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A S S E G A I

A STRATEGY FOR A SUSTAINABLE, ECONOMICAL AND GROWING AEROSPACE INDUSTRY

ASSEGAI
A Strategy for a Sustainable, Economical and Growing Aerospace Industry

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I. Introduction

This study forms part of the Advanced Manufacturing Technology Strategy (AMTS) and refers to the South African aerospace manufacturing sector, its role locally and its present and possible future position within the global context.

The process that was followed for the generation of this strategy document was to approach key local, multinational and international companies (who have an existing or potential role to play within the South African aerospace industry), with a request to provide answers to the following questions:

- What is the "state of the nation" of the local aerospace industry?
- What are the present and future international trends?
- Where is South Africa's aerospace industry heading?
- Where should South Africa's aerospace industry be heading?

The feedback obtained was then used as a basis for generating this document.

Information was also obtained from other strategic reviews such as STAR21 of the European Union, a discussion document generated by Paul Hatty for the South African Government, studies performed by the DTI-Canada and studies that are being driven by the Society for British Aerospace Companies (SBAC) in the UK.

2. Definition and Scope

The aerospace industry can be defined as follows:

The aerospace industry is that industry which covers the research and development (R&D), design, manufacture, support, maintenance, conversion and upgrade of:

- Rotary and fixed wing aircraft
- Satellites and satellite launch and tracking systems
- Air traffic control systems
- Unmanned aircraft
- Weapons Systems
- as well as their relevant subsystems and components.

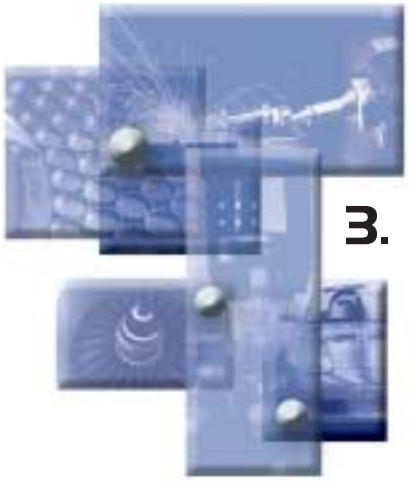
(Adapted from Paul Hatty, 2000).

Manufacturing in the context of this study encompasses not only the typical processes such as casting, sheet-metal fabrication and assembly, but also the critical upstream and downstream functions that play a role in the creation of a fully integrated aerospace product.

Maintenance, on the other hand, is seen as a well-defined function that requires strict adherence to Original Equipment Manufacturer (OEM), Operator and Federal Aviation Administration/Joint Aviation Authority (FAA/JAA) principles.

Modification is a marriage of the two and hence will be affected by forces from both ends, for instance supply chain management and aircraft maintenance levels and scheduling.

Hence, the study investigates the potential to improve the industry's delivery mechanisms and supply chains.



3. Strategic Role of the Aerospace Industry

In the European Union (EU) Strategic Aerospace Review for the 21st Century (STAR21) it is stated that a flourishing and competitive aerospace industry is essential to ensuring a secure and prosperous Europe.

Although a direct application of this statement cannot be made to South Africa on its own, it may be true of an African union in the context of New Partnership for African Development (NEPAD). In addition it is well known that the very presence of a high technology industry also raises the level of competence of the local engineering industry in general.

A high level of technical competence locally should also attract business in the form of aircraft maintenance and upgrades. This will benefit the commercial aviation industry in particular with resultant spin-offs down the chain.

South Africa's Long Term Goal

The South African government has clearly stated that it wants the aerospace industry to be as healthy and vibrant as the automotive industry by the year 2014, and has a vision that by this date South Africa will have a sustainable, growing, empowered and internationally recognised industry.

One possible measure for success would be the successful integration of the local industry into, for instance, Airbus' global supply chains, as a valued, professional and reliable partner. Another measure would be how successfully South Africa has played a role regarding Africa's growing air transport needs over the same period.

The existing South African aerospace industry has the potential to grow in a sustainable manner by cultivating a collective role both locally as well as globally, providing that certain mechanisms are put in place and particular modes of operation are adopted.

Hence, any required restructuring of the South African aerospace industry should be done with the long term requirements of the country in mind and all issues which could affect this restructuring must be addressed from a South African viewpoint.

Wealth Generation

It is a well-known fact that for most Western economies their aerospace industry is seen as not only a major strategic asset, but also as a vital generator of wealth. The aerospace and space manufacturing industries generate the highest added value items of all industries (~50%) and can therefore provide a large revenue stream for a successful industry. Furthermore, even with their highly mechanised workforce the European aerospace industry still manages to support a very large number of small and medium enterprises (SMEs) in all 15 member countries, through a well defined supply chain that ensures wealth and employment right across the EU.

It is clear that a sustainable and growing aerospace industry is key to the economic wealth and political ambitions of South Africa, and should therefore be well aligned with the principles contained in the NEPAD. The South African aerospace industry can and should play a vital role over the next decade in ensuring the prosperity of the nation as well as in ensuring its national security. What needs to be determined is the how.

Innovation and Competitiveness

The aerospace industry, by the very nature of the skills and technologies involved, is a very powerful driver of innovation across the industrial base. Internationally, extreme demands are placed on the industry to achieve suitable levels of quality, safety, efficiency, certification, and skills training. Success in terms of these measures will not only potentially position South Africa's industry as a competitive option it will also position the country as a whole.

Safety and Security

Aerospace capabilities are essential to any national safety and security requirements. A large proportion of the aerospace sector’s products are directly applicable to defensive and offensive roles, and are therefore instrumental in maintaining sovereignty, peace keeping as well as assistance in disaster relief.

South Africa's existing and possibly expanding role within the African Union (AU) will require a certain responsibility from the government and industry regarding the above roles.

4. Present Industrial Profile

The Global Aerospace Industry

The outcomes of technological advances in the manufacture and operation of aerospace systems are always felt by society at large, whether it is in the improvements of the carrying capacity of commercial transport aircraft, or the avionics capabilities of military fighter aircraft, or even in terms of dual use in other industries such as automotive and power generation. The aerospace industry will always be a driver for technological and economic growth, and an incubator of critical and pervasive technologies.

The international aerospace industry is highly weighted towards the First World, with the United States (US) the clear leader both in terms of world market share and employment numbers. This domination by the West has resulted in the emerging economies being sidelined to a large degree, with certification requirements and protective legislation providing a significant barrier to entry.

Table 1 lists the annual sales for the leading international aerospace manufacturing companies as well as for the two largest South African companies for comparison.

Company	Country	Annual Sales (RB)*	Military Sales (RB)*	% Military
Boeing	USA	423	130	30%
Lockheed	USA	235	188	80%
EADS	EU	210	52	25%
BAE Sys	UK	174	139	80%
Raytheon	USA	156	125	80%
Northrop	USA	79	56	70%
Thompson CSF	France	62	43	70%
Finmeccanica	Italy	35	17	50%
Denel Aviation	S. Africa	1.6	1.4	88%
SA Technical	S. Africa	2.2	0	0%

*Adapted from P. Hatty 2000 (International data circa 2000, Domestic data circa 2002)

Table I. Annual sales for select aerospace companies*

The global aerospace industry can be broken down in to 5 tiers, which perform well-defined functions. Table 2 gives a definition of these tiers plus some explanatory examples.

It is important to note that due to the high-technology nature of aerospace equipment and the required quality and safety standards, R&D spending in all five tiers is high in comparison with other industry sectors. Likewise, the value added component, even when defined as being low, is still significantly higher than in any other industry, bar perhaps the space sector.

The lower tier sub-contractors that supply parts or components have to have the appropriate certification before they can supply anything further up the system. Unlike the large companies that operate in the two top tiers, obtaining certification is costly and is a hindrance to entry for small and medium size businesses. The same could be said for any burgeoning Black Economic Empowerment (BEE) enterprises that would like to take advantage of mechanisms such as offsets and Industrial Participation (IP).

Tier	Description	Descriptors
1 **(Complete System)**	An entire aircraft with all the required sub systems already fully integrated. This tier could also include logistics support, upgrade and maintenance of the system for a specified period. *Examples* • Rooivalk helicopter • Airbus A380 • Hercules C130 *Players* • Denel Aviation • Airbus • Boeing • Lockheed-Martin • Embraer	• Highest value added products • System/ business integrator level • Low volumes • High level human resources • Very little manufacturing • Mostly assembly
2 **(Major sub-system)**	Sub-systems that are made up out of a significant number of minor sub-systems. This would still involve a level of system integration not dissimilar from the first tier *Examples* • Complete powerplant • Main airframe sections (e.g. wing) • Undercarriage • Complete avionics system *Players* • Rolls-Royce • General Electric (GE) • Snecma • Advanced Technologies and Engineering (ATE) • Bombardier • Smiths	• High value added products • System integrator • Low volumes • High level human resources • Little manufacturing • Assembly

Tier	Description	Descriptors
3 **(Minor sub-system)**	A defined assembly of components indivisible into other systems. *Examples* • Aerodynamic control surfaces (flaps) • Gearboxes • Navigation systems • Weapons and ordinances • Computer systems *Players* • Denel (Aviation, Kentron and Eloptro) • Aerosud	• Medium value added products • Sub-contractor • Medium volumes • Medium level human resources - production skills • Manufacturing • Assembly intensive
4 **(Component)**	A device with a clear function that is of no use unless integrated into a tier 3 system. *Examples* • Electrical circuit boards • Machined engine parts • Valves and pumps *Players* • Turbomeca Africa	• Medium value added products • Sub-contractor • High volumes • Medium level human resources - production skills • Predominantly manufacturing • Assembly intensive
5 **(Part)**	A unit that can be defined as a single monolithic part. In some cases the part has not had any value added to it through for instance assembly or machining processes. *Examples* • Un-machined castings • Shafts • Rivets • Electrical components such as resistors and capacitors *Players* • Snecma foundry • Denel foundry • Westland	• Low value added products • Sub-contractor • Highest volumes • Medium level human resources • No integration • Solely manufacturing • No assembly

Table 2. Aerospace industry Tiers

International Industry Landscape

The international aerospace industry is dominated by a few extremely large companies that offer fully packaged systems to both the commercial and military markets as first tier suppliers. They not only sell the equipment they also support it during its lifetime through maintenance, upgrade/improvement, conversion and repair, but more importantly they are referred to as the large scale business and system integrators.

The first tier suppliers are also the design authority and they are also responsible for the system integration, hence have full rights to the aircraft type. They therefore take responsibility for the manufacturing contract and management of their supply chain, but they do not undertake the actual manufacturing itself. Airbus, for instance, has its manufacturing done where it is more cost-effective to retain a competitive advantage and does not play in the arena of repair and conversion.

These first tier system/business integrators remain the wealth generators as they are ultimately responsible for the sale of the complete product. The wealth filters down through the value chain to the lower tier operators - the higher volume/lower value producers (see the descriptors in Table 2).

Mergers and Acquisitions

The international aerospace industry has been going through waves of consolidation for quite a few years now and will continue to experience mergers and acquisitions for the foreseeable future. The creation of European Aeronautic, Defence and Space Company (EADS) and the merger of Boeing and McDonnell-Douglas are two prime examples of this trend.

A result of these mergers has been the inevitable reduction in the number of new aircraft development programs for both the military and civil markets (e.g. 7E7, A380 and Joint Strike Fighter - JSF), which has in turn led to stiffer global competition between the remaining first tier business and system integrators.

Likewise, the inevitable increased competition between the lower tier sub-contractors who constitute the first tiers supply chain has had an effect on efficiencies, margins, scale of economy, and expertise retention. This strain in the whole supply chain has had the effect of upwardly driving the strategic thinking of the system integrators. They now are looking more and more towards globally competitive delivery and pricing models. This being especially true for the European industry since they do not have the same security restrictions that US companies have when subcontracting abroad. This is where the opportunities lie for countries (such as South Africa) that have an indigenous aerospace industry that could easily be positioned as a reliable manufacturing base in the global market.

There is also a trend towards commonality between civilian and military equipment (e.g. 767, A400M and C130 conversion), which is driven purely by the cost of manufacture, and the potential savings in maintainability and training.

Global Supply Chain

The system integrators, to remain competitive, have to maintain a balance between their drive to maximise efficiencies and their drive to minimise risk.

Increased supply chain efficiency, both in terms of delivery and price, has meant that most system integrators have actively cultivated global networks of subcontractors. Work is therefore placed in countries that provide a cost effective manufacturing solution, whilst still maintaining the required production efficiencies, quality and delivery standards. This has to be balanced with the continual drive to reduce the actual number of sub-contractors.

Manufacturing Efficiency

A steep improvement in global manufacturing efficiency is expected by the end of 2005, which will require significant levels of investment in capital equipment as well as human resources. This increase will be built upon the already existing global capability which includes lean manufacturing principals and methods such as high performance cutting, laser beam welding and "jig-less" flexible tooling and assembly, all methods that will be seen as commonplace and more cost effective by 2005.

For the South African Aerospace Industry to be able to compete globally, widespread upgrading of manufacturing facilities may be required. This will obviously require significant expenditure on equipment and on training of skilled personnel.

Political Forces

Passenger sentiment plays an important role in the utilisation and health of the commercial airline market, and recent events such as September 11th and Severe Acute Respiratory Syndrome (SARS) have clearly exhibited how dependant airlines are on consistent utilisation of their services.

Local Industry Landscape

The main form of the present manufacturing industry structure is as a result of the strategic funding used for military purposes over the last ±40 years. The allocation of this funding predominantly through the Defence Research and Development Board (DRDB), was driven by the then government's desire to have strategic independence from the international aerospace industry. The successful aerospace manufacturing companies today are largely as a result of government investment.

Funding for R&D and manufacturing was therefore focused on gaps in the local technology offering - gaps based purely on military requirements. R&D funding was used to develop core technologies, in many cases from scratch, and the manufacturing base was tailored around the design and manufacture of completely new first and second tier military systems.

This started changing in the early 1990's to a situation where the existing military systems needed to be maintained and upgraded to extend their lives. This meant that most of the "clean-sheet" design of aircraft and power-plants, with the exception of the Rooivalk, died, effectively reducing the first tier role to the manufacture and supply of a single complete system.

The maintenance industry has fared markedly better over this period due to the fact that the civil aviation industry has always required that international best practices and methods be used for repair and overhaul of commercial aircraft at all times. Without compliance in this sub-sector the national carrier would, in any case, not have been allowed to enter into US and European airspace.

In the late 1990's IP started becoming a significant driver with many local companies scrambling for Defense Industrial Participation (DIP) and National Industrial Participation (NIP) allocations. To date only well established players have benefited from IP. At the same time, R&D spending reduced dramatically to well below the levels seen in the late 1980's.

The resultant industry is highly fragmented with very little domestic co-operation between companies. Its market has been predominantly local and captive, with very little requirement to understand what an international customer would require.

The present industry can therefore be characterised as follows:

- Industry size
  - Few large companies, the two biggest players by far are
    - Denel (~R1.6 Billion turnover) and
    - SAA Tech (~R2.2 Billion turnover)
    - Both are state owned entities.
  - Fragmented due to historical reasons
  - No duplication of efforts
  - Limited funding available
- Capability
  - Limited, obsolete and ageing facilities
  - Flexibility, innovation entrenched due to historical reasons
  - In some parts of the industry short development cycles are achieved (avionics)
  - Good quality in some parts of the industry

- Contracts
  - Still heavily weighted towards military needs
  - Of short duration hence not conducive to long term relationships
  - Lower tiers have very few critical customers upon which they are reliant
  - Mixed local and international customer focus
  - Small in size and volume but across the tiers
- Capacity
  - Manufacturing industrial base only really suited to military requirements (i.e. small volume high value items)
  - No lean processes implemented hence not competitive
- Integration
  - Little co-operation domestically
  - History of secrecy
  - Little outside contracting
  - Captive market
- Skills base
  - Niche expertise limited to certain disciplines
  - Medium to low labour rates
  - Insufficient human resources development
  - Expertise base lacks succession planning
  - Experienced engineering and other personnel are leaving the industry and the country.
  - Fast learners
  - Flexible and innovative workforce

Ambition Versus Ability

It is very important that a sober viewpoint regarding South Africa's ability is maintained, bearing in mind what the industry is capable of doing at present, not what it was able to do 15 years ago.

5. South Africa's Future

Competing on World Markets

For South Africa to compete successfully in the US and European markets the industry must focus on those areas which are strengths – without losing sight of those factors over which they do not have control while continually striving to change those factors over which they do have control.

For instance, the industry will not be able to overcome the fact that it is geographically unfavorably placed. South Africa is very far from the potential market, hence shipping costs and delivery times will always be higher and longer than in the Northern Hemisphere. Transaction costs, such as importation of raw materials, and re-exporting of a finished product could very quickly dilute any possible margins. The answer lies in ensuring that there is more value addition integration done within South Africa. As the values of the export products increase, so the logistics costs begin to play a less significant role.

Links with International Companies

There are, nevertheless, a number of links with international companies, with the most recent ones being IP related. For example, local involvement with Boeing, Snecma, Volvo Aero, SAAB, Honeywell, Lockheed, Motor und Turbinen Union (MTB), and BAe Systems is taking place and some success has been achieved.

These links tend to be across all the tiers but predominantly on the third and fifth tiers where the local industry is providing services that are cost effective on an international scale, but slowly becoming very expensive compared to India, China and the Eastern block. Outsourcing by very large Multinationals such as GE has not borne fruits for South Africa compared to, for instance, India. Strategically South Africa must decide whether it wants to compete on cost against much cheaper countries (as mentioned), or the first world. If

against the first world, the emphasis will generally have to be on high-value addition, but capital intensive, processes as well as local development of ingenious and creative solutions.

Even with competitive products and services to offer, entry into the US and European markets is not guaranteed. Relationships and strategic alliances need to be generated at the highest levels possible, both in Government and business, if a new entrant is to be taken seriously.

A Role in Africa

South Africa's industry could be a bridge for OEMs to gain a foothold in the rest of Africa. South Africa's industrial and commercial infrastructure is the best-developed on the continent.

Also, the demand for commercial carrying capacity in Africa is expected to double over the next six years, which means that South Africa should be positioning itself to take advantage of the inevitable needs regarding aircraft maintenance, modification and upgrades that will arise.

It is quite possible for South Africa to become an aerospace hub for Africa, in much the same way that Australia has become a centre of aerospace expertise in South East Asia.

Government Controls

Creative mechanisms for fast tracking this industrial rebirth must be sought. Issues around import duties, tariffs and manufacturing incentives must be addressed in the short term. More flexible approaches to government financial lending schemes must be sought, especially regarding BEE, plus development of industrial development zones (IDZ) and associated supplier parks/clusters linked to these mechanisms.

Donations of new capital equipment by international companies to local industry must be encouraged by reducing the import burden in terms of both duties and customs procedures.

Capital investment schemes to enable big local players such as Denel Aviation to bridge the manufacturing technological divide that exists, and is worsening as time goes by, should be actively pursued. These schemes must also ensure that the lower tiers, the SMEs and any BEE startups benefit from this investment. There is a perception in the

industry that Denel and other major beneficiaries of IP have already taken the largest portion of the IP allocation for themselves and would do the same with any new investment scheme.

Industrial Participation

IP is already being leveraged to form strong international alliances, and must be used as a means for entry into the global supply chain mechanisms for the long term.

The onus is now on the local industry to ensure that the IP opportunity is used to exhibit commercial attractiveness to the suppliers so that integration into their long term supply chain becomes possible.

Issues around the implementation of IP that need addressing are:

- IP credit trading between major suppliers
- The ability to "bank" credits for future use

These issues obviously have to fit in with the governments overall IP agenda, but are nevertheless seen as two possible ways of improving the chances for local SMEs.

SME and BEE Development

Approximately 75% of the +/- 220 local companies directly or indirectly involved in aerospace can be defined as SMEs, which implies that there is at least a thriving medium size industry base that is operating in the lower (third to fifth) tiers.

As mentioned above, an active aerospace industry should also stimulate the local aircraft maintenance/repair and light aircraft sectors. This could attract more business, especially for SMEs, whilst large companies should be both encouraged and, if need be, required to support them.

Human Resource Development

The expertise base, much like the capital base at present, is very much based upon the ±40 years worth of original funding. The major portion of the original expertise is either retired or close to retirement. There is also a sense in the industry that a significant portion of the industrial expertise base has emigrated. Succession planning in especially R&D has been impossible to achieve for over a decade due to extremely low funding levels.

Transformation on the shop floor is taking place at a very good pace but, due to the highly specialised nature of the qualifications required for design and development, it is falling short in the R&D environment. It is also important to note that it is in this latter environment that the real value-addition for the industry lies.

Tertiary education institutions, such as the University of the Witwatersrand and University of Pretoria, battle to attract science and engineering students. The perception that engineering is a low level, low paying career option has to be eroded. Large numbers of students undertake IT and business degrees because of the perceived wealth that these qualifications might bring. It should therefore be part of Government's role in the aerospace industry to put the correct incentives in place for tertiary institutions to attract and provide the right calibre of young people to populate the industry.

It is vital that South Africa does not lose its trained manpower. This can, however, only be achieved if local conditions are such that people would be willing to stay and make careers in the aerospace industry. Creating these conditions is primarily the responsibility of Government.

Awareness at the primary and secondary school levels must be generated. Schemes such as the Young Falcons (SAAF) at Waterkloof, and the CAD in Schools scheme/Brighteye Programme at the CSIR are outstanding attempts at engendering science and technology during a learner’s formative years.

6. Recommended Strategic Initiative

A Possible New Operating Environment

A partnership needs to be created through which government can see a return on investment for the country through foreign earnings and growth of the industry, whilst at the same time industry must be given a platform from which they can collectively gain more value added work and have more control over their own industry.

"*Innovation Agenda*"

An engineering and business agenda for innovation must be created that will afford the government and industry the opportunity of collectively generating long term strategies around the following issues.

- Creation of the correct long term business climate for all
- Generation of a suitable business and technology infrastructure that will last until well beyond 2014
- A human capital base agenda that will nurture the countries future experts while retaining the present expertise
- Mechanisms for:
  - Communicating industries needs and expectations to government and vice-versa
  - Collective manufacturing and marketing
    - Supply chain management
    - Supplier base assistance
- Funding mechanisms
- Active SMEs, BEE development
  - Suitable business climate creation (IDZ, tariffs, taxes and duties)
  - R&D re-focus and expenditure increase

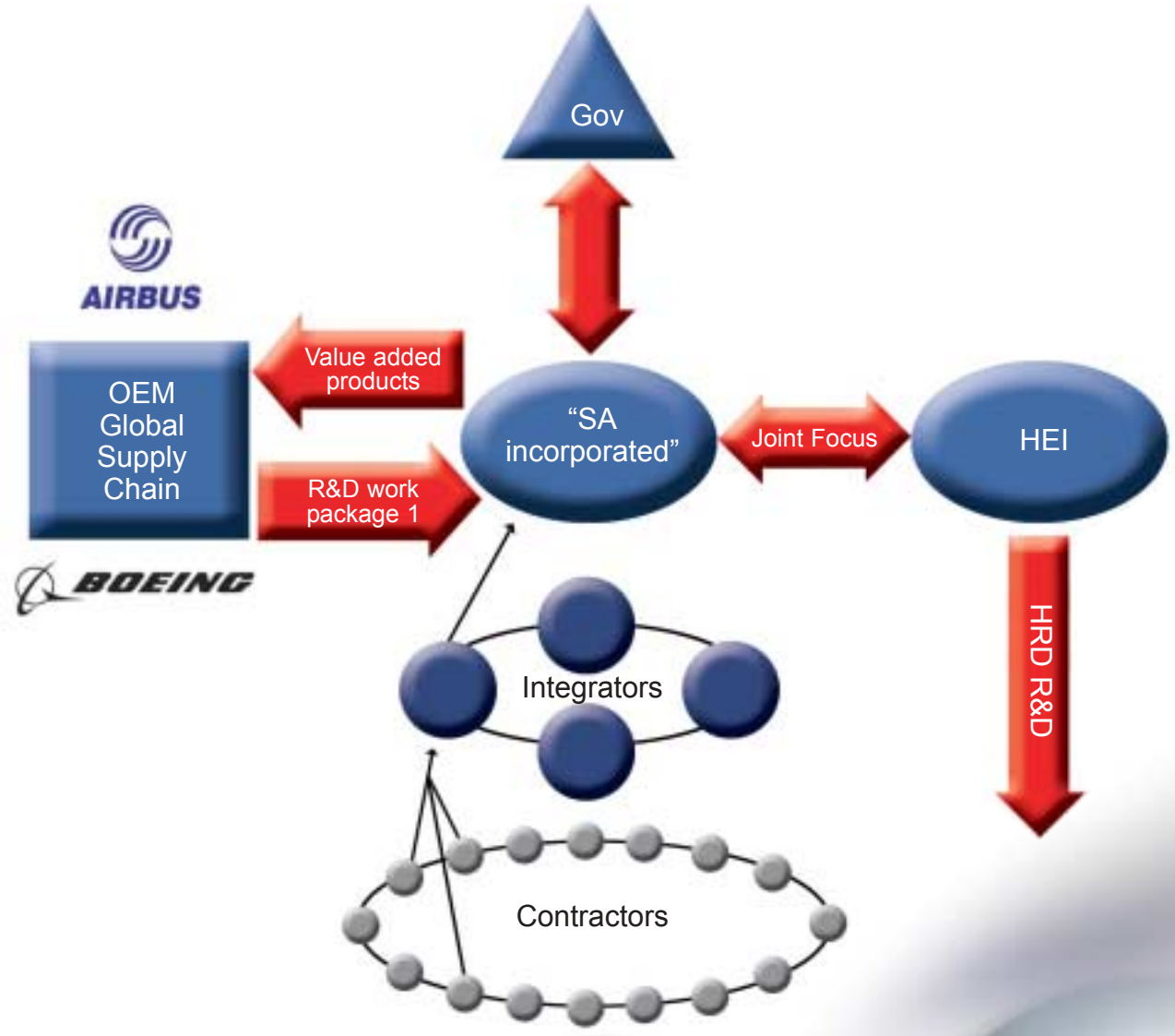
Possible new focus (S.A. Inc.)

Figure 1 gives a possible first cut industry model in which the top local companies form what can best be referred to as the Integrating Contractor Platform. The members of this platform then are obliged to play two important roles:

1. They become the system integrator for the relevant parts of the local industry that would naturally sub-contract to them. They then take responsibility for delivery to the external OEM or first tier manufacturer and behave as the front-end for all technical relationships.

2. They became partners in "South Africa Incorporated" which is seen as a front-end for representation with the client as well as with government. It is meant to market all relevant local skills as well as make the sales, i.e. they become the business integrator.

Figure I. Industrial Collaboration Model



The sub-contractors likewise form a platform upon which they can conglomerate into the necessary groupings to assist the integrating contractors. This platform should also have horizontal mechanisms that optimise raw materials costs, labour costs...etc in order to enhance their overall competitiveness.

The sub-contractors are then also protected from the size driven limitations associated with working with the large international companies (for instance Airbus will not consider sub-contractors with a turnover less than 6 million Euros) and are likewise protected from the high costs of certification and qualification by being grouped into nodes of similar expertise or offering. The nodes are certified and not the individual companies.

Government then plays a role as the only stakeholder and should see the industry as a collective whole. It must assist with tariff and duty issues and consider the funding and IP needs of the industry as a single entity.

It is suggested that this model be considered in a forum that consists of government stakeholders and the potential integrating contractors as well as academia. This forum should then function as a single national initiative that will look at industrial innovation and growth. At the same time this forum must also actively define who they regard as the international OEM or partners of this initiative.

Throughout this process the level at which South Africa wants to pitch its industry must be kept in mind, i.e. what tiers must be cultivated, for instance:

- *First to second tier*
  - Whole aircraft or large sub-system manufacture (such as the Rooivalk) will not be viable anymore
  - Integration into global supply chain of aircraft OEMs is the only possibility
- *Third to fifth tier*
  - Businesses should be nurtured and encouraged (especially component and simple sub-system manufacture)
  - Engineering expertise should be nurtured in key areas such as airframe component design and aerodynamics
  - Design and manufacture of Health and Usage Monitoring Systems (HUMS) and avionics systems is well-established and should be supported
- *Possible focus areas include:*
  - Design and manufacture of pylons, turbine components, airframe components
  - Manufacture of non critical structural parts (non-PSE's)
  - EOSS systems, helmets with head-tracking device and optics, laser technology.

7. Concluding Remarks

Risks associated if this initiative is not implemented, might lead to:

- The continued decline in the aerospace manufacturing industry locally, with the very real possibility that this would erode our global competitiveness to such an extent that large scale reductions in the industry will become inevitable.
- Sustainable growth of this industry will not be achievable and will negatively affect job creation.
- The decline of the aerospace industry will negatively impact on the rest of the engineering industry since an aerospace industry lifts the standards and capabilities of the general industry through sub-contracting, supply of high-level manpower, etc.

Loss of international markets for South African products and skills in this sector will lead to the closure of local non-competitive manufacturing companies.

Should this initiative be successful the following outcomes may be possible:

- South Africa can actively bid for parts supply of very large projects such as the Airbus' A400M programme.
- Competitive, cost-effective production, faster delivery times, increased quality levels and enhanced flexibility.
- General improvement in the capability of the SA aerospace industry to compete globally.
- Less risks for the lower tier sub-contractors whilst enabling them to retain expertise and be partners to earning foreign revenue.

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