there is a requirement by the Defence Force for a particular system, but insufficient funds in the defence budget to complete development; or
   b. ‘Stand-alone’ investment assistance, where there is no Defence Force requirement for the product in question but it has demonstrated export potential.

666. **Defence Export Control System.** The arms export control system will be refocused and streamlined to ensure a prompt response to applications and enquiries:
   a. **Refocusing defence export policy.** Government will consider, develop and set out a revised defence export policy that gives due weight to defence, strategic, foreign policy, defence industry and wider economic considerations, specifically taking into account:
      i. The impact of any exports on the Defence Force and its ability to protect and defend South Africa’s sovereignty and interests; for instance, whether export to a particular country will enhance
South Africa’s security or, alternatively, might present some direct or indirect risk in the future. Some items might be permanently barred from export except in special circumstances.

ii. The broad strategic context, for instance the position regarding exports to the SADC countries.

iii. The foreign policy context, for instance the impact:
1) On relations with a country of a refusal to permit arms exports to that country; and
2) How will exports to country A affect South Africa’s relations with country B.
3) While the new defence export policy will set out the framework and establish an initial position, it must be understood that this is a variable context and will in some cases require specific consideration at the time of the proposed export.

iv. The benefits to the industry of a particular export and, conversely, the damage or loss to industry of not permitting a particular export.

v. The wider economic impact of permitting or not permitting an export, for instance job retention or creation, company sustainment/survival, and foreign currency earnings.

b. Marketing Permits. The primary factor governing the issue of marketing permits will be whether or not the export of a particular type of equipment or system holds or could present risk to South Africa or is restricted in terms of some international agreement to which South Africa is a party. Additionally, the issuing of marketing permits will be restricted by embargoes that South Africa is obliged to implement or chooses to implement. This will, thus, in effect be an almost automatic process.

c. Contracting/Export Permits. The process of considering and issuing contracting and export permits will be streamlined on the basis of the new policy, by means of:

i. ‘Most Favoured Country’ List: Establishing a ‘most favoured country’ list of countries to which exports are permitted automatically unless precluded for security reasons, for instance some software, or international agreements. This list would not be
published and would be a ‘close hold’ document within the NCACC for reasons of foreign policy and would be regularly updated.

ii. **No/Restricted Export List:** Establishing a list of countries to which exports of defence equipment, or certain types of defence equipment, will not be allowed. This will avoid companies wasting effort and time preparing export applications that are then turned down. Like the ‘most favoured country’ list, this would be a ‘close hold’ document and would be regularly updated.

iii. **Delegated Authority:** The issuing of permits in respect of non-contentious items to non-contentious countries will be delegated to the Secretary of the NCACC, to facilitate a prompt response to an application. This authority will be granted within the limits of:

1) Specific exclusions set by the Defence Force for security reasons, which can only be overruled by the full NCACC; and

2) Guidelines set from time to time by the full NCACC.

iv. **Committee Approval:** The chairman and any two members of the NCACC will be authorised to deal with other applications, except such that might have a major strategic or foreign relations impact or fall into the category of 1) above.

d. **Export Permit Insurance:** The government will establish a system to provide the industry with insurance against and approved export permit being withdrawn for unforeseen reasons of policy or strategic consideration, to reimburse the company concerned for any irrecoverable expenditure already incurred or now unavoidable.

667. **Financing Defence Exports:**

a. **Soft Loans:** Government will consider making ‘soft loans’ available to potential client nations where it is:

i. In South Africa’s strategic interest for a particular country to be able to equip its forces more effectively;

ii. The proposed export is of particular importance to the defence industry and, specifically, its sustainment as a support system for the Defence Force.

b. **Barter:** Several key competitor nations in the defence export field are willing to accept barter arrangements to enable countries short of hard
currency to purchase their products. Government will consider such arrangements in respect of defence exports in the same circumstances as outlined above, and will:

i. Instruct the relevant agencies and departments of government to support such arrangements, obtaining advice regarding pricing and other issues from the relevant bodies outside government where necessary; and

ii. Encourage the private sector to become involved in the processing or on-sale of goods procured in this way.

668. **Export Credit Guarantee System**: Government will consider establishing a focused defence export credit guarantee system to support the industry, with government carrying the risk and the relevant fees therefore kept to a minimum.

669. Where the export to a particular country is deemed to be of national strategic importance, the guarantee will be provided free of any fees.

**Alignment and Integration with DTI Programmes**

670. The Department of Trade and Industry (DTI) has, in its most recent published IPAP, identified three key constraints on the development of the defence industry:

a. “Lack of large development programmes to build technology capabilities and skills pipelines and enable knowledge transfer from international to local firms, and between knowledge generating entities (science councils, universities) and industry. This is also related to recent reductions in R&D spend, shortage of technology demonstrators and less than optimal capacity development and skills retention”;

b. “Lack of a comprehensive aerospace and defence industry support programme, including export support, compliance skills, and a “South Africa First” philosophy, which would put a much stronger emphasis on localisation of technology”; and

c. “Lack of diversification into export markets, increased foreign ownership in key strategic technological areas, reduction in the size of the industry, insufficient product diversification (civil and commercial) etc.”
671. These constraints are primarily a result of inadequate defence funding, but also of the defence industry not having been fully drawn into the support systems of the DTI.

672. The Defence Force will work with the DTI, together with the Department of Science and Technology (DST), and Treasury as required, to align and integrate the defence industry with the various relevant DTI programmes.

673. Apart from the Defence Component Manufacturing Support Programme the Defence Force and the DTI will investigate and exploit the potential of the defence industry its::
   a. Marine Component Manufacturing Support Programme;
   b. Support programme for the local design and development of mobile applications; and the
   c. Aerospace Development Programme.

674. The Defence Force will, further, work with the DTI to draw the defence industry into its industrial financing action programmes:
   a. Developing relations with private sector financiers to create and deliver new financial packages appropriate to defence companies' needs; and
   b. Developing a defence sector specific financing package approach; which, however,
   c. Will have to be backed up by a concrete Defence Force acquisition strategy and plan that provides adequate workloads to justify investment.

675. Among the other DTI programmes that will be addressed in respect of the defence industry, are:
   a. The Manufacturing Competitiveness Enhancement Programme (MCEP);
   b. The Automotive Investment Scheme (AIS), in recognition of the fact that a sizeable proportion of the defence industry is directly related to the automotive sector;
   c. The Enterprise Development Programme, particularly with an eye to developing and supporting SMMEs in the defence industry by means of elements of this DTI programme, including:
      i. The Specialised Industrial Facilities sub-programme;
      ii. The Local Economic Development sub-programme;
      iii. The Tax Allowance Incentive Scheme; and
iv. The Empowerment Fund.

d. The Technology Localisation Programme, with particular focus on:
i. The Firm-Level Technology Assistance Packages;
ii. The Sector-Wide Technology Assistance Package; and
iii. Technology Development Grants;

676. The defence industry will, further, be integrated into the:

a. **Work-Integrated Learning Programme**, which meshes neatly with what is, for instance, being done by Denel with its intern programme; and

b. **Firm Benchmarking programme**, which will identify and highlight potential synergies within the defence industry and between companies in the defence industry and companies in other sectors, to the advantage of all.

677. **Special Economic Zones**: Government will make the necessary arrangements for the defence industry to specifically benefit from the Department of Trade and Industry’s system of Special Economic Zones\(^\text{269}\). Measures will include:

a. Encouraging defence industry companies to establish plants in designated SEZs. This would tie in with the Industrial Development Action Plan and the intent that underlies the SEZ programme and the SEZ Act No 16 of 2014, and would provide those companies with a range of benefits:
   i. Corporate tax set at 15%;
   ii. Building allowances;
   iii. Employment incentives;
   iv. VAT, customs and excise duties relief; and the
   v. ‘Greenfields’ tax allowance.

b. **Defence SEZs**: Establishing dedicated ‘Special Defence Economic Zones’ for the defence industry as designated ‘Sector Development Zones’ in terms of the SEZ Act No 16 of 2014. This would provide the relevant companies with all the benefits of being located in an SEZ, plus the advantages of:
   i. Security and safety measures optimised for defence industry needs; and

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\(^{269}\) The Philippines Department of National Defense is planning such a zone – the Government Arsenal Defense Industrial Estate (GADIE) – adjacent to the existing Government Arsenal site, and intends to establish further such zones in other parts of the country; IHS Jane's Defence Weekly, 18 January 2017, page 23.
ii. The potential to establish a system of co-located plants of companies forming part of a given supply chain.

c. These defence-focused Sector Development Zones will at the same time serve as hubs for the defence industry as such.

d. ‘Virtual’ SDEZs: It would not at this stage be practical or even viable to move factories. With this in mind, government will examine the potential to declare ‘virtual’ SDEZs encompassing identified existing defence industry facilities and designating them to be ‘Industrial Development Zones’ in terms of the SEZ Programme and SEZ Act No 16 of 2014.

678. The one possible complication would be the separation of production for export and production for the Defence Force. This could be resolved in one of two ways:

a. Appropriate accounting and audit measures; or

b. Designating the Defence Force as an export client. That would also serve to ‘clean up’ the defence budget by making clear the actual expenditure on equipment and systems by stripping out of it VAT and the various relevant customs and excise duties, for instance on imported components or sub-assemblies

679. In addition to the integration of the defence industry into the SEZ programme the Defence Force and the Department of Trade and Industry will facilitate relevant integration of the work being carried out in identified Priority Clusters with R&D required for the Defence Force or already being carried out for the Defence Force. Two Priority Clusters that are of clear relevance are:

a. The Musina Metallurgical Cluster; and

b. The Fuel Cell Cluster in Ekurhuleni.

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270 India until 2015 exempted state-owned defence companies from paying customs and excise duties, which is estimated to have given them a cost advantage of up to 40% overall in some cases over private defence companies. These tax exemptions were withdrawn in 2015 to increase competition in the sector. The key lesson here is that any exemptions must apply to all defence companies if the development of the industry is not to be stifled. Jane’s Defence Weekly, 10 June 2015, Page 36.

271 The European Defence Agency (EDA) is engaged in preparing the regulations to exempt defence projects and programmes from VAT.
DEFENCE INDUSTRY CONSOLIDATION

680. The dearth of acquisition and R&D funding has already led to a de facto consolidation of the defence industry, with several smaller companies being absorbed by large groups active in the same field (e.g. Reutech in the communications field) and others exiting the sector or the country.

681. The only part of the industry that has much overlap of companies is the development and manufacture of mine-protected vehicles and paramilitary vehicles, in which there are almost a dozen companies active.

682. But most of these companies:
   a. Produce paramilitary and/or ‘boutique’ vehicles, and are geared for the production of small batches;
   b. Use armour plate cut by just one company;
   c. Use commercial-off-the-shelf powertrain/driveline elements and components.

683. There is, therefore, arguably not much to be gained by seeking to force consolidation on these mostly private companies: Market forces will force out of the business those that do not produce quality vehicles.

684. The Defence Force should, however, look to ensuring security of supply of the vehicles that it will need. At the moment most of those vehicles are from one of the Denel group companies or DCD Protected Mobility (the Husky), with little exposure to the smaller companies.

685. There are several companies active in the field of infantry weapons and precision rifles: Denel Land Systems (light machineguns, anti-materiel rifles), Denel PMP (20x42 mm assault and automatic weapons), Milkor (40 mm grenade-launchers), Rippel Effect (40 mm grenade launchers) and Truvelo Armoury (precision and anti-materiel rifles).

686. There is, however, only actual overlap in two cases:
   a. Denel Land Systems and Truvelo Armoury in respect of anti-materiel rifles, but Truvelo and Denel Land Systems and Denel PMP in fact have

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272 Note: This document does not consider manufacturers of armoured limousines and private cars.
worked together in the past and continue to do so, so there does not seem to be a problem here.

b. Milkor and Rippel Effect in respect of their various 40 mm grenade launchers, but both are private companies that have markets and are successful, while developing innovative new products, so there is little to be gained by a forced consolidation.

687. There is some overlap in three other fields that could merit attention: Electronic warfare systems, unmanned aerial vehicles and naval combat/combat management systems.

688. **Electronic Warfare Systems**: There are three companies, Saab Grintek Defence, GEW Technologies and Sysdel[^274]. But each has a specialised area of expertise and activity[^275], with little overlap beyond being in the EW environment. The only real risk would seem to be that Saab Grintek Defence could crowd out the much smaller Sysdel by bringing in equipment from Sweden. That risk could be addressed by the Defence Force taking a decision to designate Sysdel as its preferred supplier for certain systems.

689. **Unmanned Aerial Vehicles (UAVs)**: There are two companies, Denel Dynamics and Paramount Advanced Technologies (PAT) whose products do not markedly overlap, and several smaller entities that are not focused on the defence application of UAVs. In addition, the CSIR has its own activity in this field, but in the nature of research and development rather than product development.

690. An argument can be made for consolidation in the UAV field, but perhaps the optimal route to follow would be to designate Denel Dynamics as the supplier to the Defence Force of large UAVs that have a strategic importance, and as the overall integrator of UAV systems for the Defence Force. That would enable the Defence Force to acquire a range of specialised UAVs for specific roles secure in the knowledge that they can be integrated with its other systems, without forcing local companies to attempt to meet all UAV requirements in the face of competition by the ever-growing number of companies in this field internationally. PAT and the smaller companies involved in the UAV field could remain active as long as they find markets for their products, which could include the Defence Force.

[^274]: There is also Tellumat, active in the field of IFF (Interrogation, Friend or Foe) equipment, but that is a distinct area that does not overlap with the others, and the company has a healthy export market of its own.

[^275]: Primary Areas of Activity: Saab Grintek Defence – electronic countermeasures/self-protection systems; GEW Technologies – communications intelligence systems; Sysdel – electronic support measures systems.
691. **Naval Systems**: There are two companies with expertise and experience in this field, Cybicom Atlas Defence (CAD) and Saab Grintek Defence. Both companies have some unique South African products and are able to source other items – and expertise – from Atlas and Saab respectively. In addition, both Denel Integrated Systems and Paramount Advanced Technologies seeking to enter this field.

692. This is the one area in which the Defence Force could make a sound argument for some level of consolidation:

   a. It is important to remember here the original concept, which was to have a single naval systems integration house. That local capability was largely lost when the company concerned was acquired by a foreign company and effectively wound down.

   b. Much of the expertise and experience, however, was taken over by Cybicom and CAD, and the latter is potentially a platform on which to rebuild the capability that was lost: It is a South African owned and entirely South African staffed company developing its own unique products, but can access Atlas Elektronik when it needs something outside its area of expertise and also to gain access to the international market for its local products.

   c. This needs to be considered as a case for designating a single source company for naval systems integration, albeit with the recognition that it is not a sole supplier of equipment, with the Navy free to select equipment from other companies.

   d. While this would seem to leave Saab Grintek Defence in the cold, the reality is that the company has South African products that would receive preference from the Navy, and so would remain a supplier.

693. There remains the question of the role in this field of Denel Integrated Systems and Paramount Advanced Technologies.

   a. The former, as a state-owned defence company should be positioned as a Defence Force level systems integrator, rather than seeking to enter a specialised field such as naval or air force systems. Its responsibility should be to ensure that the various systems employed

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276 And Cybicom in its own right as a specialist software developer.
by the Defence Force can ‘speak to each other’, and perhaps also to monitor local development to optimise component and sub-assembly utilisation from the point of view of standardisation.

b. The latter is a private company and should be allowed to continue to pursue naval work if it so chooses.

**FUNDING THE DEFENCE INDUSTRY**

694. The defence industry, supported by government, will have to establish an appropriate funding mechanism, such as a Defence Industry Fund (DIF), if it is to develop. The DIF is envisaged as being funded by local and international investors, and will be registered and managed by the private sector with a clear mandate to fund and support the defence industry. Government departments such as the Department of Trade and Industry (dti) and government agencies such as Armscor will play a supporting role as catalysts for the fund. The core mandate of the DIF will be to provide accessible finance to SMMEs in the defence industry, with a particular focus on those SMMEs owned by designated groups (blacks, women, youth and military veterans).

695. The defence industry is currently ‘under-funded’, in the sense that it does not have:

a. Sufficient orders to function at efficient levels; and
b. Sufficient R&D funding to develop new products with which to contest the market.
  c. Adequate access to working capital to expand its existing operations or to engage competitively in key export markets.

696. This is primarily the result of the Defence Force being under-funded and not able to place orders for new equipment or fund R&D to develop future equipment.

697. For a time, the industry was able to offset that lack of home-funding by means of exports, but its success in the export market was based on two factors, both of which have in large measure fallen away:

a. It entered the 1990s with a range of equipment and systems that were innovative, very effective and either combat-proven or developed on the basis of operational experience by a well-respected military. A
quarter of a century later, that equipment is no longer market leading, but little has been developed to replace it.

b. Elements of the industry enjoyed a boom during the wars in Afghanistan and Iraq, as initially the only suppliers of mine-protected and mine-detection vehicles, and as suppliers of long-range artillery ammunition. Those wars have wound down and there is no longer that flow of orders and, worse, there are now many competitors in the field of mine-protected vehicles, if not yet so much in the other areas.

698. The industry will not be able to capture sizeable portions of any defence market segment without either:
   a. The Defence Force helping to fund the development of new equipment and then taking it into service; or
   b. Developing close partnerships with large international defence groups that have the market access it lacks.

699. The first of the above two factors is particularly important when it comes to marketing unique equipment or systems, rather than selling sub-systems into the supply chain of an international group. To successfully market unique equipment, the industry must be able to point to its products being in service with the Defence Force: Armed forces want to be sure that:
   a. A system or piece of equipment that they are about to acquire, actually ‘works as advertised’, and are suspicious of equipment not adopted by the armed forces of the country manufacturing it; and
   b. A system or piece of equipment that they are about to acquire, will be supported through its service life, with upgrades as required, and that the design authority will be there to help integrate new sub-systems, weapons, etc.

700. The second of the above two factors is demonstrated by the export successes of GEW Systems, Hensoldt Optronics, Rheinmetall Denel Munition and Saab Grintek Defence, with Cybicom Atlas Defence beginning to also show promise. The challenge here is that the foreign partners/owners of

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277 There are exceptions, for instance Reutech Radar Systems’ sale of the RSR 210N radar to the Royal Norwegian Navy, a radar that did not even exist when the order was placed. But the order was placed on the back of RRS’s previous success with the ESR 220 radar for the SA Army, the very effective RTS 6400 tracker for the SA Navy, and its work on various projects for EADS. More typical is the fate of the Rooivalk, which failed to win any export orders largely because it was not fully in service with the SA Air Force, much as the excellent F-20 fighter failed to win any orders because it was not in service with the US Air Force – despite the fact that all of its sub-systems were, in fact, in service with the USAF.
these companies may lose interest in having a subsidiary in South Africa if the wider South African defence industry continues to decline.

701. The main implication of these factors in the context of funding the industry, is that the Defence Force will have to have sufficient funding to acquire and operate in active service more equipment developed and manufactured by the local industry, and to fund some R&D towards development of new equipment. That will boost the industry’s export potential and bring in greater forex earnings that can then be applied to self-funded R&D within the industry. Failing that, the industry will continue to decline.

702. Given the other demands on Government funding and the poor state of the economy, this will not over the near term be easily justified as part of the normal budgeting process, but it should be possible within current funding limits to:

a. ‘Trickle buy’ into service items that are already in production, to underline Defence Force confidence in that equipment278;

b. Develop and acquire additional variants of existing equipment and systems279; and

c. Complete development and bring into production some items that are near the end of their development cycles280.

703. The Defence Force should also consider leasing some non-combat military equipment on suitable multi-year contracts, for instance some IT services and equipment, D-vehicles and a proportion of the logistic vehicle fleet, naval work boats and inshore patrol craft for home use, liaison/VIP aircraft and perhaps even maritime surveillance aircraft for use over home waters281. That would have several advantages:

a. The Defence Force will be able to bring into service equipment it cannot now afford to buy (either the leased equipment or other equipment using the funds freed up by leasing rather than buying some non-combat equipment);

278 For instance, the later variants of the Umkhonto SAM, the Mokopa missile, the Seeker 400 and the T6 truck-mounted 155 mm gun.
279 For instance, the L52 upgrade of the G6, the Rooivalk and additional variants of the Badger turret family.
280 For instance, the LEO long-range 105 mm gun, the A-Darter missile and the FORT naval tracker.
281 The leasing approach has been applied very successfully by several defence forces, including those of Germany and the United Kingdom.
b. The industry will be able to open and run the relevant production lines (raising the necessary working capital from banks and investors in the normal way, with secure Defence Force orders as collateral); and

c. The equipment will demonstrably be in service with the Defence Force, making it a more attractive option for potential export clients.

704. Both of these two courses of action would provide some relief to both the Defence Force and the industry, and should be implemented as long-term options, not just as emergency measures.

705. But they will not be sufficient to enable the Defence Force and the defence industry to rejuvenate themselves and settle on a positive trajectory. That will require a rather greater funding that can be realised (or freed up) by these measures. In the long run, there is no real alternative to a defence budget that:

a. Provides the Defence Force with funding matched to operational commitments and envisaged contingencies; and

b. Enables the Defence Force to acquire equipment in numbers that justify local development, and to fund R&D for future equipment.

706. There would, however, also seem to be some potential in one other interim but longer-term measure, the proposal to realise value from under-utilised land and buildings held by the Defence Force. The concept of transferring those assets to the Public Investment Corporation to let or sell, with the PIC making an annual payment to the Defence Force over a specified period, could provide some useful ‘bridging funding’ to help see the Defence Force and the defence industry during the present budgetary trough.

707. Taken together, the measures outlined here would enable the Defence Force to weather the present funding dip in reasonable shape, begin implementing some of the Defence Review recommendations, and undo some of the damage of a quarter century of under-funding, while also meeting the current\textsuperscript{282} operational commitments placed on it by Government.

\textsuperscript{282} i.e. Border protection, coastal patrols, the Mozambique Channel patrol and a combat group with helicopter support in the DRC.
708. Looking forward, however, any new or interim funding model must be combined with a revised and more efficient expenditure model if it is to be truly effective. All of these measures will, therefore, have to be complemented by:

a. More intelligent investment and spending by the Defence Force, for instance:
   i. Making more use of ‘families’ of vehicles and systems;
   ii. Working to ensure longer build-runs and a ‘rolling build’ approach; and
   iii. Driving for greater standardisation of lower-tier equipment (e.g. trucks) sub-systems, auxiliary equipment (e.g. generators, compressors), sub-assemblies (e.g. engines, transmissions, axles) and components (e.g. standardise wheel sizes, batteries).

b. Working with the Treasury, to bring an end to the end-of-financial-year splurge of spending to avoid having to return unspent monies and having the next budget cut by a similar percentage, instead allowing for unspent funds to be rolled over into the next financial year without penalty. That will encourage more efficient handling of funds.

c. Working with Treasury to ensure that monies paid to the Defence Force (e.g. the reimbursements for flights on behalf of other departments) are added to its budget, not diverted to the B7 account or subtracted from the next budget.

d. Closer cooperation with other government departments, services and agencies in respect of, for instance:
   i. Acquisition of similar items, such as firearms and some radios and vehicles to achieve greater economies of scale and benefit the local industry;
   ii. Utilisation of Defence Force training and other establishments for an agreed fee to be retained by the Defence Force; and
   iii. Coordinated R&D programmes and projects.

709. Combining the proposed interim funding measures with more efficient investment and spending, will enable the Defence Force to ride out the present budgetary trough in good shape and able to deal with most contingencies. It will also enable the defence industry to rebuild itself, support the Defence Force effectively, expand employment, and develop
new and innovative defence equipment that will bring in foreign currency earnings for South Africa.

THE DEFENCE INDUSTRY

711. Having set out what the Defence Force will require in terms of industry support, and what government will do to support the industry, it is equally important for the defence industry to map out its own future as a collective and individually.

712. The defence industry strategy as such emanates from the Department of Defence as a tool intended primarily to ensure effective support for the Defence Force.

713. The industry itself must also play a part in its survival and future growth, and not just by articulating what government support it needs. It must collectively and at the level of each company map its own future, using the defence industry strategy as starting point.

Potential Growth Pathways

714. There are several potential growth pathways beyond merely hoping for expanded defence funding and the orders to flow from that:
   a. Strategic government intervention
   b. Import Substitution;
   c. Diversification; and
   d. Exports and international links.

Strategic Government Intervention

715. There is some potential to expand existing capabilities or capacities or to establish new capabilities on the basis of a specific strategic requirement set by government.

716. But this will only be at all viable in respect of specific niche areas where:
   a. The security aspect (e.g. sovereign control and ownership) is held to be sufficiently important for the Department of Defence to subsidise the establishment and sustainment of this capability;
   b. Where the export potential is such, that the Department of Trade and Industry is willing to join the Department of Defence to provide the investment support; or
c. Where the realistically anticipated technology spin-offs and/or spill-overs are such that the Department of Trade and Industry is willing to provide the investment support.

**Import Substitution**

717. Import substitution will provide a good starting point in technology areas new to the industry, and at the same time will provide a starting point towards the national policy objectives of Localisation and Indigenisation.

718. There is a wide range of possibilities for import substitution:
   a. Licensed manufacture of components, sub-assemblies, sub-systems for local use in a major equipment or system, and perhaps later also to be supplied to the OEM for inclusion in equipment supplied to other clients.
   b. Licensed manufacture of an entire equipment or system for local use and perhaps also for export to agreed markets.
   c. Development of new components, sub-assemblies, sub-systems locally to replace original items in an equipment or system, also with an eye to export potential.
   d. The same sequence as above can apply to munitions.

719. This approach was used successfully in the 1960s and 1970s, particularly in the field of armoured vehicles and aircraft, for instance:
   a. The FN FAL assault rifle and later the Galil were both manufactured under licence.
   b. The Panhard AML armoured car was initially manufactured under licence, and then developed into the Eland, with various elements being replaced by local equipment.
   c. The Ratel infantry combat vehicle took a German armoured personnel carrier as a basis for its development, integrating the Eland turret and various other local items.
   d. The Impala jet trainer and light attack aircraft was initially assembled locally and then manufactured under licence.
   e. Denel Airmotive (now part of Turbomeca Africa\(^{283}\)) developed an upgrade of the Snecma Atar 09K50 engine of the Mirage F1 fighter for the OEM.
   f. The Oryx helicopter was developed from the Puma, for which a licence had been obtained.

\(^{283}\) To revert to Denel ownership in 2017.
g. The Air Force’s military air traffic control radars were manufactured in South Africa under licence from the Italian OEM.
h. The Navy’s strike craft were built under licence to a foreign design.

720. This approach also formed part of the Defence Industrial Participation of the Strategic Defence Packages of 1999, for items as diverse as 30 mm ammunition for the Hawk lead-in fighter trainer and switchboards and mast assemblies for the frigates.

721. The effectiveness of this approach as a growth pathway will, however, be limited by the small size of the local market, and would need to include expansion into exports if it is to serve that purpose.

**Diversification**

722. There can be potential for defence companies to apply their technologies and processes outside the field of defence, either opening additional, civilian, product lines within the company or spinning off a company for that purpose.

723. While many, perhaps most, efforts by defence companies to diversify into civilian work have failed or had only limited success, there are examples of outstanding success, as for instance the case of Dassault entering the business jet market and spinning off software originally developed for its fighter design, development and manufacture business into the international project management market.

724. While there are a few outstanding success stories, such as the mining radar developed by Reutech Radar Systems, which can help offset the ‘boom or bust’ trend that characterises much of the defence market, this is not an approach likely to work well for most defence companies, as Denel experienced during its diversification attempts during the 1990s.

725. In general terms it seems likely that the better option is to establish a system for defence companies to transfer such technologies and know-how to civilian companies on a purely commercial basis or with compensation provided by government to take into account the originating companies investment in developing the intellectual property or acquiring it from overseas. This may not, however, always be possible, depending on how closely the technologies and skills involved are tied to defence work.
Defence Exports and International Links

726. As already indicated earlier in this document\textsuperscript{284}, the Defence Force by itself will not present a sufficiently large market to sustain an effective and efficient defence industry, except perhaps in some small, specialised sovereign niche areas. The volume of orders, even for a Defence Force expanded to provide the full capabilities outlined in the Defence Review, will simply be too small for defence industry to keep up with technologies and processes and to prosper.

727. The industry must, therefore, look outside South Africa for:
   a. Markets for its products and services;
   b. Links to defence companies in other, smaller or developing countries with whom it could partner, to share the cost of research and development and production;
   c. Links to major international defence groups, with an eye to:
      i. Becoming a part of their supply chain, even if just at component level; and
      ii. Gaining insight into evolving and new technologies and processes.

728. Exports are the immediately obvious approach, and the government will support industry efforts in this respect, as outlined above\textsuperscript{285}.

729. Export success will, however, be difficult to achieve and sustain in the long term unless:
   a. There is steady and substantial defence acquisition and research and development funding from the Defence Force, to ensure that the industry can offer equipment that is up-to-date; and
   b. The industry develops links to foreign and international defence groups to ensure access to new ideas, technologies and processes other than its own.

730. Links to foreign defence companies could take several forms, all of which have already been demonstrated as practicable at some level:
   a. Contracted manufacture of components, sub-assemblies, sub-systems or provision of services\textsuperscript{286};

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\textsuperscript{284} Paragraphs 613 to 618 above.
\textsuperscript{285} Paragraphs 638 to 662 and Paragraph 670 above.
\textsuperscript{286} For instance, the A400M work being done for Airbus by Aerosud and Denel Aviation and the research at the CSIR for Airbus.
b. Contracted design and development of components, sub-assemblies, sub-systems or even entire equipment or system²⁸⁷;

c. Joint development of new products or systems²⁸⁸;

d. Inserting South African products into the product portfolio of a foreign company²⁸⁹;

e. Foreign companies taking an equity stake in a South African company²⁹⁰; and

f. Persuading foreign defence companies to establish manufacturing plants and even design and development offices in South Africa²⁹¹,²⁹².

731. The industry must in the first instance approach this from a purely commercial point of view, to be aligned with Defence Force requirements and government policy as may be necessary.

732. Government, for its part, will do its best to support such initiatives, within the context of South Africa's wider strategic, political and economic interests.

**Innovation**

733. The success of the South African industry since the 1970s has been largely underpinned by innovation. Looking at just some of the products characterised by innovative thinking, one can consider:

a. The G5 and particularly the G6 long-range artillery systems;

b. The Ratel, the first ICV with a commander's cupola and a dual-feed cannon;

c. Mine-protected and mine-detection vehicles;

d. Frequency-agile radios; and

e. The Raptor stand-off glide bomb with its option to hand off control from the delivering aircraft to another as much as 200 km away.

734. Perhaps not innovative in the sense of being the first of its kind, but certainly very innovative in concept and how it was developed by a small industry, there is also the Rooivalk attack helicopter.

²⁸⁷ For instance, the weapons system for light helicopters developed by Advanced Technologies and Engineering (Now Paramount Advanced Technologies) and Denel Dynamics under contract to Airbus Helicopters.

²⁸⁸ For instance, the development of the A-Darter air-to-air missile with Brazil.

²⁸⁹ For instance, the LED-based head position sensor developed by Denel, which is now standard in the Saab Gripen and Eurofighter Typhoon fighter aircraft, and the Hensoldt Optronics optical periscopes and Saab Grin te Defence periscope radar warning receiver, which are integrated in all German-designed submarines.

²⁹⁰ For instance, Rheinmetall (RDM), Airbus (Optronics), Atlas (CAD), Turbomeca (Turbomeca Africa).

²⁹¹ For instance, Aselsan's optronics design office and the SAKSA armoured vehicle design office.

²⁹² The DTI also favours persuading foreign defence OEMs to establish plants in South Africa (IPAP 2017).
735. More recently there was the LEDS-150 hard-kill self-protection system for armoured vehicles, which led the field for a time, only losing ground to other products in other countries for a lack of development and acquisition funding. The soft-kill variant has, by contrast, achieved some export success.

736. Related to this was the drive to keep things simple, making maximum use of COTS and MOTS items to reduce development times, cost and support costs, and the focus on not chasing the last 20% or so of performance, but settling for what was good enough to meet the actual requirement\(^\text{293}\).

737. Some of this innovation rooted in the requirements set by the Defence Force, for instance the decision that the Army's infantry combat vehicle should be wheeled, but much of it came from the minds of the engineers and scientists – and often even the technicians – who developed the equipment and systems and then developed efficient ways to ensure support in the field.

738. It is this approach to conceiving and developing equipment and systems that will enable the industry to regain ground. This will require:
   a. Internal funding within the industry, including collaborative funding of cross-sector projects;
   b. R&D and production funding from the Defence Force; and
   c. A strong focus on prompt and early market entry.

739. **Innovation Hubs**: An option that will be explored in this context, is the establishment of defence science, engineering and manufacturing innovation hubs: These will:
   a. Be supported by the Chief Defence Scientist;
   b. Focus on both innovation and the development of SMMEs within the industry;
   c. Be linked to the CSIR and universities;
   d. Be aligned with and linked to other innovation hubs in South Africa; and
   e. Be encouraged to develop international links;

740. Such innovation hubs could include:
   a. A centralised innovation hub, managed by Armscor, addressing wide-ranging defence technology issues, and aimed more at concept and technology innovation than on product development;

\(^\text{293}\) Armscor for a time had an informal motto of providing “80% of the performance for 60% of the cost”, and to a large degree achieved this in the equipment it developed for the Defence Force, although in some fields that 80% of performance was exceeded and its equipment actually bettered anything in other countries.
b. An innovation hub funded and supported by Denel, focused on innovation in the fields in which the group is active, and on supporting SMMEs to become part of its supply chain, and located within one or more of its premises; and

c. Innovation hubs supported by one or more private defence companies or groups, with a focus on their particular field of defence technology and their supply chains, and perhaps located within or adjacent to their premises.

**Technologies to Improve Competitiveness**

741. While innovation will often, if not always, be a key to competitiveness in the market, it must be accompanied by:

a. Competitive development cost and timescales;
b. Competitive time into production and service;
c. Competitive manufacturing cost; and
d. Competitive support and sustainment requirements and cost.

742. This will require the industry to take the necessary steps to achieve competitiveness in these areas:

a. Within companies and groups;
b. As an industry, with collaborative R&D across related technology domains; and
c. By drawing on international experience.

743. The government will, as is the case in other countries, take steps to support the industry in this, by means of, among other measures:

a. Focused R&D funding to industry;
b. Initiating focused R&D projects at research establishments and at universities; and
c. A range of suitable incentives to encourage and support the relevant R&D.

744. The industry will need to identify and acquire or develop a range of new differentiating technologies to underpin its future competitiveness, both in terms of its products and in terms of how it develops, manufactures and supports them in service. While the focus of this effort should be on developing specific technologies that will provide competitive advantage for specific products, there will also be cross-cutting technologies that can be acquired or developed by the industry as a whole or by supporting government entities.
745. The industry, in close collaboration with the Defence Force's acquisition staffs and Armscor, will have to focus on intelligently ‘designing for production’ and ‘designing for service’ to help keep the overall cost of acquisition and sustainment within acceptable limits.

**Product Technologies**

746. Product differentiation can be based on unique product functionality or improved levels of performance or both. Achieving this will be dependent on pure innovation – no one has thought of this product or application before – or on the availability of unique product technologies.

747. Differentiating cost competitiveness can also be based on employing alternative product technologies that are more cost-effective while providing similar functionality and performance than previous technologies.

748. Industry and industrial development strategies must include development of capabilities to identify and acquire product technologies that will provide product differentiation and cost competitiveness. A key element will be comparative studies of competing products, which can be used to identify competitive gaps and associated market niches. Those studies should include investigation of alternative product architectures and technology configurations that can lead to a competitive advantage.

**Technology Insertion**

749. Companies can also – most optimally with Defence Force support – identify relevant new technologies that can be inserted into existing equipment or systems to produce a marked improvement in performance. That will in most cases involve a much lower cost than acquiring or developing a new system, and can give the company a distinct competitive edge.

**Cross-Cutting Product Development Technologies**

750. Competitive products are the result not just of innovation, but also of rapid, effective and efficient product development. Some industrialization pathways are critically dependent on product and technology development capabilities. These capabilities already exist in South Africa in many elements in the national system of innovation, and must be further developed in all of the existing elements. Some of the relevant specializations are:
a. Concurrent engineering;
b. DfX: Design for the key non-functional attributes, for instance reliability, safety, maintainability, manufacturability, security and environmental impact among others;
c. Performance modelling;
d. X modelling (modelling in respect of the key non-functional attributes);
e. Life cycle engineering, logistics systems engineering;
f. User Experience Engineering;
g. Agile and rapid development methodologies;
h. Stage-Gate systems, Technology Program Management Models;
i. Technical and market risk based gate designs;
j. Technical risk assessment based on systems performance and X models (see b. and d. above), constraints, and mapping to technologies;
k. Technology down selection at gates;
l. Systems Engineering, Design Engineering, CAD, CAM, PLM;
m. Digital engineering, model based engineering design, model based systems engineering;

Cross-Cutting Manufacturing Technologies

752. Equally important will be to keep abreast of new manufacturing technologies, among them 3D printing and additive manufacturing and, in sectors where it is truly relevant, the ‘digitization of the factory floor’ ("Industry 4.0")

294 CAD – Computer-Aided Design; CAM – Computer-Aided Manufacturing; PLM – Product Life-Cycle Systems, used to coordinate all of the design and development work, facilitate concurrent engineering, and to provide component traceability throughout the life of components, without which one is unable to compete in the market for medium to high complexity (typically high value/margin) products and systems, or in markets where there are significant certification or standards compliance requirements.

295 See, for instance, "Industry 4.0": the ‘fourth industrial revolution’; IHS Jane'
753. The impact of new manufacturing technologies will be relevant at several levels:

a. Manufacturing Process and Workstation:
   i. Materials processing, assembly/joining, numerically controlled machines, manufacturing equipment, consistence, minimum waste, minimum energy use, low lead-times, reduced set-up times, high throughput, SMED\(^{296}\).
   ii. Lean management, workforce empowerment, quality circles, 5S\(^{297}\), movement reduction, error-proofing and waste reduction, scrap and rework reduction and productivity improvement.

b. Factory and Internal Logistics:
   i. Factory layout, shop floor control systems, production scheduling, manufacturing planning and control, workstation synchronization (Kanban)\(^{298}\), pull systems, batch size reduction, constraint management, manufacturing cells, flexible manufacturing systems.
   ii. Workforce development and mobilization, lean manufacture, waste elimination.

c. Industry Cluster (family of end-to-end supply chains):
   i. Supply chain logistics (external to company), end-to-end supply chain optimization and synchronization (e.g. just in time), electronic data exchange, supporting industries (e.g. suppliers of manufacturing equipment, tertiary education institutes, regulators), ‘design as one’\(^{299}\) and ‘manufacture as one’\(^{300}\).

**DEFENCE INDUSTRY CULTURE AND VALUES**

754. For the defence industry to become optimally effective in supporting the Defence Force and in the international market, it must internalise a culture of:

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\(^{296}\) SMED - Single Minute Exchange of Die, a technique developed in Japan to exchange the dies used to stamp large metal parts and in so doing facilitated smaller batch sizes to be economical; this in turn reduces work in progress and working capital requirements.

\(^{297}\) 5S - A set of principles used on the shop floor by the workers to keep things orderly and clean: Sort, set in order, shine, standardise, sustain.

\(^{298}\) Kanban - A simple system using baskets, that prevents any workstation in the factory for producing faster than the bottleneck workstation, while ensuring that the bottleneck workstation runs at full speed.

\(^{299}\) “Design as one” - The ability of a number of companies to together design a product, and doing it so well that it seems as if one company or one team in a company is doing it.

\(^{300}\) “Manufacture as one” - Essentially supply chain integration, “just in time” manufacturing where the full supply chain is integrated in a similar way as what Kanban achieves in the factory.
a. **Innovation:** This does not necessarily mean being the ‘inventor’, ‘close followers’ can also be innovative in bringing practical and affordable solutions to the market on the basis of concepts and new technologies invented or developed by others. The key differentiator is imaginative and innovative thinking, resulting in new and different ways of applying technologies, materials and processes to developing new solutions to existing, evolving and new requirements.

b. **Efficiency:** This does not mean just efficiency in development and manufacture, but also conceiving, developing and bringing to market products that will be efficient in service, i.e. effective in operations, requiring the minimum of support in the field, and cost-effective in both acquisition and through-life support and sustainment. The industry in the past had an informal motto of delivering ‘80% of the performance for 60% of the price’, and that remains a good and viable target in most defence industry fields.

c. **Responsiveness (“on time, in time”):** The industry must respond:
   i. Promptly, quickly, clearly, effectively and efficiently to client requirements.
   ii. Promptly, quickly, intelligently and innovatively to developments in military operations and the resulting requirements.
   iii. Promptly, quickly, intelligently and innovatively to developments in military and related technologies, materials and processes.

d. **Agility and flexibility:** The industry must be able to respond quickly to changes in the environment, requirements and technologies, and think ‘out of the box’ in terms of how to meet the challenge of those changes.

e. **Resilience:** The industry must be able to survive through lean periods occasioned by economic factors, to which end it must develop and expand its exports and exploit collateral capabilities.

f. **Networked, collaborative, mutually supportive:** If the South African defence industry is to achieve this:
   i. The industry as a de facto collective must become networked, collaborative and mutually supportive, which does not in any way rule out competition but argues for cooperation when that is beneficial to all; and
   ii. The Defence Force and the Departments of International Relations, Science and Technology and Trade and Industry must
partner with the industry as a defence-focused ‘Team South Africa’.

755. Internally to itself, the industry must move to become:
   a. The preferred sector for the ‘best and brightest’ of our people, a sector in which bright minds are given room and opportunity;
   b. Truly inclusive of the full population of the country;
   c. A ‘knowledge university’ for industry and the wider economy, by virtue of:
      i. Active and continuous study and analysis of emerging and evolving technologies and their potential applications;
      ii. Continuous learning and study opportunities for its members;
      iii. Facilitated insight and study opportunities for specifically identified Defence Force personnel; and
      iv. A programme of briefings for academics and persons in related industries.
   d. A driver of enterprise development, helping to establish and foster SMMEs across the board of relevant technologies and processes\(^301\).

756. The point of enterprise development is that developing a ‘cloud’ of SMMEs within the industry will render the whole vastly more adaptive and agile with respect to developing, evolving and new requirements, technologies, materials and processes, small companies being inherently more agile and flexible than large industrial concerns, and also better placed to handle short-notice/short-run projects.\(^302,303\)

757. The focus on developing SMMEs will also support the government’s wider industrial development goals and plans, as those companies will mostly be focused on a particular area of technology rather than on defence per se, enabling them to apply their capabilities to the civilian market as well as to defence.

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\(^301\) Given the capital-intensive nature of much defence work, however, government support for such SMMEs will also be required.
\(^302\) A 2009 Australian Study found that in the ANZAC frigate project some 95% of the 1 300 Australian and New Zealand companies involved were SMEs (Naval Shipbuilding, Defence SA Advisory Board, December 2009). The defence industry polices and strategies of other countries support this, Finnish government documents, for instance, stating that “nearly all defence suppliers are SMEs”.
\(^303\) The Swedish government, in its defence industry related publications, states that “Many times, small and medium enterprises lie at the heart of innovation within the field of defence and security. They possess a sound ability to evaluate the relevance of technology, allied to an equally sound ability to link that relevance to different contexts and applications”. 
TRANSFORMATION

758. The profile of the defence industry is currently a reflection of the country's past, and requires transformation in many spheres. It is crucial that the ownership profile of the defence industry's companies should include blacks, youth, women and military veterans in order to become fully integrated into the wider economy and society and remain sustainable. The proposed Defence Sector Charter is intended to be instrumental in positively impacting on the industry profile while ensuring that South African companies continue to be competitive globally.

759. While the focus on SMMEs will of itself drive transformation of the industry in its broadest sense, there will also need to be a specific, focused drive to draw black people and women into the industry at every level from the boards of large groups and companies, to ownership of SMMEs.

760. There is considerable experience in industry generally and within the defence industry of identifying and winning black board members and senior management, and that will serve as the basis for future efforts in this regard.

761. In addition, there will be a continued focus on drawing black engineers, artisans and technicians into the industry, from among qualified people, from among those with the potential to benefit from bursaries or apprenticeships, and from among military veterans with the requisite skills or aptitude.

762. Further, SMMEs will be the ideal vehicle to widen industrialisation among the people of South Africa, by specifically assisting members of designated groups with the establishment of SMMEs initially linked to a particular OEM as a component or ancillary material (e.g. packing cases) supplier, with that OEM providing coaching and mentoring until the new SMME is able to stand alone and expand its activities to become a supplier to the wider defence industry and then to industry generally.

763. There will be a range of options for drawing SMMEs into the industry or supporting the establishment of new SMMEs:
   a. Contract existing SMMEs to manufacture components or ancillary items for the products of the main companies;
   b. Help young engineers and young business people to start companies in the supply chain of the industry;
c. Draw on DTI support to assist those existing companies and new companies to take up the opportunity offered;
d. Encourage the larger defence companies to set aside space within their facilities for new small businesses to start up as part of their supply chain;
e. Establish a system of government-owned/contractor-operated (GOCO) plants and facilities in which new or existing SMMEs can establish themselves as part of the defence industry supply chain, moving out as they outgrow those premises.

764. These initiatives will be funded in part from the Defence Industry Fund and in part by the DTI within the framework of its various initiatives. In addition, the potential will be exported for drawing foreign OEMs into this programme, with support for existing and start-up SMMEs gaining additional credit in terms of the DIP requirements and, where it is practicable, in terms of DTI initiatives to win fixed capital investment into South Africa by major foreign companies and groups.

765. **Military Veterans**: The industry will, in cooperation with the Department of Defence and the Department of Military Veterans, develop a focused programme of drawing into the industry former military personnel, both ‘veterans’ as defined in the act, and also serving personnel coming to the end of their service contracts:
a. This will draw into the industry their practical experience of using equipment and systems, giving it a built-in ‘closed loop’ system of incorporating practical service experience into product enhancement and development.
b. Former military personnel will more easily relate to the military personnel of client countries, being able to relate to them on the same level of expertise and practical experience.

766. This programme should be linked to a new short- and medium-service system within the Defence Force that will enable officers and NCOs in the middle ranks to exit the Forces, opening the path for the next generation to move up, and to continue their careers in the defence industry. This joint programme would, ideally, be linked to a vocational training and/or bursary system forming part of the short- and medium-service contracts.

767. All of this will only, however, be practically viable in an environment in which the OEMs are fully engaged in development and production. It cannot be implemented if they are at the same time in a situation that forces them to
lay off their own, often long-serving, staff, and would in any event be self-defeating in such a situation.

### MEASURING SUCCESS

768. If this strategy is to serve as a basis for the development of the industry over the long-term, it must provide a set of benchmarks against which to measure its implementation and the impact of that implementation.

769. While the detailed metrics will be set out in the Implementation Plan flowing from this document, the basic measures of success will include:

<table>
<thead>
<tr>
<th>S/N</th>
<th>Measure</th>
<th>Indicators</th>
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| 01  | Client Satisfaction   | • Military requirements satisfied  
• Efficient acquisition, contracting, manufacturing and delivery process  
• Improved quality of locally produced products and services |
| 02  | Economic Performance  | • Localisation  
• Increased defence exports (by value and geographies)  
• Reduced imports (e.g. high demand spares and consumables) |
| 03  | Transformation        | • New entrants into the defence industry, especially African Black, women, youth and military veterans  
• Diversification of products and services by SMMEs  
• Participation of SMMEs in top-end technologies and contracts e.g. from sub-contractor to a primary contract status |
| 04  | Defence Capabilities  | • Sovereign and strategic capabilities retained, maintained and developed  
• Research and development outputs  
• New Intellectual Property (IP) assets generated and existing ones adequately exploited  
• International partnerships |
<p>| 05  | Social Impact         | • Spin-off and spin-over of technologies, processes and skills |</p>
<table>
<thead>
<tr>
<th>06</th>
<th>Market Penetration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Improved employee numbers in the sector</td>
</tr>
<tr>
<td></td>
<td>Employer of choice for highly skilled personnel in South Africa</td>
</tr>
<tr>
<td></td>
<td>Attractive industry to the youth and designed groups</td>
</tr>
<tr>
<td></td>
<td>Expanded client base</td>
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<tr>
<td></td>
<td>Increased orders from and/or partnership with African countries</td>
</tr>
<tr>
<td></td>
<td>Increased competitiveness across geographies and product range</td>
</tr>
</tbody>
</table>

770. The purpose of these metrics is not to penalise anyone, but to be able to monitor progress intelligently, identifying bottlenecks and weak areas and devising means to address them for the greater good.

~~ END ~~
Defence Industry Strategy Cover – Photo Captions

- Top left: The Badger has been extensively adapted to meet the needs of the SA Army and the complete turret and weapons system was locally developed and is being exported.
- 2nd from top left: The A-Darter is a 5th-generation air-to-air missile being developed jointly with Brazil.
- 3rd from top left: The Husky mine-detection vehicle is the most effective of its kind in the world and has been exported to several countries, with over 1 000 going to the United States.
- The Rooivalk attack helicopter has proved extremely effective in operations in the DRC.
- The Umkhonto surface-to-air missile is fitted to the SA Navy’s frigates and has been exported to Finland and Algeria.
- Main picture: The G6 is among the best medium artillery systems in the world and has been exported to the United Arab Emirates and Oman.
- Bottom left: The Rooikat armoured car was developed specifically to meet the needs of the SA Army.