South African Aerospace Preparedness and Impact of Digitalisation

Johan Steyn
Managing Director of Aerosud
BUILT ON PASSION
Company Timeline

1990
- Company formed

2000
- First Production Program (Boeing)

2003
- A350 Build to Print – CFRTP and welded assemblies (Spirit Aerosystems)

2005

2007

2014
- Group restructuring

2016

2018

AEROSUD
- Design and Build risk share partner on Airbus A400M (Airbus Defence & Space)

AIRBUS
- A320 Gailey systems and welded assemblies (Safran)

4.
Built to fly

- Employ 660 people
- 15 local sub-tier suppliers
- 300 international & local suppliers
- 28 years experience
- Local added value 40%
- $70 Mil annual turnover
- 6% investment in R&D

- 100% Export
- 2016 - DTI Manufacturer of the year
- 2017 - DTI Exporter of the year
- 2018 - SADC Quality Award
Build smart. Fly further, faster

A smart supplier built on decades of innovation and versatility

AEROSUD
The Market Reality

- 40% Rate Increase
- 20% Cost reduction drive
- Global Collaboration
- Innovation

- USD prices
  - Contribute to price reduction
- SA Double source policy
- Consolidate Supply base
- Fewer and bigger W.P.
- DoC of Redesign

- 40% of Spend in 2020
- Offsets targets
- Countries Strategy
- China - US FAL support

- Ramp-up Support
  - On time Delivery
  - On Quality Delivery
- Risk Management
- Standardise - Simplify
- Make or Buy Established

- R&T Strategy
  - D&B or 84P Strategy
  - RSP Model
  - EEC Strategy
  - Aircraft Strategy

AEROSUD
Efficiency drive

Price reduction drives

Disruptive Manufacturing practices

Technology

Global low cost sourcing

Risk management oversight

Increased quality audits

Industry 4.0

Inefficient supply chain actions

Open book pricing

Resulting conflict: Profitability vs Reliability

effects of market reality
Adopting Theory of Constraints as a business methodology

Reliability Model = Stability + Growth

Key Implementation steps:

- TOC adopted in all aspects of the supply chain
- Comprehensive Goal Tree
- Logical Thinking tools
- Critical Chain Program Management
- Use of Throughput Accounting
- Consumption based replenishment (DDMRP)
- Management in full Supply Chain
- Deployed GRID to influence Cultural behaviour

Key Results achieved:

- Production lead time reduction from 50 to 17 days
- WIP and SOH reduction by 30%
- High reliability in new part Industrialisation and
- On time project completion
- Increased Throughput by 20%
- Reduced intervention and expediting
- Initiation of new strategic growth and Investment areas
- New Service offering
COLLABORATIONS
Purpose:

Growth-Bilateral between Government and Industry to significantly boost SA Commercial Aviation Manufacturing Exports through:

- Integrated Industry Growth Plan
- Expanding Advanced Manufacturing
- Future-orientated competitiveness (IoT, Ind 4.0)

and in particular

Promote direct partnerships with international Original Equipment Manufacturers (OEM’s) and/or Technology partners, to demonstrate and showcase local industry capabilities and capacities to collaborate. Forging stronger ties with the Global Aviation Manufacturing.
CAMASA - Domestic Collaboration

Scientific & Industrial Research and Innovation

International Partnerships with OEM's

Tertiary Education

Advanced manufacturing & Tooling skills

Cross sectorial Composite Industry capability

Titanium powder Production & Additive Laser Manufacture (ALM)

Transport and Manufacturing sectors skills development

Aerospace Industry Support Initiative and Centurion Aerospace Village (the dti)

Provincial & Regional Economic Development Agencies
CAMASA - Centurion Aerospace Village

- Contribute 43% of GDP
- 25% of SA’s mineral production
- World class Industrial infrastructure, roads, communication
- Main manufacturing center – 50% of all factories in SA

Aerospace Manufacturing Industry Requirements
- Apprentice Training Centre 1 000 - 2 000 sqm
- SMME & Incubation centre 200 - 2 000 sqm
- Attract 5 – 10 SMME’s to expand 500 - 2 000 sqm
- Advanced Manufacturing Showcase 3 000 - 5 000 sqm
- Surface Treatment and Painting facility 1 500 – 3 000 sqm
- Hard metal machining facility 1 000 - 2 000 sqm
- Large assembly facility 10 000 sqm
- Central Logistics & Warehousing 10 000 sqm
BRICS Collaboration

BRICS countries encompass 42% of the world’s population and cover 26% of the world’s territorial area. Additionally, Intra-BRICS trade now accounts for approximately 18% of global trade, and its young people make up 47% of the world’s youth (aged 15-24).

With their economic aggregate covering 23% of the world’s total, the five countries of the BRICS, along with other emerging-market countries, have become the main engines of global growth. The immanence of the Fourth Industrial Revolution and the rise of the digital economy loom over each BRICS country; both are full of promise and peril.

Agreed focus areas for BRICS Aviation Work stream

**Regional Aviation Seminar:**
- Public Policy and Regulations
- Airline Business models
- Infrastructure
- CNS/ATM

**Skills development & Qualifications:**
- Pilot training
- MRO Engineering and Technicians
- Aviation school

**B2B Supply Chain Development:**
- Capability assessment
- Capacity Development
- SME development

**Development Funding:**
- BRICS Aviation Fund
- NDB – New Development Bank
- Venture Capital (Angel network)
Future of Production in South Africa

Readiness for the Future of Production Report 2018

The country archetype framework has been applied to conduct analysis of the 100 countries included in the beta model.

[Diagram showing the structure of production with countries plotted on a graph]

DRAFT RESULTS FOR DISCUSSION

[In collaboration with A.T. Kearney]
Future of Production in South Africa

Made in Africa
Manufacturing and the fourth industrial revolution

Recommendations

- Capitalising on the opportunities presented by the fourth industrial revolution will require a concerted effort from African governments that will have to lead the charge.
- Leaders in key growth-locative countries need to implement concrete measures such as the establishment and support of special economic zones and clear national and regional industrial policies.
- Developmentally focused leaders need to put the right incentives in place, such as export orientation, support to embryonic manufacturing, and policies to move labour and capital into more productive enterprises.
- Rapid growth in manufacturing, agro-industry and tradable services requires access to larger markets, hence the imperative of progress with regard to Africa’s regional economic integration.
- Nationally, industrialisation efforts require well-administered, supportive public policies and effective administrative systems.
- Efforts to combat corruption associated with facilitating export procedures, such as removing trade friction costs due to poor logistics, require specific and ongoing attention.
- The private sector needs effective government support, such as tax incentives and institutional reforms, to lower transaction costs in customs and business regulation to offset the costs for first movers.
A decade of development Collaboration 2008-2018

Focus Areas and Outcomes

- Long term friendships built on research
- Programmes including 7 Fraunhofer institutes
- Deep integration in SU Engineering department

Future projects 2019 - 2023
- Heat Assisted Forming
- Benchmark study
- Composite demonstrator
- Ultra high pressure forming

High Performance Machining of Light Metals 2008 - 2013

Resource Efficient Process Chains 2013 - 2018

Stellenbosch Technology Centre 2016

Superplastic forming of Ti64 sheet 2016 - 2019

MOU signed February 2018

Metallic Forming limit curves 2018 - 2019

Active projects
Digitalisation of CFRTP Forming and Cellular Core Technology Development Cycle

Focus Areas and Outcomes

**CCT Manufacturing process (cure) digitalization**
MSC Marc® Non Linear simulation for design feasibility and optimisation
- Established interact between the thermoplastic cell, thermoset layup and metallic bond assembly tool
- Final component geometry and internal stress state
- Eliminating expensive “trial and error” prototype manufacturing

**CCT tooling and component thermal digitalisation**
MSC SC Cradle® CFD simulation for thermal mapping of tools and components
- Efficient autoclave loading configuration
- Location of control thermocouples

Collaboration partners

AEROSUD
Digitalisation of Advanced Metallic Forming

Focus Areas and Outcomes

- Stamping and fluid cell forming process digitization
- ESI Group Pam-stamp forming simulation software is used for concept feasibility studies, tooling and blank optimisation and manufacturability validation.
- Efficient tooling and blank concept development.
- Less dependant on “trial-and-error” method for concept validation.
- Cost saving with the improved accuracy of final components
ALM Knowledge base
- Design and Optimisation for certification

Focus Areas and Outcomes
- Optimisation studies for both prismatic and biomimetic design philosophies.
- Internal featuring and surfacing concepts
- Optimisation and validation in build preparation & process through simulation.
- Component qualification and certification investigations and validation.
- Component weight saving with equivalent strength compared to traditional design concepts
- Reduced ALM build failure risk.

Collaboration partners

AEROSUD
Foundation(s) of 4.0
- IT Infrastructure
- Processes and Procedures
- Value streams
- Business Model

Pillars of 4.0
- Big Data
- Augmented Reality
- Simulation
- Internet of Things
- Cloud Computing
- Cyber Security
- Systems Integration
- Additive Manufacturing
- Autonomous Systems

“Soft” Issues
- Culture of the organisation
- Awareness in the organisation
- Knowledge in the organisation and or access to such knowledge
- Mind set of the people involved and affected in the organisation
- Approach to the challenge(s), i.e. a “roadmap” for the 4.0 journey
DIGITAL TRANSFORMATION
Design for Certification

1990s SE V

2020s MBE Diamond

SOURCE: US Department of Transportation Federal Highway Administration

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Transitioning from a document-focused mindset to a digital engineering mind set that leverages information flow across the lifecycle.
Company Experience

- Collaborative Design
- Concurrent Engineering
- Digital Mockup
- Around the world
- Integration across different PLM systems

Design & Build risk sharing partner
Design for Certification

**Design Automation Tools**

- Automate CAE stress analysis process to account for load loops and design loops
- Standard stress analysis process using standard methods for RF/MoS calculation
- Automate process for Stress Dossier generation
- Reduce the quantity of stress recourses required
- Fast track stress engineer learning process
- Fast track Airworthiness Authority approval
PLM Systems on the market

High End

TeamCenter, 3D Experience, Windchill, SAP PLM

- Comprehensive functionality
- Expensive
- Long to implement
- Complex

Entry Level

Autodesk Vault, Solidworks PDM, Various cloud based systems

- Easy to implement - from the box
- Limited functionality
- Not very customisable
- Very little local expertise
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Serious commitment

Does not deliver
Comprehensive functionality
Fully Customisable
Low startup cost
Quick, agile implementation
Business Automation Framework
Comprehensive functionality
Fully Customisable
Low startup cost
Quick, agile implementation
Business Automation Framework

Local Expertise?
Our goal...

We believe that we can share and transfer our skills and experience to other businesses in such a manner that it provides solutions to their immediate challenges so that the businesses and we can continue to thrive.

Our origin...

We have gained our real-life skills and experience across business functions and systems over the last 10 years in the high volume manufacturing environment of Aerosud Aviation.
Typical Roadmap

Best practice
Mode of Operation
Typical Roadmap

Best practice
Mode of Operation

Data Management
Typical Roadmap

Best practice
Mode of Operation

- Digital Twin - Parts
- Data Management
## Typical Roadmap

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Digital Twin - Parts

Data Management
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