

Aerospace and Defence Sector Analysis



Prepared for:

:

Prepared by:

Name : Daniel Thwala
Position : Sector Specialist: Manufacturing
Contact number : +27 65 586 4178
Email : daniel@tikzn.co.za
Website : www.tikzn.co.za
Date : 12 August 2021

Table of Contents

1. INTRODUCTION.....	3
2. GLOBAL OVERVIEW OF THE INDUSTRY	3
2.1 Industry value chain.....	4
2.2 Market and trade dynamics	5
2.3 Global outlook.....	7
3. OVERVIEW OF SOUTH AFRICAN AEROSPACE AND DEFENCE SECTOR.....	7
3.1 Trade dynamics.....	9
3.2 Exports.....	9
3.3 Imports.....	10
4. DOMESTIC INDUSTRY AEROSPACE AND DEFENCE LINKAGES WITH OTHER ECONOMIC SECTORS	11
5. MARKET DEVELOPMENTS.....	12
6. SWOT ANALYSIS OF THE SOUTH AFRICAN AEROSPACE AND DEFENCE INDUSTRY	14
7. GOVERNMENT INTERVENTIONS	15
7.1 The Aerospace and Defence Masterplan.....	16
7.2 Aerospace Industry Support Initiative (AISI).....	16
7.3 Joint Aerospace Steering Committee (JASC)	16
7.4 South African Aerospace, Maritime and Defence Export Council (SAAMDEC)	16
7.5 Institutions of higher learning and research centres.....	17
8. LEGISLATION	18
9. KEY INDUSTRY ASSOCIATION.....	18
9.1 Aerospace, Maritime and Defence Industries Association of South Africa (AMD)	18
9.2 Commercial Aviation Association of South Africa (CAASA).....	18
9.3 Commercial Aviation Manufacturing Association of South Africa (CAMASA).....	19
10. OPPORTUNITIES FOR KWAZULU NATAL.....	19
11. MAJOR INDUSTRY EXHIBITION	21
REFERENCES.....	22

1. INTRODUCTION

The aerospace and defence industry plays a vital role in the global economy by supporting and facilitating passenger transportations, trades, logistics, security and defence. The industry consists of several players servicing both commercial and military operations across the value chain. These players include aircraft manufacturers such as Boeing and Airbus; part manufacturers such as GE Aviation, Lockheed Martin, BAE systems and Rolls-Royce Holdings; and Maintenance, Repair and Overhaul (MRO) organisations which are the aftersales service providers. Majority of the large firms are located in the United States of America which accounts for 49% of total industry value.

South Africa has positioned itself as a competitive global player within the aerospace and defence industry. The country has managed to develop designing and manufacturing capabilities and set up local companies that are now supplying tier one components across the global value chain. However, local manufacturing is highly concentrated in Gauteng and the Western Cape. This report focuses on the analysis of the industry and further looks at opportunities that Kwa-Zulu Natal province can exploit in order to attract potential investments within the industry leveraging on a myriad of factors including, inter alia, the aerotropolis strategy, strong government support, the province's airports.

2. GLOBAL OVERVIEW OF THE INDUSTRY

The industry serves mainly two main markets: Aerospace, which largely comprises the production, sale, and maintenance, repair and overhaul (MRO) of commercial aircraft; and Defence, which is dependent on the nation's need for military weapons, transportation and systems. Furthermore, it also includes the production of general aircraft (mostly for business use i.e. business jets), helicopters and space vehicles and satellites, for both military and commercial use. The industry is dominated by a small number of large firms that are supported by a large number of smaller components manufacturers across the value chain. Majority of the large firms are located in the United States of America. In 2020 the global aerospace and defence industry recorded a revenue of US\$697 billion representing an 8% decline from 2019. Table 1 below shows the top 13 industry firms by revenue for the year 2019 and 2020.

Table 1: Industry firms by revenue

No.	Company	Revenue (US \$mn)		Location
		2020	2019	
1.	Lockheed Martin	65,398	59,812	USA
2.	Boeing	58,158	76,559	USA
3.	Airbus	56,912	78,923	Netherlands
4.	Raytheon Technologies	56,587	45,349	USA
5.	General Dynamics	37,925	39,350	USA
6.	Northrop Grumman	36,799	33,841	USA
7.	BAE Systems	24,746	23,348	UK
8.	GE Aviation	22,042	32,875	USA
9.	Thales	19,372	20,606	France
10.	Safran	18,812	28,105	France
11.	L3Harris Technologies	18,194	12,856	USA
12.	Leonardo	15,291	15,436	Italy
13.	Rolls Royce	15,178	21,157	UK

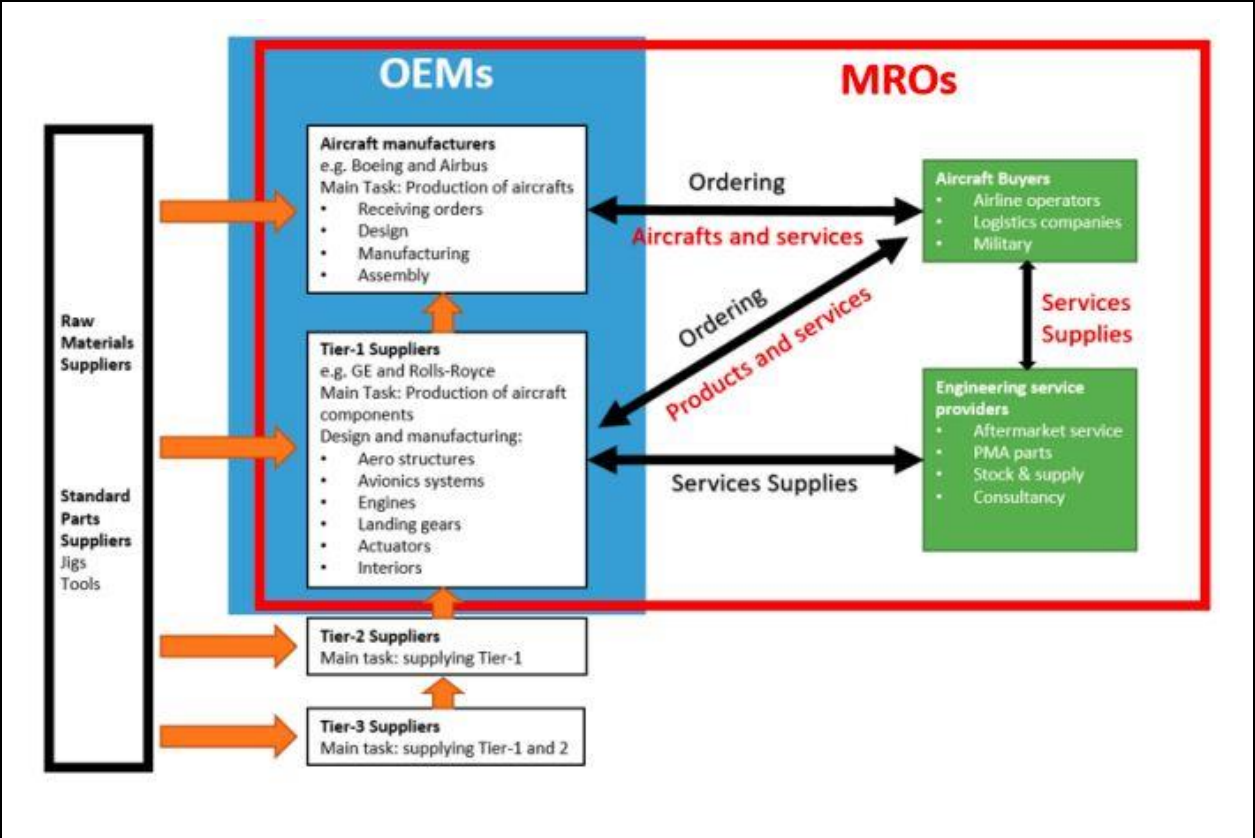
Source: PricewaterhouseCoopers, 2021

2.1 Industry value chain

Due to the high market entrance barriers, there are only a few Original Equipment Manufacturers (OEMs) designing and manufacturing aircrafts and the main component systems. The complexity of the aircraft systems, however, often necessitates OEMs to work with several suppliers, constituting a three-tier supply chain system. Tier one suppliers are the most crucial of the industry as they are responsible for working with sub tier suppliers and manufacture the vital components such as the aircraft frame, engines, interiors, avionics systems, landing gears and other complex components. Tier two supplier's manufacturer minor systems that are indivisible into other systems such as navigation systems, gearboxes, and computer systems, whilst tier 3 manufacturers that

are mainly integrated into tier three systems such as electrical circuit boards, pumps and valves. The final product, i.e., the aircraft is sold to commercial airline operators and military, while Maintenance, Repairs and Overhaul (MRO) companies offer after sale services. The overall operational structure of the aerospace and defence manufacturing industry shown in Figure 1 below, which identifies the critical industry players and the typical interactions amongst them.

Figure 1: Aerospace and defence manufacturing and maintenance value chain



Source: Adapted from Singamneni, *et al* 2019

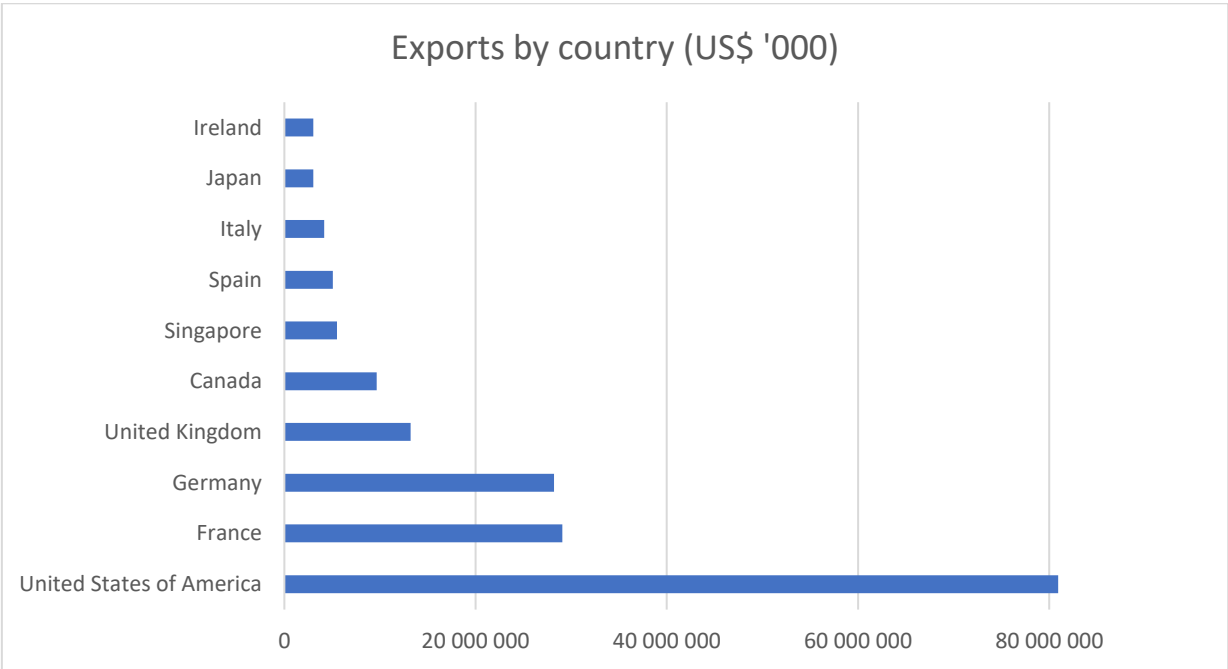
2.2 Market and trade dynamics

The continuously advancing aerospace and defence technology coupled with the surge in global airline traffic in recent years, has been increasing the global demand for aerospace related products. Manufacturing companies are now focusing on developing new and innovative products to increase their competitiveness whilst at the same time preserving the environment. According to Aboulafia and Michaels (2018), in 2017 the global aerospace industry was worth \$838 billion with the USA accounting for 49% of the

industry. Among all the industry segments, Aircraft & Engine OEMs was the largest segment, representing over 28% of the market share, followed by Civil & Military MRO & Upgrades with 27% share. Aircraft Systems & Component Manufacturing accounted for 26%, Satellites & Space accounted for 7%, Missiles & UAVs accounted for 5% and other activity, including flight simulators, defence electronics, public research accounted for the remaining 7%.

In 2020, global trade¹ of aerospace and defence related products totalled US\$379,5 billion, with exports accounting for 57% whilst imports accounted for the remainder. The overall value of trade in 2020 contracted by 34% from US\$573.9 billion in 2019, this was mainly attributed to the global COVID-19 pandemic and subsequent lockdowns. From a country perspective, the USA is the largest exporter, accounting for 38% of total exports followed by France, Germany and United Kingdom accounting for 14%, 13% and 6% respectively. Consequently, the USA is the largest importer accounting for 17% of total imports, followed by Ireland, Germany and France accounting for 9%, 8,5% and 7,9% respectively. Figures 2 and 3 below show top 10 countries by exports and imports.

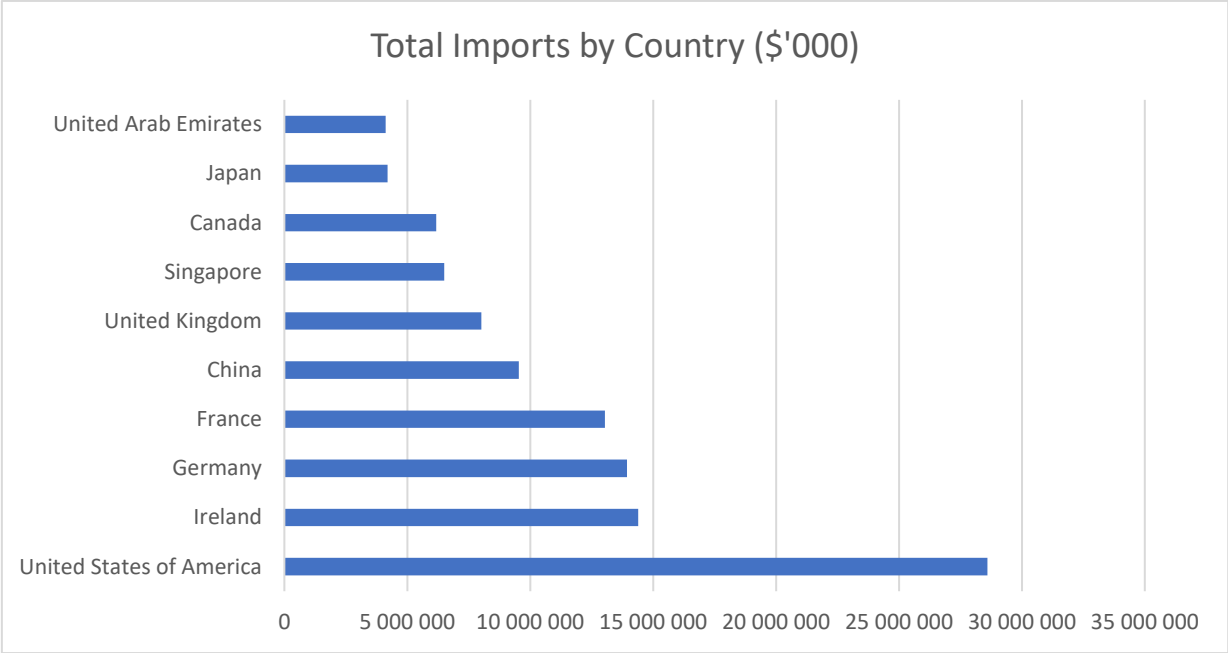
Figure 2: Global exports by country



Source: International Trade Centre, 2021

¹ 2-digit Harmonized Tariff System code prefix is 88 for aircraft and spacecraft including satellites was used

Figure 2: Global imports by country



Source: International Trade Centre, 2021

2.3 Global outlook

The COVID-19 pandemic taught us that the world can quickly change. It is still uncertain how the ongoing effects of COVID-19 will continue to impact politics, the economy, and the evolving future of the aerospace and defence sector. On the commercial side, the aerospace sector has been significantly affected by the COVID-19 pandemic, and this has led to a dramatic reduction in passenger traffic, thus affecting the demand for new aircrafts. As a result, the commercial aerospace sector is expected to recover slowly, as travel demand is not expected to return to pre-COVID-19 levels before 2025 according to IATA estimates. Furthermore, as a result of lower aircraft utilisation, the sale of aftermarket parts and MRO activities can be adversely affected as airlines delay discretionary maintenance to conserve cash. The defence sector, on the other hand, is expected to remain stable, as most countries have not significantly reduced defence budgets and remain committed to sustaining their military capabilities as geopolitical tensions continue to intensify.

3. OVERVIEW OF SOUTH AFRICAN AEROSPACE AND DEFENCE SECTOR

The South African aerospace and defence sector has long history of innovation, research,

development and manufacturing. According to Kraemer-Mbula (2008), the origins of the South African aerospace and defence industry cannot be separated from the history of the country's defence industry and is related to what is known as the military industrial complex or the South African Defence-Related Industries (SADRI). This industry was designed to serve the military purposes of the State in a period of economic isolation, aerospace and defence activities have relied heavily on funding support from the government. During apartheid, the internationally isolated South African regime largely relied on locally produced military equipment, and therefore invested heavily in the development of the country's defence manufacturing capabilities. Additionally, protection from external competition allowed the industry to acquire positions in the domestic market and as a result, many successful domestic companies are largely a result of government investment.

To date, the sector boasts the most advanced and largest industry on the Sub-Saharan Africa region with globally competitive manufacturers. Fully built aircrafts manufactured locally include, gliders or small piston-engine aircraft, four-seater light aircraft and eight-seater aircraft. The 2018 PWC aerospace manufacturing attractiveness rankings report ranks South Africa at number 40 out of 209 countries and territories. The ranking categories includes labour, infrastructure, industry, economy, cost, tax policy, and geopolitical risk.

The South African aerospace and defence industry is currently dominated by a few large companies although the segment consisting of small, medium and micro enterprises (SMMEs) is rapidly growing. The companies are mainly concentrated in Gauteng and West Cape, although the Western Cape consist mainly of a small hub connected to University of Stellenbosch. The Centurion Aerospace Village located in Gauteng has been designed as a supplier park to support the country's innovative and fast-growing aerospace and defence industry. The public sector aerospace and defence companies consists of Armscor, Denel and CSIR Defencetek, SAA Technical whilst private companies include Aerosud, African Defence Systems (ADS), Advanced Technologies and Engineering (ATE), and Saab Grintek, amongst others.

Additionally, the country's aerospace and defence industry has a small but successful, private-sector space design and manufacturing which has produced nanosatellites that

are successfully functioning in orbit, as well as subsystems successfully flying and functioning on other countries' spacecraft. The industry also boasts a manufacturer of recreational aircrafts called sailplanes which have gained an increasing traction in recent years as the demand continues to grow mainly driven by gliding sporting competitions across various countries.

3.1 Trade dynamics

The South African aerospace and defence industry has been traditionally reliant on imports. However, following lifting of the UN embargo in 1994, coupled with trade liberalisation policies saw the exports of aerospace and defence related product accelerate. Table 2 below shows that South Africa is a net importer of aerospace and defence related products. Between 2016 and 2020, both imports and exports declined at an annual average rate of 17% and 12% respectively. Major contractions were experienced in 2020 mainly attributed to the global COVID-19 pandemic.

Table 2: Total trade

Trade	2016	2017	2018	2019	2020	AAGR (%)
Imports (US\$ '000)	1 167 781	994 328	741 599	961 312	399 591	-17
Exports (\$US '000)	493 145	363 857	352 472	402 250	270 607	-12

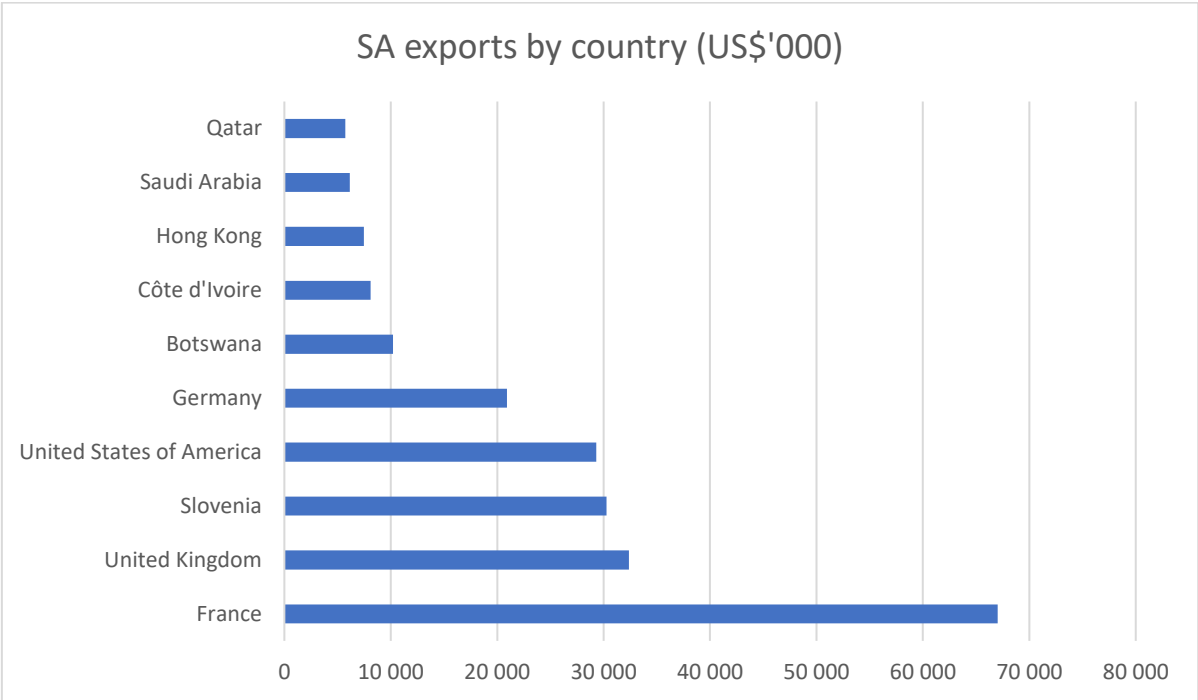
Source: International Trade Centre, 2021

3.2 Exports

South Africa is an established exporter of aerospace and defence related products, having developed a strong local manufacturing base. The country's range of strategic alliances and lack of involvement in international conflicts enable domestic companies to deliver aerospace and defence related products across the world. Aircrafts and helicopter components have traditionally made up the bulk of industry exports; however, external demand for the country's defence electronics, artillery and missiles has also been rising steadily in recent years. In addition, several European industry manufacturers - including Airbus and Saab - have contracted South African firms to produce various components.

In 2020, total export of aerospace and defence related products amounted to \$270 million, representing a 32% decline from 2020. Major exports market for South Africa included France, UK, Slovenia, USA and Germany which collectively accounted for 66 per cent of exports. On the African continent, Botswana, Ivory Coast and DRC are the major export destinations whilst Saudi Arabia and Qatar are the major export destinations in the Middle East. Figure 3 below top 10 export markets for South Africa in 2020.

Figure 4: South African exports by country



Source: International Trade Centre, 2021

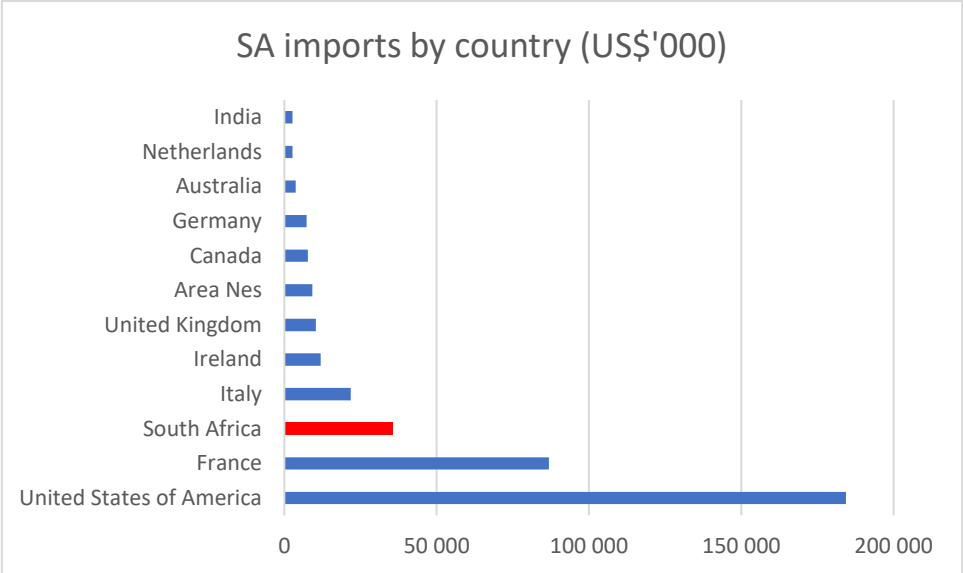
3.3 Imports

Within the aerospace and defence industry, South Africa imported significant amounts of equipment under the 1999 arms deal contracts, most of which were sourced from the European market. To date, the European market remains the major source of imports with countries such as France, Italy, Ireland and UK showing off in the list of top supplying markets of aerospace and defence related products.

The local industry has traditionally lacked advanced technological capabilities in the aircraft and naval vessel segments, thus prompting local manufacturers such as Armscor to source these products from international markets. With most of the already small

defence budget being directed to personnel and operational expenses, orders for new products have been limited. Imports are therefore predominantly driven by commercial aerospace. In 2020, imports of aerospace and defence related products amounted to US \$399 million, which represent a 58% decline from 2019 owing to the global COVID-19 pandemic. The USA is the largest source market accounting for 46% of total imports, followed by France, Italy and Ireland accounting for 22%, 5% and 3% respectively. South Africa’s re-imports of aerospace and defence related products increased by 4% on average annually between 2016 and 2020, to date the re-imports account for 8,9% of total imports showing that the local market is also reliant on cross boarder MRO activities. Figure 5 below shows the top ten source markets for aerospace and defence related products.

Figure 5: South African imports by country



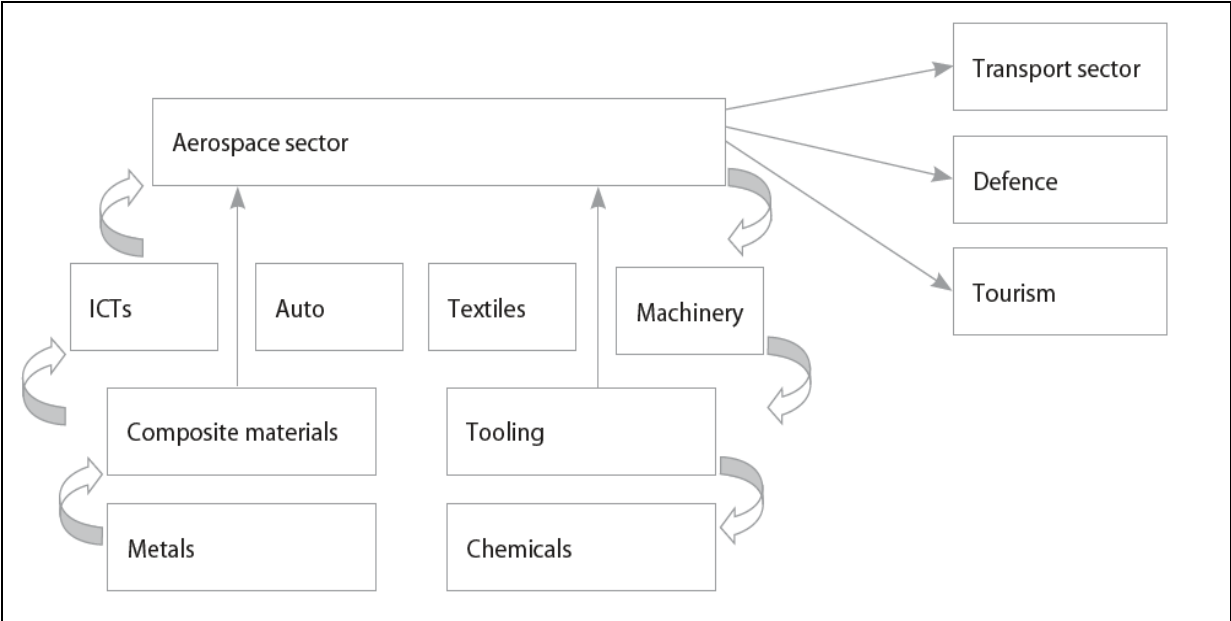
Source: International Trade Centre, 2021

4. DOMESTIC INDUSTRY AEROSPACE AND DEFENCE LINKAGES WITH OTHER ECONOMIC SECTORS

The local aerospace and defence industry has globally positioned itself to be a manufacturer with capabilities across the value chain. Because the industry cannot exist in isolation, it is therefore imperative to highlight its linkages with other economic sectors across the value chain thus identifying opportunities for localisation. According to the DTIC, the aerospace and defence industry currently has a 40% local content rate.

The effectiveness of the aerospace and defence production does not only require elements such as infrastructure, skilled labour, but also access to basic aircraft inputs such as aluminium, steel, cables, as well as more sophisticated inputs such as electronic components, complex software, amongst others. These inputs are sourced from other economic sectors including, *inter alia*; mining, automotive, ICT, textiles. This linkage with other sectors is illustrated in Figure 4 below.

Figure 6: Industry linkage with other sectors



Source: Adapted from Kraemer-Mbula 2008

South Africa is well endowed with raw materials, as well as the advanced industries such as the automotive and chemicals. This therefore positions the country favourably to maintain a domestic supplier base of materials and components thus accelerating industrialisation. Furthermore, this presents the country with a huge potential to exploit, leveraging on the country’ strength in the more traditional sectors such as metals and mining.

5. MARKET DEVELOPMENTS

Local companies within the industry have made commitments to accelerate industry growth as part of the 2021 Aerospace and Defense Masterplan. According to DefenceWeb (2021) the following are some of the key short-term actions that have been

approved by stakeholders within the industry:

- Aircraft engine maker Adept has committed to additional internships and apprenticeship training.
- Aircraft parts maker Aerosud will provide Letters of Intent for investment in the CAV, pursue foreign direct investment, explore investment in the maintenance, repair and overhaul (MRO) of fixed wing aircraft and helicopters, and establish a training school for artisans in the CAV.
- Reutech will implement investment in local production and international markets to the value of R750 million, resulting in the retention of 600 jobs and a significant increase in export sales within three to five years. The company is also willing to lead/support an industry export programme for international markets and provide resources.
- Rheinmetall Denel Munition committed to funding bursaries for engineers and support high schools with equipment and capacity to strengthen Science, Technology, Engineering & Mathematics (STEM) training and outcomes. The company is currently providing 80 interns per annum with workplace internships and retaining over 20% in permanent positions. It further committed to supporting Small, Medium, & Micro Enterprise (SMME) development through 1% and 2% of Net Profit After Tax (NPAT) spending on programmes; and continues to support Military Veterans programmes with financial resources.
- Sandock Austral has committed to implementing the largest apprenticeship programme in KwaZulu-Natal through its shipyards and will implement an Enterprise Development programme by allocating between 30% and 40% of each project revenue to black-owned SMME support in the supply chain.
- The South African Civil Aviation Authority (SACAA) committed to ensure that through its working groups with the relevant State entities and the industry, the final regulatory framework and related systems for RPAS/UAS (drone) design, manufacturing, utilisation, training, certification and operations would be concluded by the end of March 2021.
- Other companies that have pledged commitments in support of the Masterplan include the African NDT Centre, Damen Shipyards Cape Town, GEW Technologies, Hensoldt Optronics, Paramount Group, and the Council for

Scientific and Industrial Research (CSIR). The latter will continue to pursue research and development activities, while Denel will secure strategic equity partners in core Strategic Business Units as approved by the Board and this may include missiles, artillery, and UAVs.

6. SWOT ANALYSIS OF THE SOUTH AFRICAN AEROSPACE AND DEFENCE INDUSTRY

Strengths

- South Africa has a well-established aerospace and defence industry which has a strong government support for joint ventures between local companies and international players.
- Good relations with the global players provide South Africa with access to advanced technologies.
- Domestic companies produce subsystems for several major international aerospace, defence and space programmes and leading manufacturers.
- Domestic companies export a variety of aerospace and defence related products, and South Africa is viewed as a competitive supplier of affordable, middle technology systems and products.
- South Africa's location and wide range of strategic alliances and trade relations means that the country is well placed to serve the wider African aerospace and defence market.

Weaknesses

- The business rescue of South African Airways and the liquidity crisis at its subsidiary SA Express affect MRO activities.
- Procurement of new equipment by the SANDF remains limited, making local companies highly reliant on commercial aerospace and export markets.
- High capital investment and operating costs as well as a highly regulated industry, which may serve as deterrents to new entrants.
- Persistent corruption in state-owned entities which are the major player in the sector

continues to weaken these institutions.

- 57% of the military budget is allocated for salaries, limiting scope for capital expenditure and research and development.

Opportunities

- Demand for defence equipment will continue to remain strong for the foreseeable future, as countries continue to strengthen their military capabilities as geopolitical tensions deepen.
- Single African Air Transport Market and the African Continental Free Trade Area agreements has the potential to increase connectivity and open up markets for local players on the African continent.
- Maintenance, refurbishment and overhaul of aerospace and defence products.
- Strengthening aerospace and defence ties with other emerging markets - particularly Brazil – can create opportunities for joint product development, enhancing South Africa's competitiveness in the global market.
- A series of joint ventures formed with Middle Eastern, Asian and European companies over the past years can enable South African aerospace and defence manufacturers to tap into new export markets over the medium term.

Threats

- The commercial aerospace sector is expected to recover slowly, as travel demand is not expected to return to pre–COVID-19 levels before 2025 thus limiting purchase of newer aircrafts.
- Financial constraints will remain in the medium term, forcing the aerospace and defence industry to prioritise programmes.
- A failure to reduce staff levels over the coming years would see significant shares of defence expenditure continue to be diverted away to the SANDF's operational budget, limiting new procurement.

7. GOVERNMENT INTERVENTIONS

The South African government has a number of interventions in the form of plans, actions

and programmes aimed at growing and sustaining the aerospace and defence industry. These interventions are briefly outlined below.

7.1 The Aerospace and Defence Masterplan

The Aerospace and Defence Masterplan, completed in 2020, aims to increase localisation of selected components by 50% from current baseline levels by the end of 2024; improve export sales by 100% from the current baseline by the end of 2022; increase formal employment from current levels by 50% by the end of 2025; retain advanced skills in the ecosystem and double the participation of black and/or women participants in the industry from the current baseline by the end of 2022.

7.2 Aerospace Industry Support Initiative (AISI)

AISI is the government initiative aimed at improving the competitiveness of the local aeronautics, space, defence, and marine advanced manufacturing sectors. The initiative further aims to position South Africa's aerospace and defence industry as a global leader. The initiative includes four programmes, namely:

- Supplier development.
- Sector strategic support initiatives.
- Industry development and technology support.
- Coordination, promotion and awareness.

7.3 Joint Aerospace Steering Committee (JASC)

Established in 2012, JASC is tasked with developing interventions and coordinating on clustering, skills development and strategic positioning of the South African aerospace industry. The creation of the JASC was one of the recommendations of the Aerospace Sector Development Plan (ASDP), which was commissioned by the DTI and the Department of Science and Technology. The JASC is composed of representatives of government departments, industry, finance institutions and research and development (R&D) agencies.

7.4 South African Aerospace, Maritime and Defence Export Council (SAAMDEC)

The South African Aerospace, Maritime and Defence Export Council (SAAMDEC) was

established in 2015, jointly by the Department of Trade and Industry and, the Aerospace, Maritime and Defence Industries Association, for the express purpose of facilitating exports for the Defence and Related Industries Sector. Main Functions include:

- Growing – Export Volume and Value
- Growing – Export Base
- Diversifying – Export Base
- Diversifying – Export Markets

7.5 Institutions of higher learning and research centres

The Council for Scientific and Industrial Research (CSIR) and National Aerospace Centre (NAC), together with 13 universities are providing aerospace and defence related course as well as world class research in the field. These universities are as follows:

- University of Stellenbosch
- University of Cape Town
- University of the Western Cape
- Cape Peninsula University of Technology
- University of Witwatersrand
- University of Johannesburg
- University of Pretoria
- Tshwane University of Technology
- Vaal University of Technology
- North-West University
- University of Limpopo
- Nelson Mandela Metropolitan University
- Central University of Technology

8. LEGISLATION

The aerospace and defence industry is a highly regulated industry owing to safety concerns. In South Africa activities related to the industry are regulated by the South African Civil Aviation Authority (SACAA), which is a body tasked with promoting, regulating and enforcing civil aviation safety and security. The organisation issues certificates to manufacturers, MRO organisations and aviation personnel in line with international standards.

Suppliers to the military aviation have to comply with the requirements of Armscor which is the procurement arm of the South African National Defence Force (SANDF). The objectives of Armscor are to meet:

- the defence matériel requirements of the DOD effectively, efficiently, and economically; and
- the defence technology, research, development, analysis, and test and evaluation (T&E) requirements of the DOD effectively, efficiently, and economically.

9. KEY INDUSTRY ASSOCIATION

There are three main industry associations within the aerospace and defence industry. These associations are as follows:

9.1 Aerospace, Maritime and Defence Industries Association of South Africa (AMD)

Its primary objectives are the representation of the industry in matters of mutual interest, and the promotion of a profitable, sustainable and responsible industry. The association is acknowledged as the only trade association of South Africa's defence industry (SADI) and is mandated by its members to promote and champion the collective interests of the industry. It comprises a cluster of leading companies in the South African private and public sector that supply defence materiel, products and services.

9.2 Commercial Aviation Association of South Africa (CAASA)

CAASA is a non-profit organisation formed in 1944 to promote and protect the commercial interest of the general aviation industry in South African Aviation. Member companies include airport operators, non-scheduled operators, business aircraft operators, flying

training organisations, aircraft maintenance companies and companies offering a whole range of supporting and retail services.

9.3 Commercial Aviation Manufacturing Association of South Africa (CAMASA)

CAMASA is a non-profit organisation formed in 2016 to integrate the collective offering of the SA aviation sector. It aims to establish a growth-bilateral between the Public & Private sectors with the intent to significantly boost South African Commercial Aerospace Manufacturing Exports through:

- Public-Private partnership
- Integrated Industry Growth Plan
- Expanding Advanced Manufacturing
- Future-orientated competitiveness (IoT, Ind 4.0).
- Labour Engagement & Skills Development

10. OPPORTUNITIES FOR KWAZULU NATAL

The aerospace and defence industry in KwaZulu Natal is still at infancy with fewer players mostly involved in MRO activities of aircrafts and helicopters with one manufacturer involved in the manufacture of aircraft filters, there are however opportunities that can be further exploited and attract potential investments within the industry leveraging on a myriad of factors including, *inter alia*, the aerotropolis strategy, strong government support, the province's airports, the strength of other economic sectors in the province that can be integrated into the supply chain, and the province's air connectivity. Furthermore, the aerospace and defence industry in Africa is expected to grow exponentially in the 20 years as airlines in the region are expected to upgrade, replace and increase their fleet thus providing opportunities ranging from supplying of aircraft components, MRO and other industry related activities. The opportunities for the province include the following:

Maintenance, Repair and Overhaul (MRO)

While there are smaller companies in the province currently involved in MRO activities for smaller aircrafts, there is however an untapped opportunity to further deepen investments

in MRO activities for leisure, training, business and commercial aircrafts as well as helicopters in the province. The uncertainty regarding SAA Technical also creates a vacuum within the industry especially with regards to maintenance of larger commercial aircrafts for both international and local airline operators.

Aircraft components

There is already one manufacturer in the province manufacturing aircraft filters, this shows the province has the capability to manufacture aircraft components. Components such as aircrafts seats can be manufactured within the province leveraging on the province's robust textiles and clothing sector. Additionally, replacements components such as windscreen wipers for both large and small aircrafts can be also produced within the province to service the MRO market.

Drones

The use of drones or remotely piloted aircraft systems is forecast to grow exponentially. Globally the drone business is proving to be one of the most explosive new growth industries in recent years, with South Africa a relatively late bloomer. Opportunities to position Kwa-Zulu Natal as a drone operation hub leveraging on the province's many airports and airstrips for efficient delivery of goods and service. Furthermore, opportunities exist for components manufacturing for after sales, maintenance and repairs of drones.

Sailplanes/Gliders

Sailplanes (also referred to as gliders) are small aircrafts used in sporting and leisure activities. These aircrafts are normally use rising air in the atmosphere to gain altitude. Although the manufacturing activities are mainly in Germany, Jonker Sailplanes based in Potchefstroom is one of the world's biggest manufacturers. There is already an established market in South Africa for the sailplanes that Kwa-Zulu Natal can also tap into, particularly with regards to manufacturing of sailplanes to support sporting and leisure activities that can further boost tourism. The Soaring Society of America estimates that new, factory-built sailplanes may cost \$50,000 to over \$300,000 or more depending on performance, construction, and equipment. Major components used in the manufacture of sailplanes include carbon composites, fiberglass, aluminium, wood and

special fabric stretched over steel tubing.

Academic research

Of the 13 universities currently involved in research and programme offering for aerospace and defence, none are from Kwa-Zulu Natal, thus creating a vacuum for skills development of this sector in the province. Opportunities exist for universities within the province to collaborate with industry players and offer industry related courses and research to enhance knowledge and upskill the workforce.

11. MAJOR INDUSTRY EXHIBITION

The African Aerospace and Defence Expo (AAD) is an aerospace and defence exhibition held biennially at AFB Waterkloof, in Centurion, Gauteng, South Africa. The exhibition combines a trade exhibition and an air show with close to 500 exhibitors and more than 32 000 trade visitors. The next exhibition will be held on 22- 25 September 2022.

REFERENCES

Aboulafia, R. and Michaels, K. 2018. The Global Aerospace Industry Size & Country Rankings. [Online] Available from: https://aerodynamicadvisory.com/wp-content/uploads/2018/07/AeroDynamic-Teal_Global-Aerospace-Industry_16July2018.pdf

DefenceWeb. 2021. South African companies commit to grow aerospace and defence sectors under new Masterplan. [Online] Available from: <https://www.defenceweb.co.za/featured/south-african-companies-commit-to-grow-aerospace-and-defence-sectors-under-new-masterplan/>

International Trade Centre. 2021. [Online] Available from: <https://www.trademap.org/Index.aspx>

Kraemer-Mbula, E. 2008. The nature of the aerospace industry in South Africa. Institute for Economic Research on Innovation.

PricewaterhouseCoopers. 2021. Global Aerospace and Defense: Annual Industry Performance and Outlook. [Online] Available from: <https://www.pwc.com/us/en/industrial-products/publications/assets/pwc-aerospace-defense-annual-industry-performance-outlook-2021.pdf>

Singamneni, S., Yifan, L.V., Hewitt, A., Chalk, R., Thomas, W. and Jordison, D., 2019. Additive manufacturing for the aircraft industry: a review. J. Aeronaut. Aerosp. Eng, 8(214), p.2.