IMPACT REPORT 2012/2013

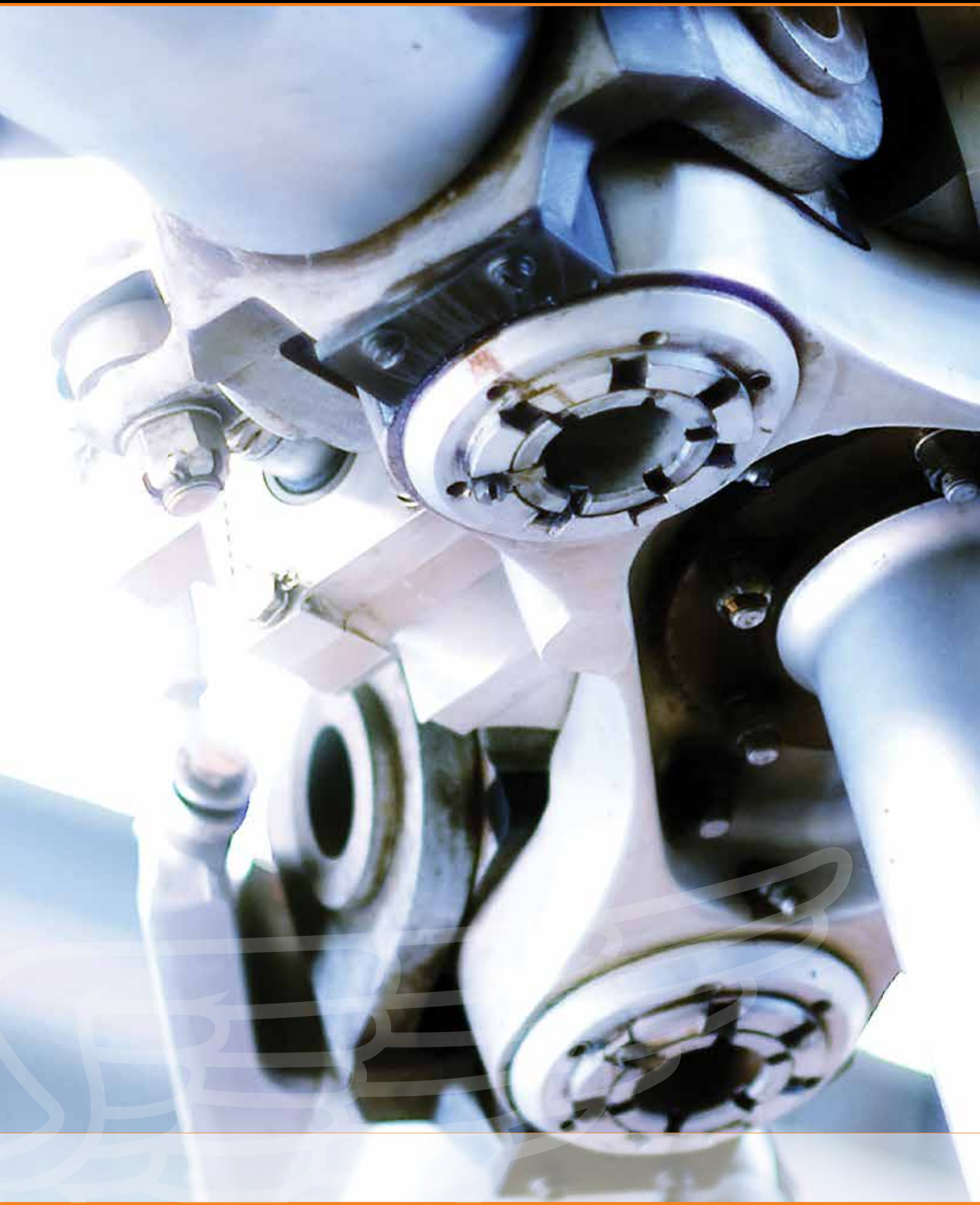
AISI

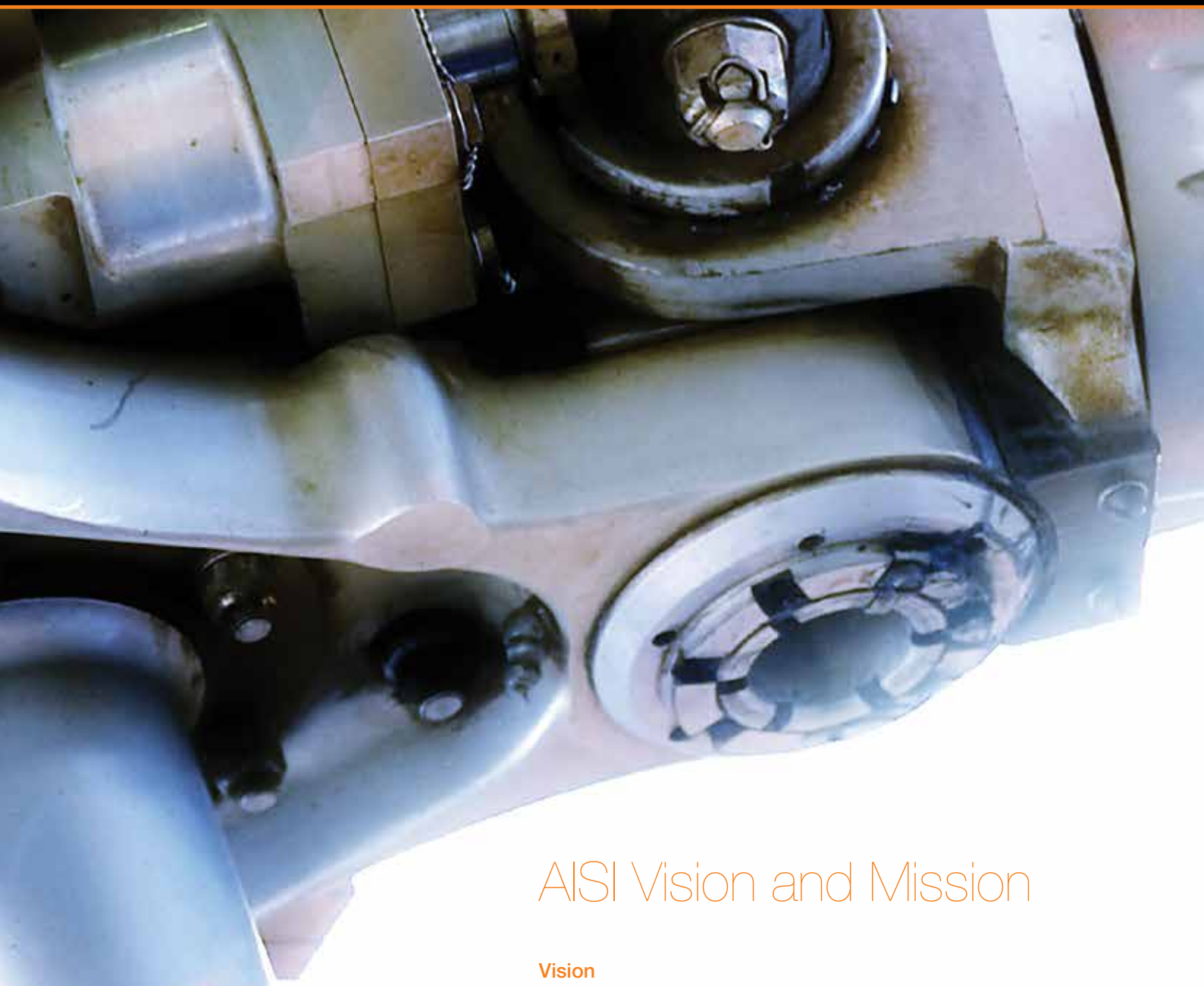
Aerospace Industry Support Initiative

an initiative of the dti

the dti
Department:
Trade and Industry
REPUBLIC OF SOUTH AFRICA

CSIR
our future through science





AISI Vision and Mission

Vision

Through the collective leadership of government and industry, upgrade, propel and position the South African aerospace industry to be firmly integrated as part of global supply chains.

Mission

- To enhance the global competitiveness of the South African aerospace industry.
- To provide an institutional platform to facilitate partnerships and innovation between government, industry and academia.
- To identify, develop, support and promote the interests and capabilities of the South African aerospace industry.
- To accelerate the achievement of government's strategic objectives, including growth, employment and equity.

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Executive Impact Summary

The Aerospace Industry Support Initiative's (AISI's) strategy is guided by the Department of Trade and Industry's (**the dti's**) vision of "A dynamic industrial, globally competitive South African economy, characterised by inclusive growth and development, decent employment and equity, built on the full potential of all citizens". As an initiative of **the dti**, the AISI has a strong focus on achieving impact and addressing **the dti's** vision through its investments in the aerospace and defence industry.

Investments in industry are directed through the AISI's operating programmes. The programmes are developed with the specific aim of ensuring investment in appropriate areas for optimum impact in achieving key objectives, such as industrialisation, transformation and job creation. The areas of investment for the AISI over the 2012/2013 financial period were:

1. New Industry Development and Technology Support
2. Supplier Development
3. Space Regulation and Human Capital Development
4. Sector Strategic Support Initiatives
5. Co-ordination, Promotion and Awareness.[1]

AISI Estimated Impact at a Glance 2012/2013[2]

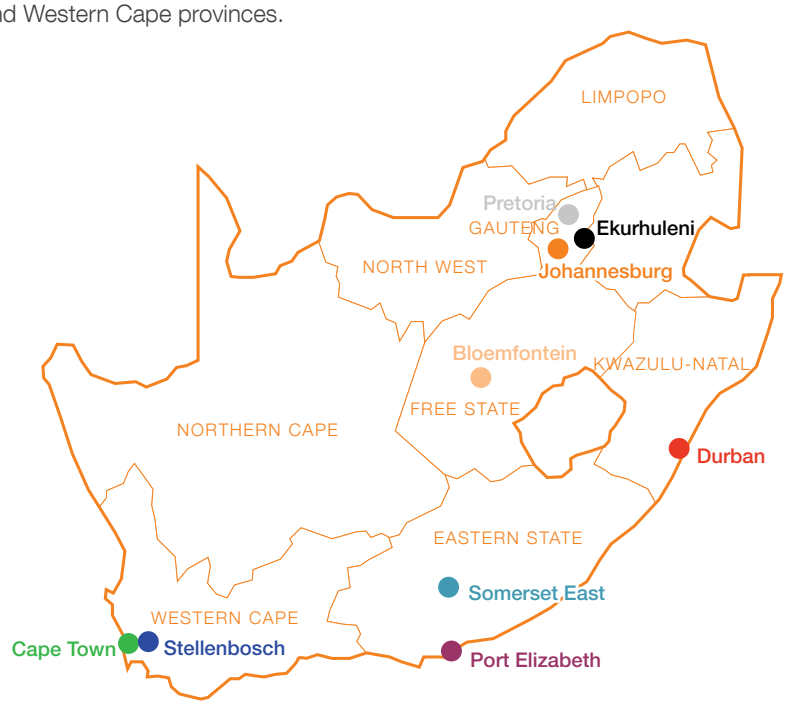
Industry support investment	R21 million
Number of projects undertaken	34
Number of organisations benefitting from AISI projects[3]	169
Number of SMMEs benefitting from AISI projects	96
Resulting Impact on Industry	
Jobs created/retained	104
Capacity development	57 students involved 16 AISI-funded interns 63 trainees through AISI projects

[1] A sixth area of investment, namely industry and impact studies, was identified; however, no investment was made towards the programme, as per an AISI management committee decision.

[2] Impact information derived from data submitted by benefitting organsiations.

[3] Numbers based on organisations benefitting from AISI support, per initiative.

The figure below is an illustrative representation of organisations benefitting from the AISI's value offering, and maps their geographic location. The predominant locations of the industry benefitting from AISI support are in the Gauteng and Western Cape provinces.



Organisation Name	Location
Central University of Technology	
Aerotechnic (Pty) Ltd	
BaxMod Models	
Cape Peninsula University of Technology (F'SATI)	
Daliff Precision Engineering	
Litson and Associates	
Robin Coss Aviation (Pty) Ltd	
TiTamed (Pty) Ltd	
University of Cape Town	
Veecraft Marine (Pty) Ltd	
Adept Airmotive	
African Astronautics (Pty) Ltd	
Advanced Material Technology	
Aero Services (Pty) Ltd	
Aerotechnic (Pty) Ltd	
Applied Services	
Avex	
Cliff'sway Engineering (Pty) Ltd	
Compumach Engineering CC	
ISCAR South Africa (Pty) Ltd	
Jackpack Trading CC	
PPG Coatings South Africa (Pty) Ltd	
Rheinmetall Denel Munition	
Safomar Industrial Brands	
TP Agencies	
Turbomeca Africa	
Thorax	

Organisation Name	Location
Aerospace Training Academy of South Africa Pty (Ltd)	
Albetron Precision Engineering	
Aquajet Profiles	
DW Industrial	
Heyns Laboratories	
HMR High Tech Machine Tools (Pty) Ltd	
Lelebotse Projects and Engineering	
M Square Precision Manufacturing	
MARCOM Aeronautics and Space (Pty) Ltd	
MCC Aviation	
Megaray Limited	
National Aerospace Centre	
Northern Bolt and Tool	
Pamodzi Aviation	
Radio Tracker	
Safety First	
SRS Aviation	
Tiffy Safety	
University of Witwatersrand	
Wesco	
West Engineering	
Collaborative Xchange	

Organisation Name	Location
Aerosud Aviation (Pty) Ltd	
Aerosud ITC	
African NDT Centre (Pty) Ltd	
Business Enterprises at the University of Pretoria (Pty) Ltd	
CSIR	
Lefa Engineering and Security Services	
Marksman Trainer (Pty) Ltd	
Megapack	
Rosslyn Sandblasting & Engineering	
Rost Engineering	
SAAB Grintek Defence	
Sondor Industries	
the dti	
Tony Beverley Agencies	
Tshwane University of Technology	
University of Pretoria	
Blue Crane Development Agency	
Space Advisory Company	
Stellenbosch University	
Sunspace and Information Systems	

According to the Aerospace Sector Development Plan (ASDP), the aerospace market segmentation is intended to serve as a reference framework and is aligned with international market data available. The segmentation model is aligned with international market data and is well suited to graphically represent and interpret the local spending patterns and focus areas. It is designed to address three common sector perspectives, namely:

- Military and civil aerospace
- Aerospace product-centric view of the sector
- Technology stream-centric view of the sector.

Utilising the market segmentation framework of the ASDP, the AISI investments in strategic sectors, as defined in the ASDP, is mapped in the diagram below. As a result of the AISI being an initiative of **the dti**, and **the dti's** role in creating a fair regulatory environment for South African industry, an additional technology stream has been added, namely 'Policy and Strategy'. According to the ASDP, South Africa has one significant product stream, namely aeronautics services. AISI investment over the past financial period reflects this capability with noteworthy investment in this product stream. AISI investments in industry are defined in three categories:

- Technology Advancement Support: This entails industrialisation support to industry
- Competitiveness Improvement Support: This is achieved through interventions that improve the efficiency and effectiveness of the local industry
- AISI Organisational Support: Through the creation of enabling mechanisms, the AISI assisted industry through the creation of platforms to improve its operating environment.

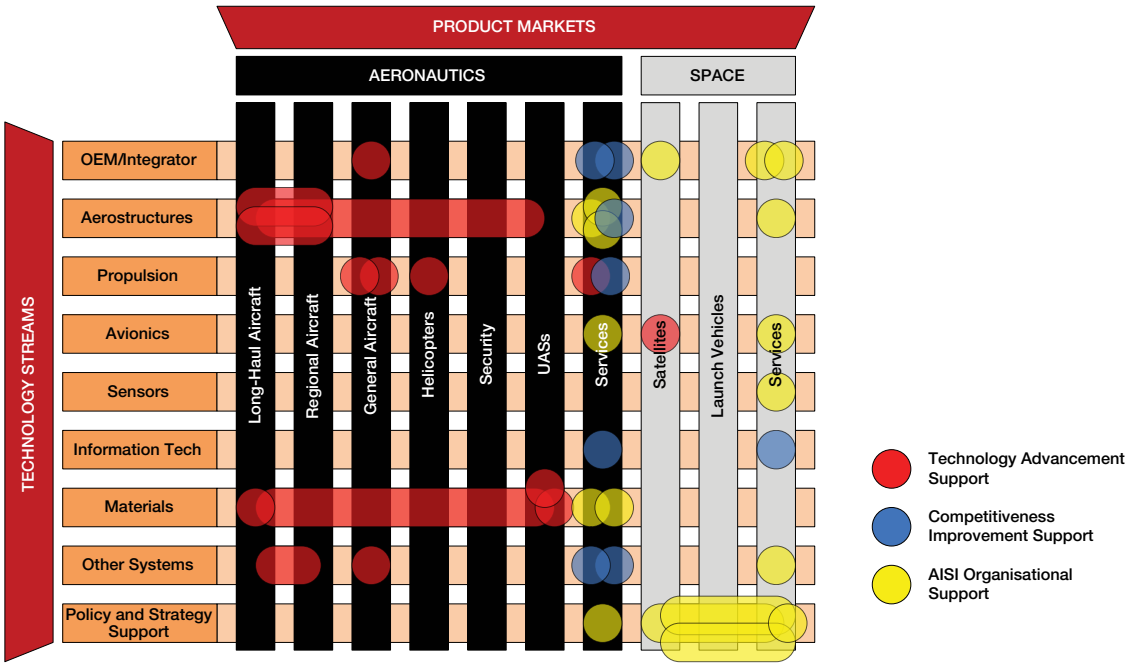


Figure 1: AISI investment areas 2012/2013 according to the ASDP Product and Technology Matrix

The figure highlights two main technology streams in which the AISI has invested through technology advancement support during 2012/2013, namely aerostructures and materials. This is building on already existing local capability and has cross-cutting application possibilities across numerous product markets. This ensures broader market possibilities for local industry.

New Industry Development and Technology Support

The main objective of the first programme is to ensure industrialisation of technologies for industry, which would not have been achieved if it were not for AISI support.

Service providers are encouraged to include partner organisations when undertaking industrialisation projects supported through the AISI, and specific emphasis is placed on small, medium and micro enterprise (SMME) inclusion to ensure technology transfer, industry development and transformation. This programme achieved the highest percentage investment of the AISI totalling 44% of programme budget. This is as a result of a drive by the AISI since 2011, to improve on its investment in technology advancement as a means to develop the local industry.

Programme focus	Technology advancement support
Predominant technology stream	Aerostructures and materials
Industry support investment	R9 million
% AISI investment of programme budget	44%
Number of projects undertaken	15
Number of organisations involved	39
SMME involved	16
Resulting Impact on Industry	
Jobs created/retained	41
Capacity development	19 students
Business opportunity	2 local sub-tier suppliers benefitted from technology transfer from local Original Equipment Manufacturer (OEM)
Efficiency and profitable	9 laser-based manufacturing processes introduced to industry
Export opportunity	2 technologies industrialised for export readiness
Industry access to national experts and facilities	22 organisations directly benefitting
Project aligned to national programmes	1 project aligned to Titanium Centre of Competence
Knowledge transferred to industry	2 industry guidelines published
Strategic Interventions established	1 national steering committee established and resourced

Testimonial

"ADEPT Airmotive has been fortunate to receive project support from **the dti**, through the AISI. The AISI has facilitated and funded critical technical support in areas in which ADEPT does not yet have in-house resources, facilitating access to national facilities and experts, enabling improved competitiveness. Through this support, ADEPT has made use of advanced Non-Destructive Testing processes in its foundry activities and the National Laser Centre at the Council for Scientific and Industrial Research (CSIR) for laser welding. The AISI is also assisting with the testing and verification of components as part of ADEPT's certification programme."

– Richard Schulz, Managing Director: Adept Airmotive

Supplier Development

The improvement of organisational efficiency and effectiveness is the focus of supplier development interventions. This ensures that organisations' competitiveness improves and enables them to integrate into global supply chains.

Programme focus	Competitiveness improvement support
Predominant product stream	Services
Industry support investment	R3 million
% AISI investment of programme budget	14%
Number of projects undertaken	12
Number of organisations involved	55
SMME involved	40
Resulting Impact on Industry	
Jobs created/retained	53
Transformation	Average increase of 22% in staff transformation at three SMMEs
Energy savings	Cost saving at one OEM of R906 000 per annum Energy saving of 20% at one SMME per annum 1.6 GWh saving per annum at one OEM
Efficiency and profitable	10 quality management systems implemented at five SMMEs Web-based procurement portal utilised by 33 suppliers and one OEM, improving efficiency
Capacity development	45 staff members of SMME trained in quality management system

Testimonial

"Through our involvement with the AISI, Daliff Precision Engineering has received the necessary support to rebuild and expand our business. AISI supplier development support has enabled Daliff to meet the requirements of international OEMs, as well as the certification specifications which enables Daliff to become globally competitive. This support has ensured that Daliff has a solid platform from which it can expand into additional industries, such as directly supplying to the medical industry. Daliff has been involved with the AISI and its value offerings since 2008, and this has added to the sustainability and expansion of our business, which in turn ensured economic impact in the Western Cape."

– Rowland Chute, Chairman: Daliff Precision Engineering

Space Regulation and Human Capital Development

One of the strategic objectives of **the dti** is to "create a fair regulatory environment that enables investment, trade and enterprise development in an equitable and socially responsible manner". In support of this, the AISI focuses on space regulation, space regulation human capital development, as well as human capital development of already graduated individuals.

Programme focus	AISI organisational support
Predominant technology stream	Policy and strategy support and services product stream
Industry support investment	R4 million
% AISI investment of programme budget	18%
Number of projects undertaken	6
Number of organisations involved	39
SMME involved	16

Resulting Impact on Industry	
Jobs created/retained	10
Capacity development	16 interns 18 trainees in air-, space- and telecommunications law 16 students in capacity building in space law 22 studentships supported through NAC at four universities
Scarce skills development	Satellite systems engineering Space law
Transformation	68% of students are previously disadvantaged individuals (PDIs) 56% of interns are PDIs

Testimonial

"The French South African Institute of Technology (F'SATI) at Cape Peninsula University of Technology (CPUT) is very proud of its relationship with AISI, which has been fostered over the past three years. Having established an applied research-focused programme in nano-satellite engineering, F'SATI has systematically broadened its activities to include professional development of our graduates through an internship programme. With generous support from AISI, this programme has not only prepared our engineers-in-training for the local space industry, and established an advanced manufacturing capability, but has also developed a wide range of CubeSat communications systems that is being sold internationally through strategic partnerships. The AISI furthermore supports our prestigious Space Industry Seminar series, which provides a unique, shared national platform for academia, government and industry. Our relationship with the AISI is clearly a text book case for the benefit that can be derived for the aerospace industry from such support programmes. We extend our gratitude to the management of AISI for sharing our vision and enabling us to be an effective and productive contributor to the national space industry, now and in future."

– Robert van Zyl, Director: F'SATI, CPUT

Sector Strategic Support Initiatives

The AISI creates platforms for industry, specifically SMMEs, to interact and liaise with stakeholders which, unless facilitated by the AISI, they would not have had access to. By hosting an AISI-branded pavilion at the 2012 Africa Aerospace and Defence Show 2012 (AAD 2012), the AISI made it possible for 24 South African SMMEs to engage with local and overseas players in the aerospace industry. The AISI stand also supported participation by eight South African universities that have active aerospace research programmes. **The dti** exhibited its offerings on the pavilion as did two **the dti**-funded aerospace initiatives – the National Aerospace Centre and the Centurion Aerospace Village, bringing the total number of participating organisations to 36.

Programme focus	AISI organisational support
Predominant product stream	Services
Industry support investment	R4 million
% AISI investment of programme budget	18%
Number of projects undertaken	1
Number of organisations involved	36
SMME involved	24
Resulting Impact on Industry	
Business opportunity	Local organisations utilised the AISI platform to gain exposure to national and international business opportunities

Testimonial

"Without the tremendous support received through AISI's initiative, it would not have been possible for Robin Coss Aviation to attend AAD 2012 as an exhibitor.

Having a very visible presence on the AISI pavilion made it possible for the company to engage with potential customers and strengthen business relationships with existing clients.

I want to compliment the entire AISI Management Team on the tremendous effort and support provided in making AAD 2012 a highly successful event and a platform to promote local aviation manufacturing capabilities to the world market."

– Rob Cook, Business Development Manager: Robin Coss Aviation

Co-ordination, Promotion and Awareness

Through a range of activities, the AISI co-ordinates and promotes awareness of activities in the South African aerospace and space domain. The AISI pavilion at the 63rd International Astronautical Congress (IAC) was aimed at sustaining a South African presence in the global space and aerospace community. It provided a platform for senior South African representatives and delegates from some five other South African organisations active in the space and aerospace domain to interact and network with peer organisations. Contributions to established print and online publication, media interaction and outreach activities contribute to a sustained level of awareness of AISI opportunities and the outcomes of its investments.

Programme focus	AISI organisational support
Predominant product stream	Services for aerospace and space
Industry support investment	R1 million
% AISI investment of programme budget	6%
Number of projects undertaken	4

Testimonial

"I would like to express my sincere thanks and appreciation for the manner in which the AISI, an initiative of **the dti**, created an opportunity for the South African National Space Agency (SANSA) to also be part of the national presence at the International Astronautical Congress in Naples, Italy. The approach of a national presence at this type of event was indeed the way to go; not only was the pavilion well suited to the needs of the country as a whole, but the AISI officials present did a great job of acting in our interests. This was hugely appreciated, especially in consideration of the fact that the intensity of the various sessions and International Accreditation Forum (IAF) meetings that were held during the event did not allow for SANSA officials at the pavilion at all times."

– Francois Denner, Space Programme Manager: SANSA

Through its operating programmes, the AISI reaches a range of stakeholders, including relevant industry, academia and government departments. In addition, the AISI and the National Aerospace Centre (NAC) have aligned operations to function as the Integrated **the dti** Aerospace Programme (IDAP), to ensure maximum impact and relevance in South African industry.

The remainder of the document contains a full list of projects undertaken through the AISI programmes. The information was submitted by the service providers undertaking the projects, and the impact achieved for industry, was derived from this information.

PROGRAMME 1

New Industry Development and Technology Support

New Industry Development and Technology Support focuses on promoting the involvement of industry in sectors relating to advanced manufacturing in aerospace and defence. Industry is encouraged to industrialise technologies to the advancement of South African niche capability and value proposition. Partnerships are established between organisations to achieve this goal. Original Equipment Manufacturers (OEMs) are encouraged to include small, medium and micro enterprises (SMMEs) and lower tier suppliers to ensure the continuous transfer of knowledge, expertise, capability and technology.

Through strategic partnerships, technology platforms and the utilisation of national experts and facilities, the Aerospace Industry Support Initiative (AISI) aims to assist new and existing industry development by strategically investing in key technologies. These technologies impact on industry through economic benefits such as job creation, job retention, skills development, transformation, cost savings, technology localisation and improved technology offerings. This is in line with government's key objectives and national development imperatives.

PROJECTS SUPPORTED THROUGH PROGRAMME 1 INVESTMENTS

- Joint Aerospace Steering Committee
- LABAMA Support Project
- CFRTP Clip Manufacturing Phase II
- Deep Drawn Press Technology Phase II
- Transfer of Airline Galley Design, Certification and Manufacturing Capability to SA Sub-Tier Suppliers
- Laser Shock Peening
- Special Projects Support
- Guidelines for Type Certificate of Aircraft Engines
- Support for Casting Integrity to ADEPT Airmotive's 320T Engine
- Type Certification Test Flight Requirements
- AISI/NAC Projects
- Development of Fibre Metal Laminates for Aerospace Applications
- Development of a Stiffness Tailored UAS Wing

Joint Aerospace Steering Committee (JASC)

The JASC was established as a result of the findings of the Aerospace SDP to strategically position the aerospace and defence industry in South Africa. JASC aims to improve the country's aerospace and defence industry by continuously monitoring and evaluating progress. The committee was officially launched during the Africa Aerospace and Defence Show 2012 (AAD 2012) to a large contingent of stakeholders and media.

JASC takes a leading role in positioning and profiling the aerospace and defence sector as pivotal to technology and industry development. It is envisaged that JASC's activities, through focused research and development (R&D), human capital development, and skills and infrastructure investment, will benefit national industry. This will be guided by industry and R&D roadmaps and agendas.

By integrating and utilising policies to strengthen aerospace and defence, JASC aims to facilitate competitiveness improvement programmes, government procurement, supplier development, international and multi-lateral agreements, export support mechanisms, funding for intellectual property exploitation, new product development and exports. JASC aims to play a role in South African R&D co-ordination by influencing research agendas and financing mechanisms.

2 Jobs created

Strategic guidance to South African industry

JASC will also support various skills development initiatives, while providing support and funding for R&D and industrial infrastructure. JASC hopes to achieve the above through the implementation of strategic national flagship projects, implemented by the AISI.

JASC meets on a monthly basis and comprises members from the following institutions:

- Department of Trade and Industry (**the dti**)
- Department of Science and Technology (DST)
- Department of Defence
- Department of Public Enterprises
- Department of Transport
- National Treasury
- Aerospace Maritime and Defence Association (two seats representing industry)
- Commercial Aviation Association of South Africa
- Council for Scientific and Industrial Research (CSIR)
- Industrial Development Corporation
- Technology Innovation Agency.

The JASC is supported by three sub-forums, namely:

- Government
- Industry
- R&D.

The Government Sub-forum takes responsibility for resourcing the JASC through funding initiatives, and ensures integration with related government policies and strategies. It aims to simplify business dealings with South African industry, and assists in leveraging government procurement.

The Industry Sub-forum will review technology development and requirements and define elements for increased competitiveness and market opportunity.

The R&D Sub-forum is tasked with defining and maintaining the strategic R&D agenda with relevant stakeholders.

The AISI supports **the dti** and the DST, as custodians of JASC, by hosting the JASC secretariat. The AISI is responsible for ensuring that the JASC and its operations are managed in accordance with the processes and procedures of the CSIR, and fulfil the objectives of JASC as stipulated above. Dedicated personnel will be tasked to achieve these objectives, and will keep stakeholders informed and engaged through regular impact and progress reports.

Major-General Des Barker, Chair of R&D Sub-forum

*Nomfuneko Majaja, Chief Director: Advanced Manufacturing, **the dti** – co-chair of JASC*

LABAMA Support Project

The CSIR's Laser Enabled Manufacturing Programme within the Laser Materials Processing (LMP) Competence Area aims to develop and transfer laser-based manufacturing technology to local industry through various initiatives. The importance of laser-based manufacturing as a key technology for industrial competitiveness is widely recognised. Laser-based manufacturing (LABAMA) allows the user to increase productivity, to develop new products and services, and to reduce the dependence on skilled labour, which can be deployed to use their skills in other areas that might be of more value to the company and the economy.

Despite these advantages, LABAMA has some barriers to entry for new players in the field. This is mainly due to the fact that it is capital intensive, and specialist knowledge is required to develop and optimise manufacturing applications.

9 New manufacturing processes introduced for better competitiveness

The LMP group operates across the entire technology value chain, from development of R&D projects, to the execution of feasibility and proof of concept studies, process development, decision support, technology implementation projects, limited manufacturing support and training of staff and technical specialists in the field of LABAMA. The competencies developed by this group are fully aligned with industry requirements. Based on this expertise and R&D infrastructure, LABAMA support is used for very specific industry support projects, especially projects in the feasibility study or initial process development phase.

During the 2012/2013 financial year, nine new manufacturing processes were developed with LABAMA funding support, which were used for the following projects:

- Marcom Aeronautics and Space (Pty) Ltd requested the development of a laser welding process for use during the assembly of a prototype fuel manifold
- Rheinmetall Denel Munition (Pty) Ltd requested assistance with the development of a new generation bulkhead to be incorporated into a rocket motor
- Denel Aviation requested a feasibility study on the dissimilar laser welding of an aluminium bombshell
- Albetron Precision Engineering requested the laser cladding of hydraulic pistons for landing gear
- M Square Precision Manufacturing requested the autogenous laser welding of an aluminium AA6082-T6 Telemetry Control Unit (TCU) enclosure for British multinational defence, security and aerospace company (BAE) Systems
- ADEPT Airmotive requested the autogenous laser welding of a steel gear onto a carburised axle
- Rost Engineering requested the laser welding of 304L stainless-steel beams used in a pod for airborne surveillance cameras

Advanced laser processes

- Saab Grintek Defence's requested the weld repair of an aluminium bracket used in their high speed directed launcher
- Aerosud ITC requested a feasibility study on using infrared (IR) laser diodes as a pre-heating source in their Carbon Fibre Reinforced Thermoplastics (CFRTP) press.

Impact of the Work

The impact of this work has been the development of nine new manufacturing processes that could be used by these companies to improve their competitive position in the market.

The developed processes for SAAB Grintek brought about a saving for the company, in that a damaged component could be reclaimed.

CFRTP Clip Manufacturing Phase II

The goal of this project was to develop the part-trimming process to reduce the high level of scrap being experienced and improve the repeatability of the process to meet the increasing build rate of the Airbus A350 aircraft.

Original tool design

New tool design and manufacture completed and in operation

26 Jobs retained

Number of Jobs Created/Retained

The production of additional tooling ensured the retention of jobs in manufacturing, engineering, tool design and tool manufacturing at the subcontractor level for approximately eight people during this phase. Eighteen people were employed for the production process, including three direct operators and three indirect support personnel for the trimming process.

Transformation

- Of the eight development personnel, 35% are previously disadvantaged individuals (PDIs).
- Of the 18 production personnel, 70% are PDIs.

Technology Advancement

This project utilises thermoplastic composites which are still a relatively new type of lightweight composite material that can be press-formed into aircraft parts. The demand for thermoplastic composite parts has increased, and Aerosud has received a number of enquiries from OEMs, especially for structural components.

New Opportunities

The current work package has been extended to include new part types, and Aerosud have positioned themselves to extend the contract duration until 2020.

Productivity Improvement

There has been productivity improvement through the tool implementation and, more importantly, Aerosud has taken steps towards achieving the high tolerances required by Spirit Aerosystems. A further process improvement will be required to fully achieve the drawing specifications.

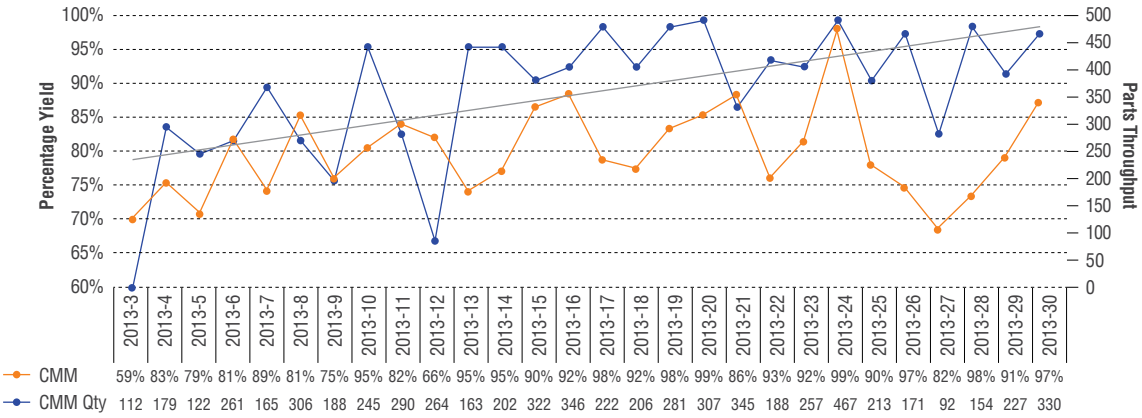


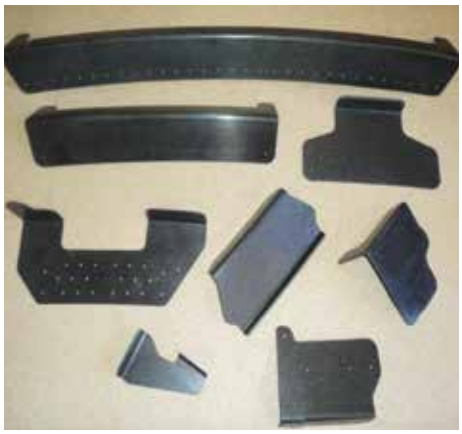
Figure 1: Weekly Co-ordinate Measurement Machine (CMM) yield and throughput

This chart displays the ongoing improvement in pass rate since the trim improvements. Aerosud improved its pass rate from 75% to 95% on the relaxed tolerance standard.

20% Productivity improvement

Competitive Advantage

Currently Spirit Aerosystems only has one US-based company and Aerosud Aviation as their suppliers for frame clips, a Section 15 portion of the airframe; this puts Aerosud in a very competitive position.



Family of parts

Final assembly into airframe

Socio-economic Impact

The frame clips project now operates at a production rate of two aircraft sets per month and is entering an enhancement phase to manufacture and deliver three aircraft sets per month to Spirit Aerosystems (to be achieved by the second quarter of 2014). This equates to almost 3 000 components produced per month. Further year-on-year enhancements will eventually allow for the manufacturing of 8–10 aircraft sets per month. Facilities and personnel will continue to develop to achieve this manufacturing rate.

The growth in work opportunity creates sustainable employment and the environment for operators and support personnel to advance their skills through experiential learning and formal training within the company. The product is manufactured to high specification international standards, which in turn creates a strategic skills level within the aerospace sector in the country.

Deep Drawn Press Technology Phase II

The goal of this project was to further develop the current deep-draw process to press complex shapes such as track can centre sections and end caps in a single operation and within the high tolerance requirement of Spirit Aerosystems, a supplier to Airbus.

7 Jobs created

6 Jobs retained

Number of Jobs Created/Retained

Aerosud designed and manufactured the tooling required for the process, through which jobs were retained in the manufacturing engineering, tool design, tool manufacture and subcontractor levels for approximately six people during this phase. The project currently employs three direct operators and four indirect support personnel. The employment created is long term and sustainable. Additional direct/indirect employment is created through the manufacturing requirements on other components necessary for the deliverable assembly.

Technology Advancement

The hydroform process used to manufacture the track can centre sections has been proven a very efficient method of production, and has shown a 75% process improvement from traditional mandrel method.

Centre section development

Transformation

- Of the six development personnel, 50% are PDIs.
- Of the seven production personnel, 75% are PDIs.

Completed end caps and track cans

Deep draw is a metal forming process that requires experience to generate the shape and control the pressure without breaking the work piece. Various trials have been carried out on the aluminium material, namely:

- Blank size and shape – determined blank sizes and shapes
- Forming speed – sufficient forming speed allows time for materials to flow through the tool
- Draw radii – radius on the draw die where the material flows through
- Draw ratio – to prove the ability of the material flow or draw
- Draw bead height and shape – controls metal flow and gripping pressure during the deep-drawing process.

End cap trials and development

Productivity Improvement

Development of tooling and the sequence of the heat treatment process have shown improvement in the production of end caps. In addition, trial pressings have proved successful and first-off sets have been completed within tolerance.

Competitive Advantage

Currently Spirit Aerosystems Europe has only Aerosud Aviation as their supplier for Airbus A320 and A350 Track Cans; this puts Aerosud in a very competitive position. This type of manufacturing has high entry levels in both skills and financial investment.

The AISI investment has led to the continued expansion of this capability, which has positioned Aerosud to tender and win the A350 contract, planned to continue until 2020.

Other tenders for a similar product have been submitted for other aircraft types such as the Gulfstream G650.

Socio-economic Impact

The track cans project is now entering a enhancement phase to manufacture and deliver three aircraft sets per month to Spirit Aerosystems. This equates to 18 fully assembled components per month. Further year-on-year enhancements will eventually allow for the manufacturing of 8–10 aircraft sets per month. Facilities and personnel will continue to develop to achieve this manufacturing rate.

This growth in work opportunity creates sustainable employment and the environment for operators and support personnel to advance their skills through experiential learning and formal training within the company. The product is manufactured to high specification international standards, which in turn creates a strategic skills level within the aerospace sector in the country.

Transfer of Airline Galley Design, Certification and Manufacturing Capability to SA Sub-tier Suppliers

Aerosud Aviation is in the process of withdrawing from the Airbus A320 Buyer Furnished Equipment (BFE) galley supply business, and has already indicated that it is willing to transfer the design, certification and production know-how to one or more South African companies. Discussions confirmed that at least two candidates – Aero Services and Safomar – were considered as viable recipient organisations.

Aerosud has operated in the airline galley market since 1995, and has established a significant technical capability in this regard – including the design, engineering, certification and production of such units. Aerosud established production baselines for a number of Airbus A320-related products, ranging from A318, A319, A320 and A321 installations with varying levels of complexity and customer requirements.

Typical example of A321 galley set – refrigerated

Suitability of Recipient Organisations

Aerosud has no vested interest in the proposed companies taking over the galley supply business, and has no direct business links with these organisations.

Both organisations are registered South African companies with more than 20 years' experience in the local aviation market and both hold relevant Civil Aviation Authority certifications.

Both organisations expressed interest in participating in such a venture and an initial introductory meeting was arranged at Aerosud's facility in Pierre van Ryneveld, on 15 March 2012.

It was noted that Safomar was not targeting the product development, engineering and manufacturing aspects of what was proposed, but showed more interest in marketing and material support of such programmes.

A decision was made that, as there were synergies between Aero Services and Safomar, they would meet to explore avenues whereby they could form a working relationship.

Feedback

On 5 July 2012, Aerosud received confirmation that Safomar and Aero Services had agreed that Aero Services would drive the process with Aerosud and that Safomar would subcontract to them on certain projects. Safomar is not equipped for manufacturing (its specialties are painting, trimming and composite repairs), whereas Aero Services is. Safomar, however, has the clientele and reach into Africa.

2 Sub-tier suppliers benefited from technology transfer

It was agreed that it would be best that Aero Services engage with Aerosud on the galley transfer and Safomar would set up a direct working relationship with Aero Services.

Process and Standards Documentation

Copies of the drawings, specifications, CAD models, interface drawings, as well as vendor and pricing documents were transferred to Aero Services and the following processes and standards were discussed:

- **Aerosud Organisational Processes and Procedures System (OPPS)**: The OPPS forms part of the Aerosud Quality Management System and is a total processed-based, electronic business system, through which processes, their sequences and interactions are identified
- **Flammability database**: Test plan and other reports
- **Standard materials and components**: These include sandwich panels; adhesives and fillers; extrusions; hardware and fittings; decorative laminates and galley insert equipment
- **Aircraft interface and integration documentation**: Includes the Airbus A320 Series Multi-standard Galley Brochure and A320 Series Cabin Configuration Guide
- A320 Galley G1 interface drawings
- CD with Aerosud documentation
- **Pricing**: Typical bill of materials list with prices for the A320 Galley G1
- **Pricing:** Aerosud reconciliation of all programmes from 1996 to 2011, including:
  - Airline
  - Equipment type
  - Customer
  - Ship sets supplied
  - Value
  - Certification baseline
  - Year.

Manufacturing Training and Practical

Training was given on the following topics:

- General overview of work process and workshop layout
- Insert population on panels according to Processes and Procedures Systems (PPS) and drawing
- PPS compliance and mix registers. Aerosud Procedures Systems (APS) and MB006 manuals to comply with PPS
- Insert population on panels
- Cleaning of panels after insert population
- Dry fitting of panels
- Stage bonding of galley
- Cleaning and sealing
- Second stage bonding of galley
- Cleaning and sealing
- Third stage bonding
- Cleaning and sealing.

New Opportunities

With the knowledge and historical experience passed on by Aerosud, Aero Services is in a far better position to approach international airlines and OEMs to offer their services at a competitive rate.

The transfer of galley supplies to Aero Services should allow for more work opportunities and create sustainable employment. It also creates an environment for personnel to advance their skills through experiential learning and formal training within Aero Services. The product is manufactured to high specification international standards, which in turn creates a strategic skills level within the aerospace sector in the country.

Laser Shock Peening

By combining the unique laser expertise of the CSIR and the Laser Shock Peening (LSP) expertise at the School of Mechanical, Industrial and Aeronautical Engineering at the University of the Witwatersrand (Wits), the team demonstrated LSP for the first time in South Africa. Not only that, the tests validated the potential of LSP for use by not only the aerospace industry, but several other industries which have stress fatigue susceptible components. If subsequent phases can build on the successes of the first phase, it would place South Africa at the forefront of this developing technology and could give the local industry a significant competitive advantage.

2 Engineers trained

The impact has been:

- Establishment of an operational LSP workstation with co-funding from the Laser Rental Pool Programme;
- Training of two engineering students at Wits
- Airbus bursaries
- Discussions with the following industry role players:
  - Local:
    - Aerosud
    - Eskom
  - International:
    - AgustaWestland
    - Airbus
    - Astrium
    - European Aeronautic Defence and Space Company (EADS)
    - Piaggio
- Wits is exploring the possibility of obtaining funding from the Technology Innovation Agency's Product Development Fund to build a prototype LSP system for industrial applications.

The potential impact of this technology is as follows:

- Increase local and international market access opportunities for South African goods and services by improving the competitiveness of local industries through the uptake of unique, locally developed LSP technology
- Increase the contribution of SMMEs to the economy by giving them access to new, world-class, aerospace-related technologies via the LSP facility
- Expand and improve current national aerospace-related research and manufacturing infrastructure via the LSP facility to ensure that new technologies are taken up by industry through an active process of innovation
- Promote human capital development (HCD) in the field of LSP by promoting the utilisation of the state-of-the-art, trans-disciplinary LSP platform established in the first phase by science councils, Higher Education Institutions (HEIs), and industry.

The foundation of this innovative technology is the unique LSP workstation, specifically configured to address the needs of the local and international aerospace industry and R&D community.

3 Organisations involved

Special Projects Support

Special Projects encompasses investigations of support to various companies in the aerospace industry and, more specifically, smaller entities that wish to enter the aerospace market and that face technical or certification challenges to market penetration.

One such company is ADEPT Airmotive. Through Special Projects, a number of interventions are being implemented, including the preparation of a primer for engine type certification and the investigation of applicable Non-Destructive Testing (NDT) techniques. Special Projects visited and considered many other entities, such as Sat Auth, Aero Services, Daliff Tellumat and Robin Coss Aviation, and where possible, appropriate support was offered. The companies were also involved in other marketing initiatives led by **the dti**; received AISI funding; were ISO and AS/EN9100 certified and were recommended to the Industrial Development Corporation (IDC). The impact of these projects is probably best illustrated by the requests for further assistance and the Memorandum of Agreement signed for future ADEPT support.

6 SMMEs supported

Testimonial

"ADEPT Airmotive has been fortunate to receive project support from **the dti**, through the AISI. The AISI has facilitated and funded critical technical support in areas in which ADEPT does not yet have in-house resources, facilitating access to national facilities and experts, enabling improved competitiveness. Through this support, ADEPT has made use of advanced Non-Destructive Testing processes in its foundry activities, and the National Laser Centre at the CSIR for laser welding. The AISI is also assisting with the testing and verification of components as part of ADEPT's Certification programme."

– Richard Schulz, Managing Director: ADEPT Airmotive

Guidelines for Type Certificate of Aircraft Engines

A detailed back-to-back analysis of the Federal Aviation Authority (FAA) and European Aviation Safety Association (EASA) engine type certification standards was carried out and then summarised in a report to ADEPT. This report serves as background to the detailed study of the standards ultimately required for engine type certification. Even though many of the tests required for certification are standard, the final list of tests is largely compiled at the discretion of the auditor assigned to each type certification, making it imperative for ADEPT to approach the FAA or EASA before embarking on the type certification process.

Guidelines published
for industry use

Testimonial

"The summary document is distributed to industry as an 'Engine Type Certification Guide for Dummies', an introductory document explaining the steps and key elements of the tests required to obtain type certification."

– Dr Glen Snedden, Research Group Leader: Aeronautics Systems, CSIR

Support for Casting Integrity to ADEPT Airmotive's 320T Engine

One of the immediate interventions emanating from the Special Projects visit to ADEPT Airmotive has been the access to national NDT infrastructure at the CSIR, the South African Nuclear Corporation (Necsa), the Palaeontology Department at Wits and the Computed Tomography (CT) scanner at the Central Analytical Centre (CAF) at the University of Stellenbosch. This led to a comprehensive investigation of the available NDT methods to determine the integrity of the cylinder head, engine block, sump cover castings and the composite inlet airbox.

The problem with casting complex components such as cylinder heads, is that normal 2-D industrial radiography does not provide adequate detail on the integrity of the casting. Too many projections and layers are imaged over one another. This was illustrated by the 2-D images utilising the capabilities of the Micro-focus X-ray Unit.

In South Africa, a number of CT scanners have been purchased in the past four years for industrial use. These include:

- The system at Necsa which was funded by the National Research Foundation (NRF). This system was, however, not available as it had been out of commission as university students (geology and palaeontology) had fully booked the system for completion of their research projects. A similar system at X-sight x-rays, which has a smaller detector system, was utilised to assess the capability
- The CT system at the CAF in Stellenbosch, which was specifically installed for use by industry at large. The system is designed to accommodate 'large' samples, such as the ADEPT Airmotive castings
- The latest CT system, which also has the highest energy capability, i.e. 360 KV as opposed to 220 KV on the other systems, is the system in the Palaeontology Department at Wits. This system was used to assess whether the results produced by the higher energy x-rays provide better results.

In addition to these CT and x-ray inspections, the samples provided were interrogated through ultrasonic testing using CSIR equipment, and dye penetrant inspection (PT), which was performed at the African NDT Centre in Centurion using the aircraft-quality PT production line.

The airbox, which is manufactured from carbon composite material and which has a wall thickness of approximately 1 to 2 mm, was inspected using the Infrared Thermography Testing (IRT) system at the CSIR.

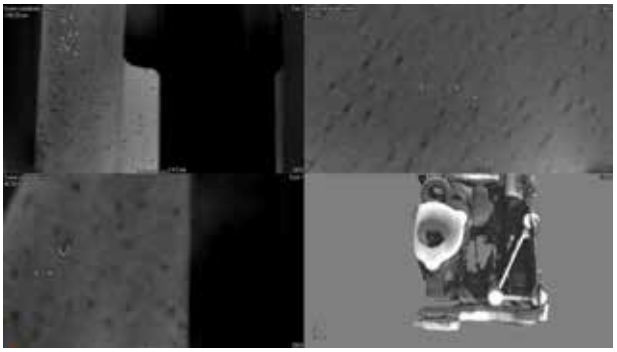
Results

All the CT systems could produce adequate results on the integrity of the cylinder head casting, which was the most convoluted of all the samples provided. A typical collage of CT scans is shown below, revealing pores amounting to 5% of the volume (the system can calculate the volume fraction of the pores in a predetermined volume).

The other CT systems provided similar results. The definition on the 360 KV system, which was operated at 330 KV, provided slightly better definition (a clearer image).

The University of Technology (UT) inspection could not detect the porosity, as the pores are too small to give detectable signals, even when using 8 MHz probes.

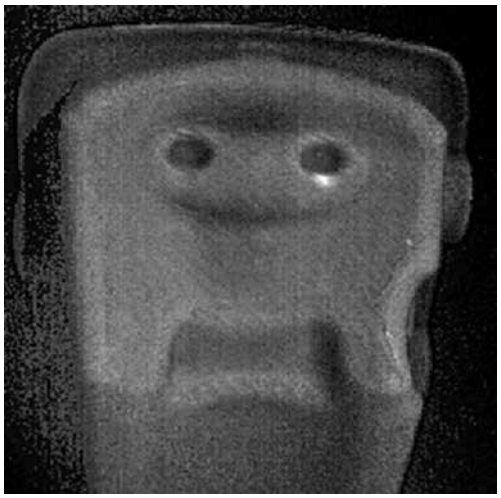
The results from the PT revealed pores which are open to the surface. In accordance with general acceptance criteria for PT, the castings would be acceptable. The picture on the right shows the result for the sump cover.



A compilation of CT images clearly showing the presence of gas pores in aluminium casting
(Results provided by CAF)

Aluminium casting showing isolated bleed-out of dye penetrant test

The airbox was inspected using the IRT system and no significant defect, which could impair the use of the air box, could be detected. The image on the right shows indications from some of the creases on the inside surface of the airbox.



Composite airbox thermography image

Job creation

It is difficult to quantify future job creation, as interventions such as these at the technology advancement level do little to retain or grow jobs or business. This start-up venture currently employs roughly four permanent staff members who will in the long-run ensure that the company has a viable product and can grow in the market.

6 SMMEs supported

Conclusion

It has been shown that 'normal' NDT does not suffice to assess the quality level of the castings. Advanced inspection technology, such as CT scanning, has to be used to obtain meaningful results and insight.

Testimonial

"AISI funding has been instrumental in giving the SMME, ADEPT Airmotive, access to top national infrastructure, enabling them to ensure better and consistent quality castings in their high-tech aviation engine design."

– Dr Manfred Johannes, Senior Researcher: Aeronautics Systems, CSIR

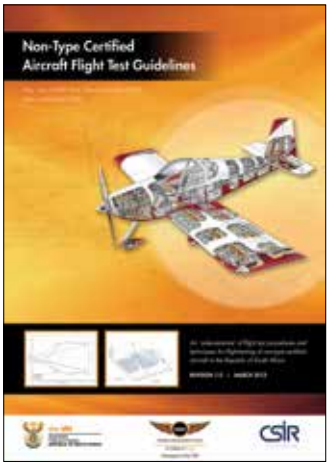
Type Certification Test Flight Requirements

The aviation engineering sciences have advanced faster than any of the other sciences and today are at the forefront of many advanced and radical technologies. While the world of certificated aircraft design and development is strictly regulated in contrast to non-type certificated aircraft, the flight test domain of the amateur homebuilder, aviation enthusiast and amateur aircraft designer is essentially a 'free for all', with minimal oversight by a regulator.

Within this regulatory environment, **the dti**, through the AISI, has, amongst others, developed this 'aide-mémoire' of flight test procedures and technologies for flight testing of non-type certified aircraft in the country. It understands that flight testing, in its very nature, involves varying levels of risk, so to try and pass specific safety advice relating to the multitude of potential flight test scenarios is not practicable.

Instead, this handbook is presented to provide some background fundamentals to flight test safety. It therefore attempts, in general, to address the provision of resources for a safety-conscious flight test and evaluation programme, including test planning principles, hazard analyses, risk management procedures and processes that are pertinent during the conduct of flight test operations. Not all relevant information is necessarily presented, and it is recommended that the references and other authoritative publications should be consulted for a fuller understanding of the topic.

The CSIR and **the dti** believe that this booklet will be of great value to SMMEs in the flight testing of non-type certificated aircraft.



Published guidelines

Guidelines published
for general aviation industry

Testimonials

"The advent of a flight test guideline in experimental and light sport aviation has long been overdue. This publication does not re-invent test flying, it takes the international best practice in the field of test flying these aircraft and blends it with the South African flying environment. This publication will have a unifying effect on how this subject is approached in the South African context, and will align the procedures for this purpose. Further development of regulations to provide for test flying will no doubt regard the content of this work, and minimum test flying pilot qualifications will take a reference in this publication. We congratulate the authors for putting this publication together, as well as **the dti** for their support in its production."

– CEO, Recreation Aviation Administration – South Africa (RAASA)

Comments received on the South African general aviation website, AVCOM:

"This is indeed a very good publication."

– Thys Basson

"How lucky do you want to be? It is an amazing publication – had a look through it. To get the distilled knowledge of a world-renowned test pilot and an engineer in a BOOK – focused on homebuilders – FOR FREE?!"

– Leo Theron

AISI/NAC Projects

Projects funded:

1. Development of high-strength, high-temperature shape memory nano-composites – Tshwane University of Technology
2. Helicopter main gearbox refurbishing based on human capital and knowledge development – Wits
3. Advanced nano-satellite communication systems – CPUT French South African Institute of Technology (F'SATI Space Programme).

Number of Students Supported or Involved in the Project

A total of 17 students are participating in this project in pursuit of their Master's and Doctoral degrees, or to gain practical experience through internships.

The students' project or thesis topics are spread across various fields, such as software, high-frequency communications, electronics, power systems, embedded systems, composites and the refurbishing of aircraft components.

17 Students participated in technology advancement projects

Transformation

The demographics of the students include ten historically disadvantaged individuals and two females, which indicate that this project is contributing significantly to the transformation of the country.

Technology Advancement

In each of the three projects funded, unique technologies or skills are being developed. This includes the development of a new class of materials with high-temperature smart properties, skills to repair or replace failed components on older aircrafts and to support industrialisation of the domestic space technology arena.

Competitiveness Improvement

The desired impact on competitiveness improvement comprise the following:

- Subsystems that will match or outperform equivalent commercially available products
- To become the *de facto* communication solution, preferred by industry and the research community
- Improvement of current systems
- Training of engineers in high-reliability production, processes and support
- Improved product parts
- Patented product synthesis technology
- Scarce and high-level skills development.

Socio-economic Impact

The students involved in this programme are equipped with the skills necessary to contribute positively to the South African economy. This will have a favourable impact on their personal lives as they are able to sustain themselves and their immediate families.

The technologies developed create a platform for new business generation or business expansion, especially in the case of SMMEs, which will in turn contribute to increased employment.

The aerospace industry in the country will have access to improved technologies and relevant skills.

Testimonial

"All the projects within this programme fit in well with the National Aerospace Centres (NAC) thematic areas. By funding these projects, opportunities were created for new partnerships with relevant educational institutions and industry. Most importantly, the NAC has been able to fulfil its mandate of developing relevant skills for the aerospace industry though its collaboration with AISI."

– Phillip Haupt, Director: National Aerospace Centre

The three projects are briefly described below:

Development of high-strength, high-temperature shape memory nano-composites

Number of Students Supported or Involved in the Project

The following students are participating in this project:

- **Linda Lethabane, DTech:** With structural and phase transformation characteristics of high-temperature shape memory composites as her thesis subject
- **Vincent Shokane, MTech:** With the optimisation of spark plasma sintering of shape memory alloy nano-composites as his thesis subject.

Transformation

Both students participating in this project are historically disadvantaged individuals and are supported in their postgraduate studies. Linda Lethabane is now able to work professionally in a formerly male dominated domain.

Technology Advancement

This project aims to develop a new class of materials with high-temperature smart properties that can be used in extremely harsh environments such as those aerospace materials are subjected to.

Competitiveness Improvement

The research done through this project provides the opportunity for the development of high-strength, high-temperature titanium-based shape memory nano-composites, as potential multifunctional components that can be used in a variety of aerospace applications such as micro-electrical mechanical systems (MEMS).

Main Outputs Envisaged

- Improved product parts.
- Patented product synthesis technology.
- Human capital development.

Socio-economic Impact

The two students supported by this project are being equipped to participate in the local and even global aerospace industry. The knowledge acquired will have a positive impact on their personal lives, as they are now able to contribute to the South African economy and sustain themselves and their immediate families.

Similarly, there is an opportunity for this technology to be commercialised and in turn create employment.

Testimonial

"This project fits in well with the Aerospace Manufacturing Processes and Materials (AMPM) NAC thematic area and allows for an increase in the number of universities that are supported. The AISI funding provided allowed for a new partnership with an educational institution that is developing practical skills essential to improving the competitiveness of the South African aerospace industry."

– Phillip Haupt, Director: National Aerospace Centre

Helicopter main gearbox refurbishing based on human capital and knowledge development

Number of Students Supported or Involved in the Project

The following students are participating in this project:

- **Taetjo Mathabatha, MSc:** With helicopter main gearbox refurbishing based on human capital and knowledge development as his research subject
- **Israel Zimuto, MSc:** With helicopter main gearbox refurbishing based on human capital and knowledge development as his research subject.

Transformation

Both the students participating in this project are PDIs who are proceeding with their postgraduate studies through the support of this project.

Technology Advancement

This project aims to develop the skills and ability to repair or replace failed components for older aircrafts. The new skill sets acquired by the participants will enable the aerospace industry to upgrade and repair older aircraft instead of spending vast amounts of money on new components and/or aircraft.

Competitiveness Improvement

The research done through this project provides the opportunity to increase the lifespan of passenger and cargo fleet, which is approximately seven and 28 years respectively.

Main Outputs Envisaged

- Human capital development.
- Development of scarce and higher level skills relevant to industry requirements.
- Improved collaboration with knowledge organisations and resultant enhanced competitiveness of the aerospace industry.
- Execution of a commercially significant project.

Socio-economic Impact

The two students supported through this project are being equipped to participate in the local and even global aerospace industry. The knowledge acquired will have a positive impact on their personal lives, as they will now be able to contribute to the South African economy and sustain themselves and their immediate families.

In addition, the refurbishment of old aircraft increases the possibility and viability of SMMEs to participate in the aviation industry.

Testimonial

"This project fits in well with the AMPM NAC thematic area. NAC-funded research conducted in cold spray technology will be used in the refurbishment of the components in this project. This indicates a good return on investment for the NAC, as the industry will now be able to realise tangible benefits from this technology.

The project increases the potential for partnerships and new business generation for industry, especially SMMEs and Tertiary Education Institutions (TEIs)."

– Phillip Haupt, Director: National Aerospace Centre

Advanced nano-satellite communication systems

Number of students supported or involved in the project

A total of 13 students are participating in this project. The project or thesis topics are spread across various fields such as software, high-frequency communications, electronics, power systems and embedded systems.

These students are gaining valuable experience as engineers in training and in pursuing their Master's Degrees.

Transformation

Six of the students involved in this project are PDIs and two are from other African countries. As a percentage, this project is contributing significantly to the transformation of the country.

Technology Advancement

F'SATI has developed into a multi-faceted, multi-disciplined training programme that broadly encompasses three programmatic phases, namely theory, research and professional development. Having established a firm human capacity, infrastructure, technology and research platform, the programme now ventures into the development of user-responsive services and products as a key objective of the National Space Strategy. Of particular significance is the project's support of industrialisation of the domestic space technology arena.

Competitiveness Improvement

This project aims to develop subsystems that will match or outperform equivalent commercially available products on a hardware level. For it to become the *de facto* communication solution, preferred by industry and the research community, it is imperative that the current systems be improved on a firmware level.

The engineers are trained in high-reliability production, processes and support. In keeping with these practices, this project includes the upgrade of a thermal vacuum chamber, as well as the acquisition of a small thermal vacuum chamber for regular, reliable testing of the products in different stages of development.

Main outputs envisaged

- High speed S-band transceiver (HSTRX).
- Thermal-cycle chamber.
- Thermal vacuum chamber.
- Advanced soldering station.
- Microscope with viewer.
- Ground station viewer.
- CAD commercial software licences.
- Training for production and system engineers.

Socio-economic Impact

Satellite communication technology is a means by which developing countries can access information that will assist in improving its socio-economic conditions. The technologies and capacity developed in this project would greatly benefit the aerospace industry, but will also be relevant and beneficial to many others.

Development of Fibre Metal Laminates for Aerospace Application

Many of the next generation aerospace materials being researched internationally will only see practical implementation in the longer term, and are of high technical risk. The most promising class of material for short- to medium-term implementation is that of Fibre Metal Laminates (FMLs). This material offers properties of relevance to the aerospace field that are superior to metals and composites, with excellent fatigue, impact and damage tolerance characteristics and low weight.

The activity addressed in this project is the development of an FML-type material with high impact resistance that is suitable for Unmanned Aerial Systems (UASs). This work was carried out in conjunction with parallel research funded by the CSIR.

Strategic Alignment

The relevance of the material development can be seen in the light of the Industry Policy Plan (IPAP), which integrates the activities of both **the dti** and the DST, amongst others. Of particular interest are activities grouped in Cluster 3: Sectors with Potential for Development of Long-term Advanced Capabilities. Both titanium and advanced composites are identified among the four major growth areas in the South African advanced manufacturing industry, this project combines both materials into an enhanced material. Furthermore, IPAP states that the development and applications of advanced materials have become critical to enable much needed technological and economic advantages. The aerospace and defence sectors are identified as critical generators of new technology that provide a cross-cutting intensification of the country's industrialisation processes and movement towards a knowledge economy. In addition, titanium-based products are explicitly identified as a component of South Africa's drive to enter high-value global supply chains.

This project calls for combining titanium and advanced composite materials into an enhanced material. The strategic alignment of the broader project within the CSIR falls primarily within the context of the Titanium Centre of Competence and is supported by the Aerospace and Automotive Growth Strategies.

Technical Outputs

Numerical modelling was used to design an FML consisting of a combination of glass fibre and fine stainless-steel mesh as a replacement for the glass fibre currently used in UAS manufacturing. Both FML and glass fibre samples were tested in an instrumented drop test machine. The type of damage induced in this test can be seen in the adjacent image.

The damaged area for the FML was smaller than that for the glass fibre specimens. This characteristic is advantageous from a structural integrity point of view due to the higher degree of localisation of the damage.

Titanium-based FML armour test

Induced impact damage

The parallel work carried out at the CSIR primarily addressed the application of the technology to titanium- and carbon fibre-based FMLs for vehicle armour. This research was prompted by new levels of threats that are increasingly making current armour systems for personnel carriers ineffective. An image from a high speed video is shown in the adjacent image, where a titanium- and carbon fibre-based FML is being tested for resistance to an explosively formed projectile at the CSIR D-BEL range.

Aerospace – UAS Applications

The AISI project has demonstrated a material that will allow for the manufacture of more damage resistant UAS structures that can also be aerodynamically optimised for maximum range due to the stiffness tailoring that this material provides. This material will allow for greater ease and lower manufacturing cost than traditional FMLs. There will be a minimal weight penalty on the airframe from the added protection. Application of this material has the potential to create an additional competitive advantage for local industry. The material will be used for future UAS designs. The project planning has included the UAS group at the CSIR in order to achieve maximum relevant impact.

Aerospace – Satellite Applications

A need has been identified for laser surface treatment of both titanium and carbon fibre to enhance the bonding of the material constituents for possible satellite applications. Additional research into this field is currently pursued by the CSIR as a continuation of the project. This need also existed for the current CSIR ground vehicle armour applications.

The analysis techniques developed under the project will provide additional optimisation tools for the design of structures. These could include satellite truss structures that have zero thermal expansion and contraction. Thermal stability of such structures at the extreme temperature differences experienced during orbits around the earth is essential for accurate data acquisition.

Spin-on Benefits

Spin-on benefits include the establishment of composite material test facilities, enhanced structural design tools and better chemical surface treatment technologies for titanium.

The project required the mechanical testing capabilities at the CSIR to be expanded in order to adequately characterise the material. These additional capabilities have subsequently been applied to supporting the Square Kilometre Array (SKA) bid.

The material testing facilities required for qualifying the material could also be used more widely to provide South African industry with a comprehensive facility for characterising composite materials, which has been lacking in the country.

The technologies that will be developed have the potential for a downstream contribution to South African localisation activities, particularly in the chemical process environment. The plans to produce titanium sheets locally will initially result in a commercially pure metal. This will be of use to the chemical industry due to the metal's resistance to chemical attack. The FML technologies will allow for the manufacture of pipes and pressure vessels from the locally produced titanium.

Research is currently being carried out regarding the thermal processing of titanium to enhance its fracture resistance for the vehicle armour applications. This type of processing will also be required locally if there are future contracts from foreign airframe manufacturers for the supply of titanium aircraft components.

Testimonial

"The AISI funding has enabled the demonstration of a hybrid composite and metal material that shows enhanced resistance to impact damage. This material has the potential to increase the local competitiveness of future UASs that will have a reduced sensitivity to damage under operational conditions. The associated technologies that have been developed will give a range of spin-on benefits for South African industry."

– Gary Corderley, Principal Engineer: Materials Science Manufacturing, CSIR

Development of a Stiffness Tailored UAS Wing

The South African Aerospace Sector Development Plan (SDP) of **the dti** and the DST has identified UASs as the best product to make South Africa internationally competitive in the military sector, and the sixth best in the civilian sector. In both cases the design and manufacturing capabilities were assessed and found to be competitive, but in order to sustain this competitive edge, it is important to continually advance the technologies that are being applied.

The design of an airframe traditionally occurs in three phases: concept design, initial design and detailed design.

During the concept design or layout phase, the geometry of the wing will be selected. In order to aid in this process, the CSIR has developed a methodology for the design of wings with optimal aerodynamic performance, which results in, amongst others, increased range. This methodology is currently being applied to the design of the ATE Vulture upgrade.

In addition to determining the shape of the wing, it also gives the structural characteristics, such as stiffness (deflection and rotation), required to attain optimal performance.

During the initial design phase, the first iteration of the structural design of the wing is done. Traditionally the drivers for this process are strength and damage tolerance and consequently the stiffness of the resulting design often varies significantly from that required for optimal aerodynamic performance. Several design iterations are traditionally required in order to achieve the best compromise between aerodynamic and structural performance.

The structural design methodology required to design a stiffness tailored wing does not as yet exist. By using the stiffness requirements as an input to the design process, it is envisaged that the number of iterations required to produce a feasible design will be significantly reduced.

Strategic Alignment

Making this methodology available to the South African aerospace industry will offer it a number of advantages over its international competitors.

Better products will be offered as the improved match between the actual and required stiffness will ensure that the actual aerodynamic performance is a closer match to the design performance. This will result in the performance of the UAS in key areas, such as range or payload, being better than that of other systems of equivalent size.

Cheaper products will be offered, as the reduction in the number of design iterations to reach a feasible design will result in a reduction in development costs when compared to other systems of equivalent size.

A larger product range could be offered as the reduction in the number of design iterations to reach a feasible design will result in a reduction of the development timescales for each product when compared to products of equivalent size.

Technical Outputs

The use of finite element-based methodologies for the design of a tailored box beam was developed, although it did not produce a design which could be manufactured. By combining this methodology with that developed using research funded by the CSIR, a new methodology was developed for design. This methodology has been captured in a manual that is attached as an appendix to the technical report.

The availability of this methodology will increase the ability of the CSIR and its industry collaborators to improve the performance of existing UAS airframes, as well as to develop new UAS airframes, for example a new generation medium altitude long endurance (MALE) civil commercial UAS. It will also improve the competitiveness of the South African aerospace industry, ensuring skills and job retention and eventually new job creation.

Both formal and informal discussions have been held with Denel Aerostructures where it was indicated that the industry had a need for a capability of this nature and that it would welcome its availability.

Although being developed for application to UAS wings, the technology will be adaptable to the structural design of any type of wing-like structure. Examples include aircraft rudders and tail planes, helicopter rotor blades, wind turbine blades and yacht keels.


ZS-TWZ

PROGRAMME 2

Supplier Development

The AISI's Supplier Development interventions provide enabling mechanisms to assist industry to improve its competitiveness, productiveness and quality management systems, and in doing so optimise its operations and procedures to ensure integration into global supply chains. The strategic focus remains on small, medium and micro enterprises (SMMEs), with the objective of ensuring industry transformation.

Economic benefits derived through supplier development projects include improved competitiveness, productivity, lead times, delivery performance and quality, as well as cost savings, compliance with environmental standards, increased customer satisfaction and job creation and retention.

PROJECTS SUPPORTED THROUGH PROGRAMME 2 INVESTMENTS

- **Supply Chain Analysis and Benchmarking**
- **Green Supply Chain Audit of the South African Aerospace and Defence Industry**
- **Status of Supply Chains in the South African Aerospace and Defence Industry**
- **Standards, Accreditations and Certification Support**
- **E-business Web Portal**
- **Supply Chain Improvement and Optimisation Interventions**

Supply Chain Analysis and Benchmarking

This project focused on enabling companies in the South African aerospace and defence industry to improve their supply chains and reduce costs by developing various industry benchmarks and using them to compare individual companies' performance with that of similar companies in the industry. The benchmark results could then be used by these companies to manage and improve their supply chain performance and reduce excessive supply chain costs.

12 Organisations participated

The following activities were completed as part of this project:

1. Investigate the current aerospace and defence industry and identify the main product and service groups
2. Develop the first iteration metrics for different aerospace and defence industry product and service groups
3. Refine developed metrics for different aerospace and defence industry product and service supply chains
4. Collect and verify data from appropriate organisations in the South African aerospace and defence industry via an online survey. A total of 80 companies were targeted for this survey
5. Determine the benchmark values for the metrics of the different product supply chains using the available data;
6. Use the available data to compare individual companies in the industry and provide feedback to these companies
7. Identify future data gathering options in order to improve the data collection process to create benchmark values for industry.

This project enabled companies in the aerospace and defence industry to compare their various areas of supply chain performance with those of competitors and identify focus areas for improvement. Since the scope of the study was to help the companies identify their supply chain problems, rather than address them, direct measurable impacts could not be realised as part of the study. However, longer-term impacts of participating companies' interventions, initiated as a result of this study, could include reduced supply chain costs, improved supply chain responsiveness, improved supply chain agility, improved supply chain asset management, and improved supply chain reliability.

During the course of this project, it was realised that many companies did not even measure their supply chain performance and could therefore need assistance to set up supply chain performance measurement systems before considering benchmarking with competitors. This resulted in a new Aerospace Industry Support Initiative (AISI) supplier development project that focused on investigating the supply chain challenges and needs of companies in the industry, and identifying future AISI supply chain improvement projects at these companies.

Green Supply Chain Audit of the South African Aerospace and Defence Industry

This project was a continuation of support provided to the AISI during the 2011/2012 financial year, and focused on carrying out energy assessments as part of the Green Supply Chain Audit Project.

The energy assessment for Rheinmetall Denel Munition (RDM), Aero Services and Turbomeca Africa was carried out in collaboration with the National Cleaner Introduction Centre – SA (NCPC-SA).

Aero Services (Pty) Ltd

The aim for Aero Services was to identify energy efficiency improvement opportunities and to provide a financial feasibility analysis with respect to these opportunities. In addition, it was envisaged that these opportunities should become part of an energy management plan for the company.

The energy assessment also sought to estimate the potential reduction in carbon dioxide emissions, which could be obtained through improved energy efficiency and savings. Part of the energy assessment involved identifying the significant electrical energy users so that the proposed energy efficiency improvements could prioritise the equipment with respect to energy-saving benefits. For Aero Services, the elements (42%), compressed air system (30%), lighting system (10%) and ovens (9%) were found to be the main electricity consumers according to the percentage breakdown, as given in *Figure 1*.

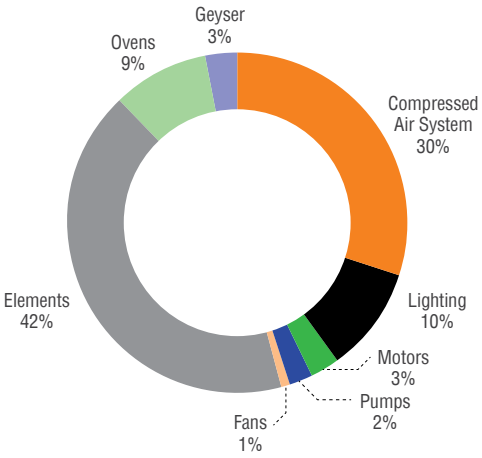


***Figure 1: Breakdown of annual electricity consumption for the significant energy users at Aero Services* (kWh/year)**

The assessment identified potential energy savings of more than **20% of kWh** usage through the implementation of various energy-saving initiatives, which amounts to an estimated saving of **40 000 KWh** per year.

These energy savings could amount to a reduction in carbon emissions of more than **40 tons** per year.

20% Energy savings

40 000 kWh Savings per annum

Once the recommended interventions are implemented, the project has the potential to increase the competitiveness of the company through reduced energy costs. The saved costs can be used in other areas of the production process to improve efficiency, which could further enhance the competitiveness of the company. The avoided carbon dioxide emissions would also help to reduce the socio-economic impact of greenhouse gas emissions on society.

Rheinmetall Denel Munition (RDM)

The aim of RDM was to identify energy efficiency improvement opportunities and to provide a financial feasibility analysis with respect to these opportunities. In addition, it was envisaged that these opportunities should become part of an energy management plan for the company.

The breakdown of the annual electricity consumption for the company was determined in order to help direct energy-saving opportunities going forward, as shown in *Figure 2*.

Once the recommended interventions are implemented at the company, it will save energy to the amount of **R906 000** annually. This saving is approximately **11%** of RDM's annual electricity bill, and would result in improved competitiveness for the company since the saved costs could be directed to other areas of the production process. Improved energy efficiency could also result in increased productivity in some areas, if implemented properly.

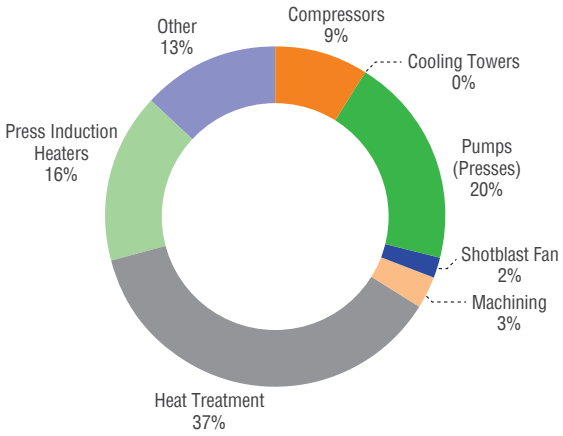


Figure 2: Breakdown of annual electricity consumption for RDM

R906 000 Cost savings

11% Savings on energy expenditure

Turbomeca Africa

The aim of Turbomeca was to identify energy-efficiency improvement opportunities and to provide a financial feasibility analysis with respect to these opportunities. The energy assessment also estimated the potential reduction in greenhouse gas emissions that could be realised through the implementation of the proposed energy-saving interventions. In addition, these opportunities will form part of an energy management system for Turbomeca Africa, which is currently being implemented by the NCPC-SA.

Since the energy management system implementation is a long-term process spanning many months, this component of the project is still underway and some of its impacts will only be realised after completion. However, the following findings were evident from the preliminary energy assessment:

- The biggest impact of the proposed energy-saving interventions is that the company could potentially reduce its overall electrical energy consumption by **1.6 GWh** per year with a payback period of two years or less
- The energy-saving interventions also have the potential to reduce carbon dioxide emissions by **1 820 tons** per year. This will help to reduce the socio-economic impact of greenhouse gases on society.

The saving in energy consumption will increase the competitiveness of the company through energy cost reductions. These savings could then be channelled to other parts of the production process, resulting in improved productivity and competitiveness.

1.6 GWh Potential reduction of consumption per annum

Status of Supply Chains in the South African Aerospace and Defence Industry

All role players within the aerospace and defence industry supply chains in South Africa need to find ways of driving down their costs to compete on the international market. One way of achieving this is through the reduction of logistics costs, giving rise to the need to quantify the cost of logistics in these supply chains.

This project focused on providing a bird's-eye view of the supply chain situation in the South African aerospace and defence industry. The main objective was to quantify the cost of supply chain and logistics for the aerospace and defence industry in South Africa, taking into account various cost areas such as transportation, warehousing, inventory and management.

The following activities were completed as part of this project:

1. Perform a literature review to provide an overview of the global aerospace and defence industry
2. Investigate existing methods to calculate logistics costs in an industry and choose the most suitable methods for this project
3. Gather the necessary data for the cost analysis from enterprises in the South African aerospace and defence industry. An online survey that targeted 80 companies was used to gather data
4. Calculate various logistics component costs using the available data collected and analyse this data
5. Identify logistics and supply chain challenges and opportunities in the industry.

Some key results are summarised in *Figures 1* through *4*. These figures provide decision-makers with a better idea of the logistics cost drivers in the supply chains of South African aerospace and defence companies, thereby indicating which areas to target for cost reductions and improvements.

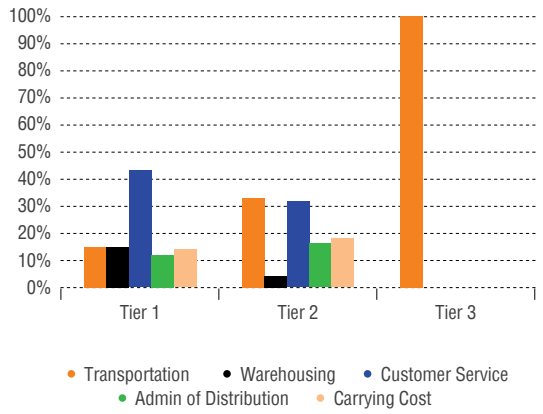


Figure 1: Logistics cost components as a % of total logistics cost (Average per tier)

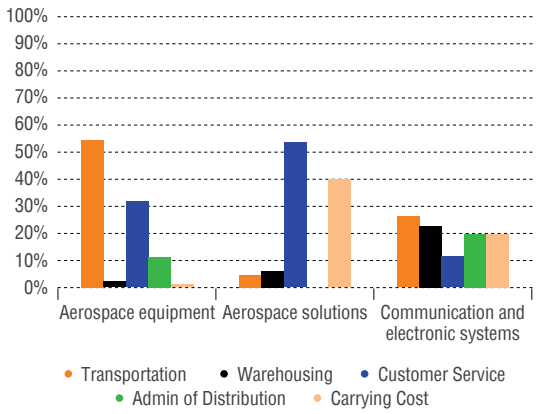


Figure 2: Logistics cost components as a % of total logistics cost (Average per product group)

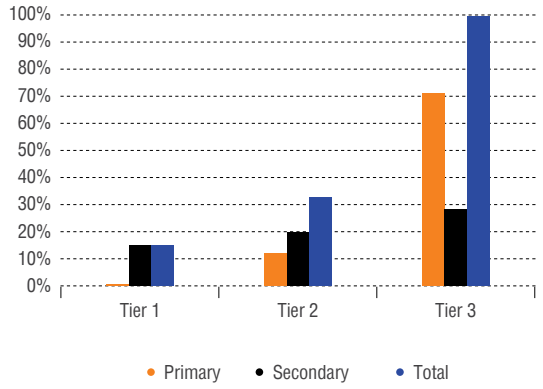


Figure 3: Transportation cost as a % of total logistics cost (Average per tier)

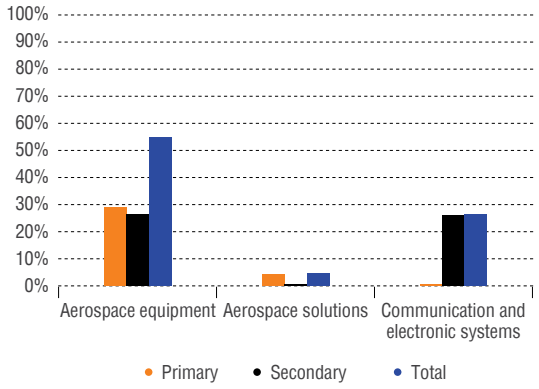


Figure 4: Transportation cost as a % of total logistics cost (Average per product group)

One of the major challenges encountered during this study was the lack of supply chain performance measures in the companies that were asked to participate in the survey. Generally, logistics cost components were not clearly tracked and were seldom recognised as target areas for improvement in order to lower logistics costs. The logistics costs, as a percentage of revenue, for some of the companies that participated in the survey were extremely high, which implies that the survival of these companies could be threatened. A lot of effort needs to be put into capturing information, both on supply chain performance and logistics component costs.

Furthermore, companies need to monitor problematic components within their logistics processes and put interventions in place to reduce their logistics costs in these areas. Consequently, a new AISI project was started that focused on determining the supply chain needs of companies in the industry and identifying interventions that can be provided by the AISI.

8 Organisations involved

Understanding
of logistics cost drivers in industry

Standards, Accreditations and Certifications Support

Several companies within the South African aerospace industry act as suppliers, at various tiers, to the global Original Equipment Manufacturers (OEMs). Some OEMs which specifically use South African suppliers include Boeing, Airbus, EADS and Embraer. Furthermore, some of the Tier 2 suppliers to these OEMs also use South African suppliers. These include Spirit Aerosystems Europe and Spirit Aerosystems USA. In South Africa we have several Tier 1 and Tier 2 suppliers to these OEMs as well, and these South African suppliers usually offload work to South African Tier 2, Tier 3 and lower tier suppliers. This supply chain structure is illustrated in the diagram below.

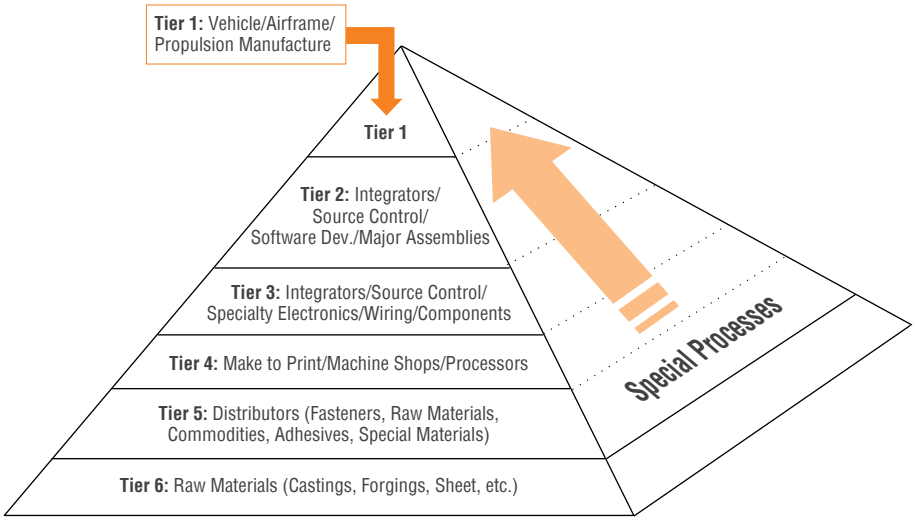


Figure 1: Aerospace supplier tiers

Globally, the OEMs (Tier 1) require any and all of their lower tier suppliers to comply with several requirements (and enforce on). Those requirements include, but are not limited to, the suppliers' management system, quality of product (as this could adversely affect safety), environmental factors as well as safety of the workforce at such lower tier suppliers. This is achieved by the OEMs requiring the lower tier suppliers to have management systems that conform to, are certified to, and accredited to specified international standards.

In addition, the OEMs also enforce their own unique OEM requirements (customer requirements) onto their lower tier suppliers. This they achieve by laying down qualification criteria and then auditing these lower tier suppliers to verify compliance before officially approving and adding such a supplier to their approved supplier list. They also enforce entry requirements for any lower tier supplier to comply with before being considered as a supplier to an OEM.

The certifications and accreditations required by OEMs on lower tier suppliers are governed by the International Standards Organisation (ISO). The ISO governs the majority of these standards, but the standards applicable to the aerospace and defence industry are governed by the International Aerospace Quality Group (IAQG).

These international standards ensure conformity and standardisation across the globe and across all tiers of supply, whether it is a Tier 1 or Tier 6 supplier. These international standards come at various levels of sophistication, detail and complexity which reflect industry-specific requirements. In the aerospace and defence industry, the hierarchy of the applicable international standards to achieve OEM approval can be reflected as follows:

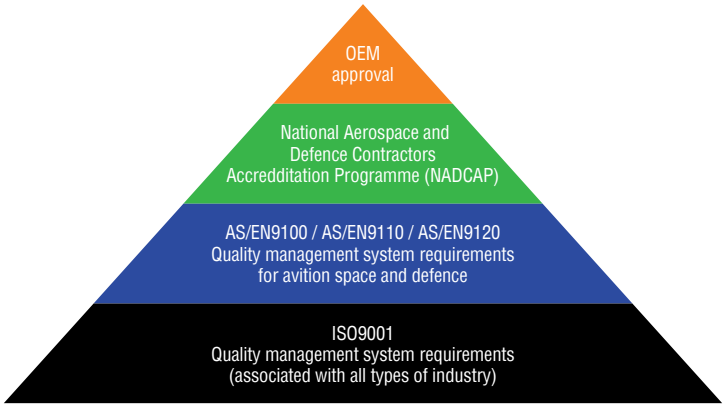


Figure 2: Hierarchy of international standards for the aerospace and defence industry

In addition to the above quality-related international standards, OEMs also encourage their suppliers to comply with ISO 14001 (Environmental Management Systems) and OHSAS 18001 (Occupational Health and Safety Assessment System). Certification to these two international standards is also done by global Certification and Registration Bodies (CRBs) through the International Accreditation Forum (IAF).

The AISI, through Standards, Accreditations and Certification Support, aims to assist industry in complying with international requirements for the aerospace and defence industry. The AISI has supported the implementation of quality management systems at organisations, after which the organisation itself becomes responsible for the actual certification at a third party certifying body. The following Quality Management Systems (QMSs) were implemented at five organisations.

African Non-Destructive Testing Centre

African NDT Centre is involved in NDT operations, mainly as a supplier on wing slat mechanism track cans for Airbus (through Aerosud), and in training of personnel in NDT, specialising in aerospace and general industry NDT. It is also an examination centre for Personnel Certification in Non-Destructive Testing (PCN) examinations and has British Institute for Non-Destructive Testing (BINDT) Training Centre approval (the only company in Africa holding these two approvals). They are currently based in Centurion, Gauteng.

AISI Standards, Accreditations and Certification Project Participation

a. AS/EN9100 Certification: The company was assisted by the AISI and is certificated to AS/EN9100.
b. ISO14001 Certification: The company was assisted by the AISI to ready itself for ISO14001 (Environmental) certification. Due to the relocation of the organisation, the actual certification audit process was delayed to early in 2014 (as ISO14001 certification is facility dependent) but the company is compliant to and ready for certification.
c. OHSAS18001 Certification: The company was assisted by the AISI to ready itself for OHSAS18001 certification. Due to the relocation of the organisation, the actual certification audit process was delayed to early in 2014 (as ISO14001 certification is facility dependent) but the company is compliant to and ready for certification.

a. **Number of Jobs Created or Retained**

10 Jobs created

21% Transformation increase

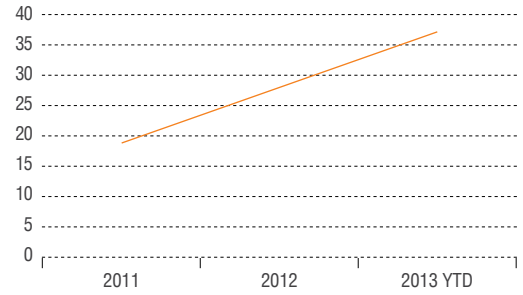


Figure 3: African NDT Centre – personnel complement

b. **Transformation**

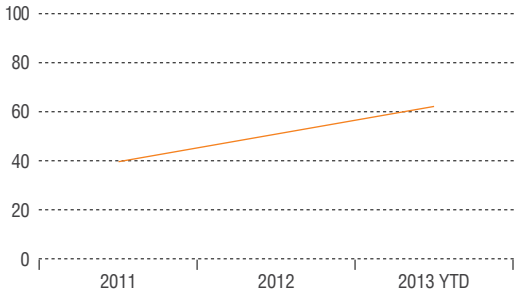


Figure 4: African NDT Centre – transformation (previously disadvantaged individual (PDI)% of staff)

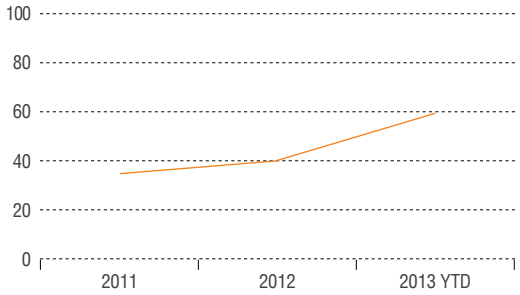


Figure 5: African NDT Centre – transformation (PDI% of students)

c. **Technology Advancement:** Through the obtainment of AS/EN9100, the African NDT Centre also managed to use this as a stepping stone to achieve National Aerospace and Defence Contracts Accreditation Programme) Nadcap accreditation in penetrant and radiography testing. A new ultrasonic testing laboratory was recently opened and has authority to proceed from Airbus. The African NDT Centre managed to obtain Airbus, Spirit Aerosystems Europe and Spirit Aerosystems USA approval for NDT inspections. A state-of-the-art extraction system was installed at the new training facility to enhance environmental and occupational health and safety factors.

d. **New Contracts as a Result of AISI Funding:** Key customers are more secure in the knowledge that the African NDT Centre complies with additional international standards. Due to increased workload (relating to both NDT inspections and training), the African NDT Centre relocated to a bigger facility with almost 100% more floorspace.

Increased productivity

e. **Productivity Improvement**

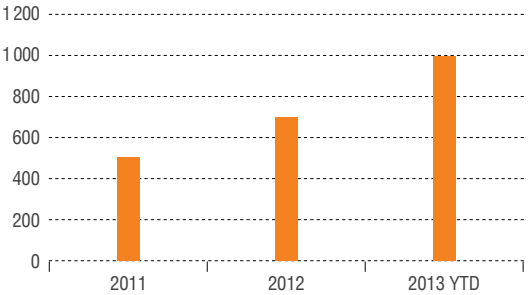


Figure 6: African NDT Centre – parts inspected (average per week)

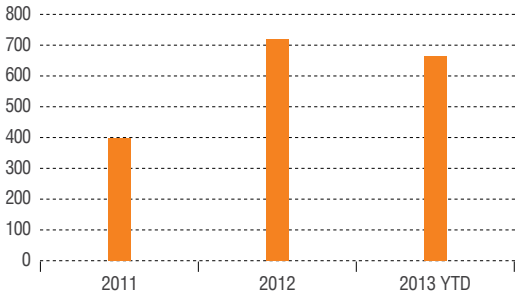


Figure 7: African NDT Centre – students trained in NDT

f. **Lead Time Improvement:** Due to increased capacity and productivity, lead time improved.

g. **Competitiveness Improvement:** More and more customers require certification to the ISO14001 and OHSAS18001 international standards. These include Airbus and Spirit Aerosystems on the aviation side and Eskom, Oceaneering, De-Tech and Pro-Tech in terms of general industry.

h. **Socio Economic Impact:** Due to the improved and a safer working environment, quality of life for employees and their families were impacted positively.

i. **Requirement:** The African NDT Centre has a requirement to become compliant with Airbus General Requirements for Aerostructure Manufacturing Specifications (GRAMS).

Testimonial

"More and more of our customers require certification to the ISO14001 and OHSAS18001 international standards. These include Airbus and Spirit Aerosystems on the aviation side and Eskom, Oceaneering, De-Tech and Pro-Tech in terms of general industry.

In terms of our training activities, BINDT approved the African NDT Centre as a training centre. This is significant, as they place a high value on ISO14001 and OHSAS18001 certification.

The invaluable and expert assistance received from the AISI in achieving this certification, will enhance the marketability and market accessibility of the African NDT Centre not only locally but globally."

– Mr Hennie Fourie, General Manager: African NDT Centre

Daliff Precision Engineering

Daliff is a supplier of precision machined (milling and turning) aircraft parts and components to Aerosud (whose customers are mainly some of the large OEMs like Boeing, Airbus and BAE Systems), Denel Aerostructures, Denel Aviation and other subsidiaries in the Denel group. They also, on a limited scale, supply the general engineering industry. They are currently based in Cape Town.

AISI Standards, Accreditations and Certification Project Participation

a. AS/EN9100 Upgrade to Revision C: The company was assisted by the AISI to successfully upgrade their Quality Management System (QMS) to AS/EN9100 Revision C.
b. AS/EN9100 Upgrade to accommodate Airbus GRAMS compliance: The company was assisted by the AISI to revise and upgrade its QMS to facilitate the implementation of Airbus GRAMS requirements.

Impact

a. **Number of Jobs Created or Retained**

5 Jobs created

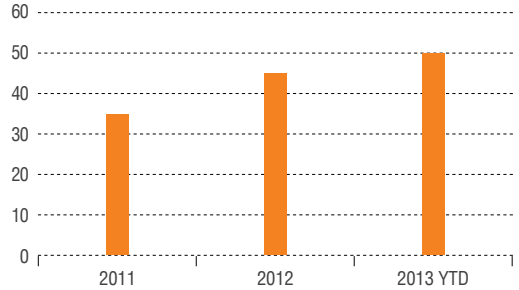
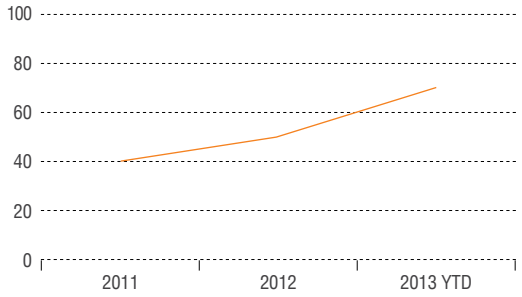


Figure 8: Daliff Precision Engineering – personnel complement

b. **Transformation**



30% Transformation increase

Figure 9: Daliff Precision Engineering – transformation (PDI% of staff)

c. **Technology Advancement:** A technology transfer programme (driven by Airbus through Aerosud) is currently underway to allow for transfer of Computer Numerical Control (CNC) software programmes directly to Daliff to facilitate product integrity.

d. **New Contracts as a Result of AISI Funding:** Three potentially big contracts are in pipeline due to the AS9100 QMS enhancements made and world-class QMS processes. These potential contracts include Passenger Rail Agency of South Africa (PRASA) (through Tellumat) and Airbus.

e. **Productivity Improvement**

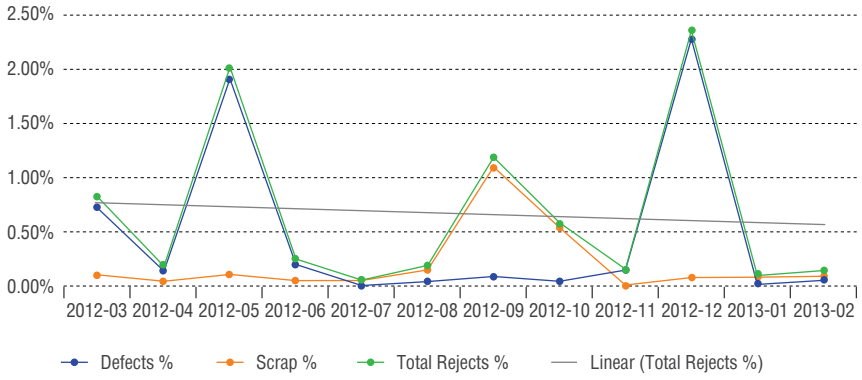


Figure 10: Reject rate YTD 2012–2013

Productivity and lead time improvement

f. **Lead Time Improvement**

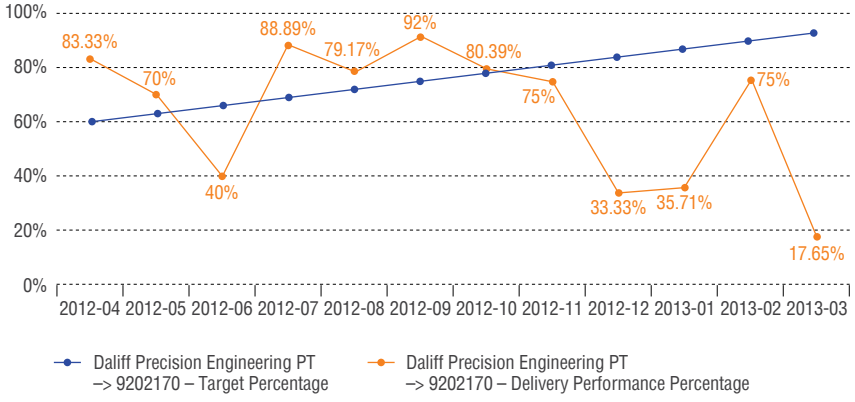


Figure 11: On time delivery performance per supplier

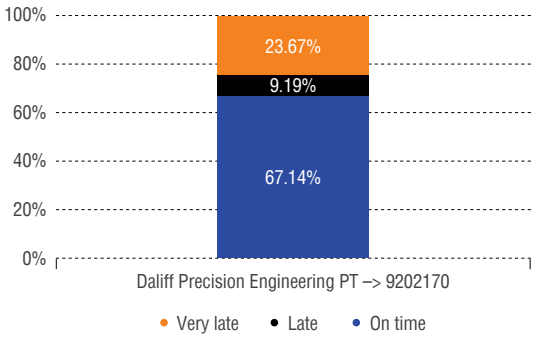


Figure 12: Delivery performance per supplier

g. **Competitiveness Improvement:** Daliff is close to obtaining full Airbus approval, making it the only machining company in Africa that will have this status.

h. **Socio-economic Impact:** Extensive training of staff leads directly to an increase in quality of life, and employees and their families were impacted positively.

25 Staff members trained

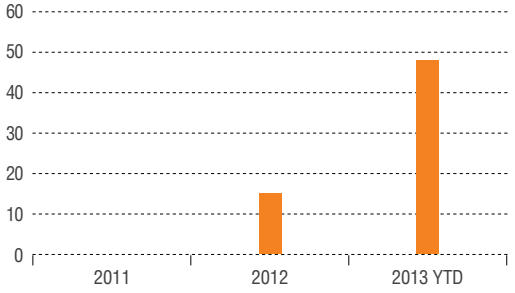


Figure 13: Daliff Precision Engineering – staff members trained in AS/EN9100 and Airbus GRAMS

Testimonial

"The AISI has performed excellent work in supporting the total revamp of Daliff's QMS.

The AISI assisted Daliff to get its QMS and processes in line with industry standard requirements, as well as Airbus GRAMS. All aspects of Daliff's QMS are now cohesive, comprehensive and well organised.

We are currently working towards direct Airbus approval and the assistance received was our first and most important step towards achieving this.

Daliff gained in competitive advantage in its business outputs through the implementation of new processes and guidance by the AISI. Daliff's employees acquired the necessary skills for sustaining these processes through training provided."

– Christiaan van Schalkwyk, Managing Director: Daliff Precision Engineering (Pty) Ltd

Omnipless (t/a Cobham Satcom Cape Town)

Omnipless is mainly involved in the design, manufacture and support of airborne satellite communications systems and antennas to both the local and international markets, with Boeing, Airbus and Embraer as their main customers. The company is currently certificated to the AS/EN9100 Aviation, Space and Defence Quality Management System standard.

AISI Standards, Accreditations and Certification Project Participation

a. ISO14001 Certification: The company was assisted by the AISI for ISO14001 (Environmental) certification.
b. OHSAS18001 Certification: The company was assisted by the AISI for OHSAS18001 (Occupational Health and Safety) certification.

Decreased incident rate

Impact

a. **Number of Jobs Retained:** As the above two projects (ISO14001 and OHSAS18001) are work environment-related, jobs were retained due to a reduction in environmental illness and number of injuries at the workplace.

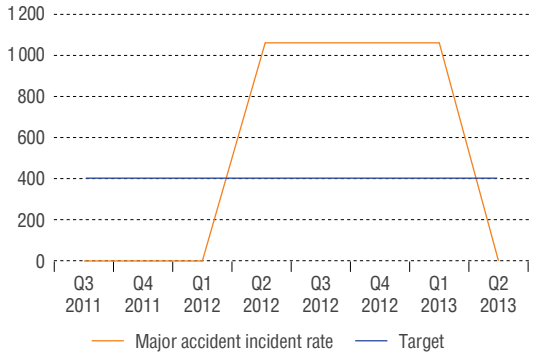


Figure 14: Major accident incident rate (# accidents >3 days per 100 000 Full Time Equivalents (FTEs))

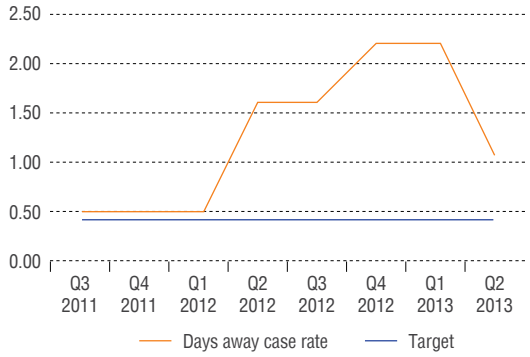
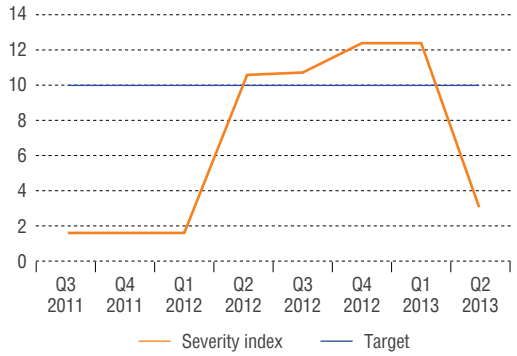


Figure 15: Days away case rate (# accidents >1 day per 100 FTEs)

b. **New Contracts as a Result of AISI Funding:** The funding received from the AISI enabled the company to implement the ISO14001 and OHSAS18001 standards, which are highly desirable in the global avionics industry and ensure that the company's products remain sought after in the marketplace.

c. **Productivity Improvement/Lead Time Improvement**



Fewer lost days

Figure 16: Severity index (lost work days per 100 FTEs)

d. **Competitiveness Improvement:** The funding received from the AISI enabled the company to implement the ISO14001 and OHSAS18001 standards, which are highly desirable in the global avionics industry and ensure that the company's products remain sought after in the marketplace.

e. **Socio-economic Impact**

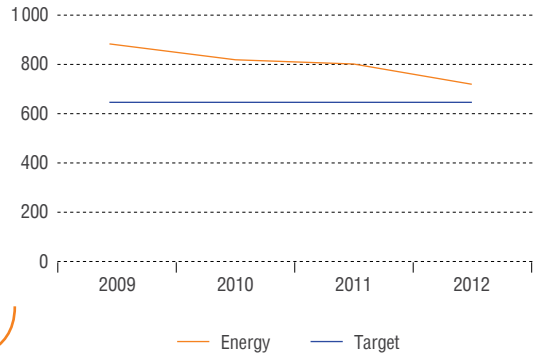


Figure 17: Total yearly energy consumption (MWh)

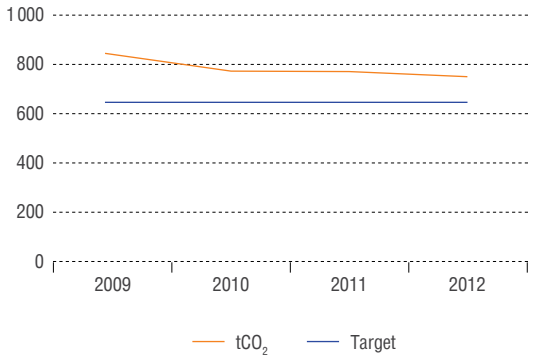


Figure 18: Total yearly CO_2 relating to energy consumption (tCO_2)

Improved energy consumption

Testimonial

"AISI assisted Cobham Cape Town with support towards the preparation and implementation of procedures for the ISO14001 and OHSAS18001 standards.

The AISI provider performed the internal document and site audit, provided training and advice on the implementation of said standards."

– Shaneen Bezuidenhout, HR Manager: Omnipless Manufacturing (Pty) Ltd (t/a Cobham Satcom Cape Town)

Electrothread

Electrothread is involved in aircraft electrical wiring and looming systems and is based in Midrand, South Africa. They have an extensive local and international customer base. At present they are heavily committed as a supplier to Aerosud in the Pilatus aircraft upgrade programme and are committed to various Airbus programmes (as a supplier to Aerosud, specifically on the A400M).

AISI Standards, Accreditations and Certification Project Participation

a. AS/EN9100 Certification: The company was assisted by the AISI and is certificated to AS/EN9100.
b. ISO14001 Certification: The company was assisted by the AISI to ready itself for ISO14001 (Environmental) certification.
c. OHSAS18001 Certification: The company was assisted by the AISI to ready itself for OHSAS18001 (Occupational Health and Safety) certification.

Impact

a. **Number of Jobs Created or Retained**

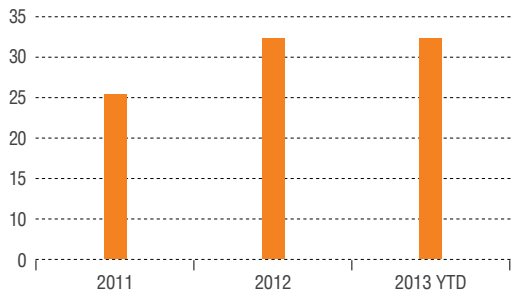


Figure 19: Electrothread – personnel complement

8 Jobs created and retained

b. **Transformation.**

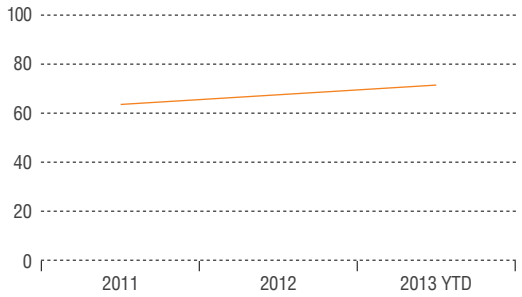


Figure 20: Electrothread – Transformation (PDI% of staff)

10% Transformation increase

c. **Technology Advancement:** Won the Pilatus PC21 manufacturing contract due to the AS/EN9100 certification. Technology transfer to take place from Pilatus Switzerland to enable Electrothread to manufacture items according to the latest specifications.

d. **New Contracts as a Result of AISI Funding:** Airbus A400M Wingtip Programme: Laser Marking of Wire and Automated Testing of Harnesses. Pilatus PC21: Manufacture of Harnesses for 30 Aircraft.

e. **Productivity Improvement:** Improved efficiency of administrative functions and reduced scrap and re-work rate during production, leading to 10% improvement in productivity.

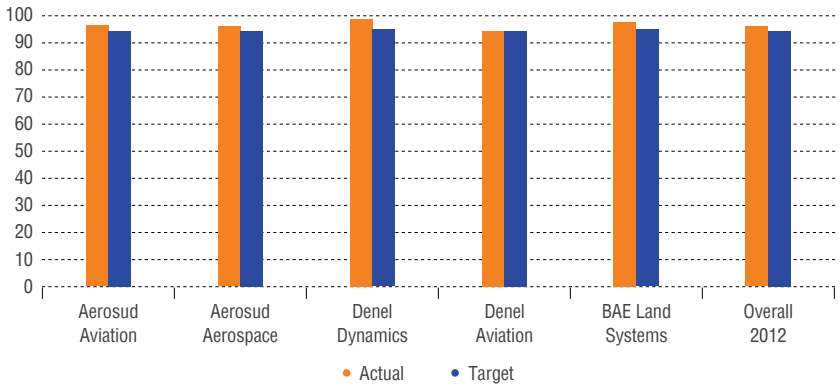


Figure 21: Electrothread – Customer satisfaction 2012

Exceeded customer satisfaction targets

f. **Lead Time Improvement.**

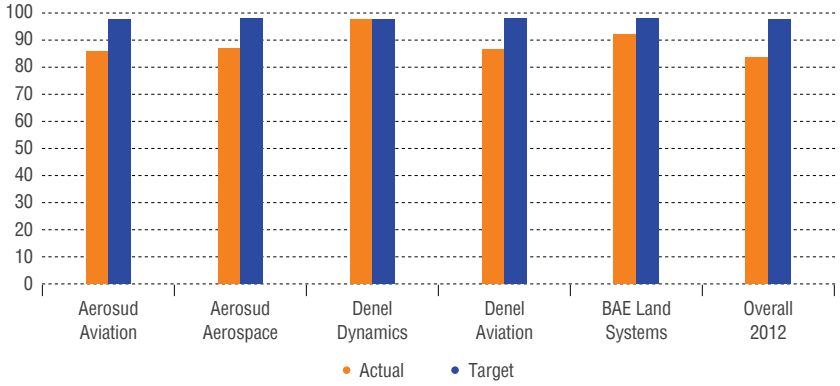


Figure 22: Electrothread – On time delivery 2012

g. **Competitiveness Improvement:** Electrothread will be in a position to directly engage with aircraft OEM's and will be able to secure civil aviation industry-related contracts, which would not have been possible without the AS/EN9100 certification.

j. **Socio-economic Impact**. Eight Electrothread employees have already received extensive training from Pilatus Switzerland, greatly improving their skills and their value in to labour market, enabling them to earn increased salaries.

Testimonial

"Being a small company operating in the very demanding defence and aerospace industry, Electrothread has to deliver the highest possible quality products at a reasonable price. It was therefore imperative that we attained the AS/EN9100 certification to remain competitive in the market. Without the assistance received from the AISI, Electrothread, with its limited, resources would not have been able to attain this certification in such a short period of time."

– Chris Coertse, CEO: Electrothread

TiTaMED (Pty) Ltd

TiTaMED is a manufacturing company established in Cape Town, South Africa in 1996. They specialise in high-precision engineering with exotic materials such as titanium, stainless-steel, nitronic, aluminium and high-performance polymers. They received assistance for the obtainment of the AS/EN 9100 certification, which allows them to manufacture aerospace, aviation, and defence components for prototype or production.

Testimonial

"The implementation of AS9100 has assisted us by opening up more contracts to quote for than we would have been able to do before. There is a definite potential for increased in production and therefore more job opportunities down the line."

– Ms S Ashbury, Quality Manager: TiTaMED (Pty) Ltd

E-business Web Portal

Project Objectives

The AISI commissioned a project to develop a solution that mobilises the local aerospace industry to bring together the disparate systems of the various supply chain role players, with the specific aim of:

- Providing complete supply chain visibility for the South African aerospace industry
- Connecting disparate systems on a unified communications platform
- Providing immediate cost savings
- On-going efficiencies and increased productivity.

Furthermore, additional objectives of the proposed solution included:

- Improved operational efficiency and simplified processes
- Reduced paper dependency and duplication
- Standardisation (data and format)
- Improved processing time
- Efficient use of resources

Improved communication between trading partners

- Electronic updates.
- Tracking & recording of processes.

Common OEM/Supplier Forum – common direction within the industry

- Shared knowledge, reduced risks.
- Identify opportunities & industry needs.

33 Suppliers utilised web portal

Supply chain solution for industry

24 SMMEs utilised web portal

Reduced processing and operating costs

- Shared infrastructure and thereby economies of scale.
- One system versus several and single integration point.
- Reduces the requirement for hardware, software and expertise (making effective use of the internet for low-tech user access) at all points – all centrally managed.

Project Results

The graph below provides an indication of transactions processed on the MyXchange Solution from April 2012–April 2013 across 33 suppliers, both local and international.

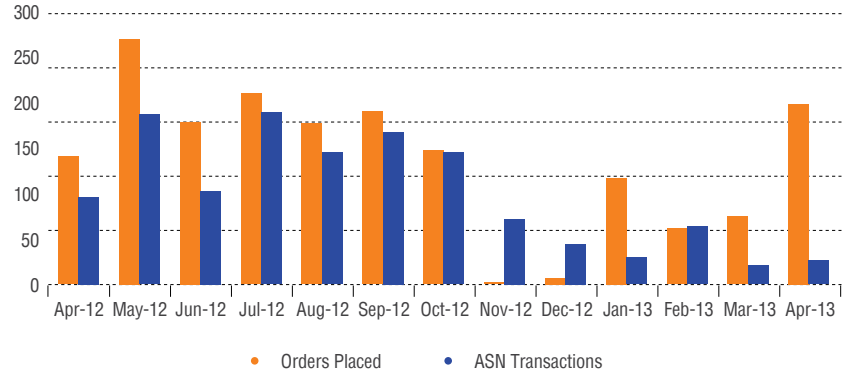


Figure 1: Transactions on AISI web portal

Project Roadmap

- Automated Request for Quotation (RFQ) solution: Enabling OEM's to automate the RFQ process whilst improving process efficiency and visibility.
- Electronic Data Interchange (EDI) interaction: All/any supplier can avoid the need for capturing any order/ Advaned Ship Notice (ASN) information, allowing them the opportunity to utilise resources more effectively.
- Technical drawing solution: Allowing for a fully electronic technical drawing solution linking orders to drawings and tying the entire supply chain process together in a centralised host location, resulting cost saving across the board.

Web Portal Participant Feedback

Aerosud Aviation (Pty) Ltd

- Jobs retained: 10.
- Assisting in reducing purchase orders sent via e-mail to suppliers.
- Allowed suppliers to communicate with us via one EDI (Electronic Data Interchange) system instead of individual Enterprise Resource Planning (ERP) systems.

10 Jobs retained

Testimonial

"The AISI ordering solution has assisted us by ensuring that our purchase orders go through an EDI system instead of fax and e-mail, thus saving time.

We are looking forward, to the automated Goods Received Notification (GRN) modules to enhance the supply chain cycle."

– Brian Ingram, Aerosud Aviation (Pty) Ltd

Applied Services

- Assisted in job satisfaction due to elimination of paperwork and capturing errors.
- Increased productivity due to accurate data, as well immediate data availability.
- Improved lead times due to automated solutions and shipment processes.
- Improved accounts due to fewer payment disputes as a result of automated delivery note information.

Improved supply chain
responsiveness

Testimonial

"The AISI ordering and invoicing solution has assisted us by ensuring full visibility of the supply chain between us and our customers, which resulted in fewer account queries and payment disputes."

Applied Services

Jackpack Trading CC

- Assisted in job satisfaction due to elimination of paperwork and capturing errors.
- Increased productivity due to accurate data, as well immediate data availability.
- Improved lead times due to automated solutions and shipment processes.
- Improved accounts due to fewer payment disputes as a result of automated delivery note information.

Testimonial

"The AISI ordering and invoicing solution has assisted us by ensuring full transparency of the supply chain between us and our customers, which resulted in fewer account queries and payment disputes."

Jackpack Trading CC

Collaborative Xchange

Testimonial

"Collaborative Xchange, in partnership with the AISI, has been able to develop supply chain solutions for the improvement of the supply chain processes within the aerospace industry. Such improvements result in better visibility of stock requirements and volumes, as well as improve payment disputes due to managed solutions."

– Niel McLaren, Operations Manager: VSC Solutions

Supply Chain Improvement and Optimisation Interventions

This project was a continuation of support provided by the AISI during the 2011/2012 financial year, and focused on interaction with various aerospace and defence industry stakeholders to identify their immediate supply chain needs.

The approach for this project focused on two aspects. The first was to participate in aerospace and defence industry events, in particular the African Aerospace and Defence Show 2012 (AAD 2012) and Defence Industry Day, to interact with stakeholders and gather relevant information. The second was to perform various individual company supply chain analyses to identify strengths and weaknesses, as well as potential improvement opportunities and future AISI projects.

The project team therefore participated in the AAD 2012 to create awareness of what the AISI can offer through the various projects falling under the AISI Sector Development Plan (SDP), as well as to assess whether the companies would support further studies on supply chain projects for the industry. In addition, companies with a specific need for assistance from the AISI on their supply chain issues were identified, as well as specific contact people from the companies within the industry that could be used in future studies.

Based on the interactions with companies at AAD 2012 and previous interactions through past projects, it was decided that specific companies would be targeted for the individual company supply chain needs analysis. These companies expressed special interest in getting assistance from the AISI as they felt it could be of benefit to potentially improve their supply chain operations. In the end, the two companies that agreed to participate in this project were Denel Aviation and Aerotechnic. The AISI supplier development project that was started as part of this study is currently underway at Denel Aviation.

A detailed supply chain needs analysis was performed at Aerotechnic to provide detailed information regarding their business and supply chain operations. This included a supply chain Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis to determine Aerotechnic's supply chain strengths, weaknesses, opportunities and threats, as well as various potential supply chain projects that could be done by the AISI in future. In addition, various challenges and projects that Aerotechnic's management felt they could possibly need help with were discussed. It should be noted that a focused AISI supply chain improvement project emanated from this study and is currently underway at Aerotechnic. The project will entail an inventory management system to assist Aerotechnic with dealing with market fluctuations and decision-making under uncertainty. They felt that such a project would have the highest impact on improving their supply chain operations.

This project enabled Aerotechnic to identify their supply chain strengths, weaknesses and threats, as well as potential improvement opportunities in their supply chains. This project was also used to identify supply chain improvement projects that can be undertaken by the AISI in future. The improved supply chain performance and reduced costs of companies emanating from projects recommended as part of this project could, in turn, open up new opportunities in existing supply chains, thereby facilitating job creation and reducing lead time.

Improved
efficiency and effectiveness

1 SMME supported

Testimonial

"The AISI team, involved in the supply chain needs analysis, undertook a thorough evaluation of our current processes – from sourcing and quoting a part to a client, through to finally delivering the part to the end user.

The team had the opportunity to access all staff and current processes, and identified key areas for improvement.

From the report we received after the analysis, it was clear that the AISI team quickly got to grips with our core activities, and were able to propose key areas to develop as a project that would improve our company's performance and efficiency in what is a very competitive market."

"I found the flow diagram very clear and the teams presentation interesting. We would like to incorporate the chart into our QMS manual as an overview of activities."

– Mr JC Pina, Director: Aerotechnic

PROGRAMME 3

Space Regulation and Human Capital Development

South Africa's Department of Trade and Industry (**the dti**) determines the country's general space policy to meet all international commitments and responsibilities in respect of the peaceful utilisation of outer space, while the Department of Trade and Industry (DST), through the South African National Space Agency (SANSA), is responsible for the implementation of space programmes.

The Aerospace Industry Support Initiative (AISI) aims to support **the dti**'s mandate of acting as custodian for space policy in South Africa. Due to strategic developments in the space sector, the AISI focuses on capacity and human capital development in the sector, including space law, CubeSats development, satellite systems engineering, as well as related fields of technology. The AISI is involved in a number of internship programmes with reputable organisations. The aim of these programmes is job creation, skills development and transformation. Graduates are capacitated with the necessary technical experience to enter the job market, which ensures a well-equipped aerospace workforce.

Through the AISI's support, the South African space community has the invaluable opportunity to identify the regulatory shortcomings and challenges that need to be addressed to enable the country to be a vibrant and responsible role player in the space arena.

PROJECTS SUPPORTED THROUGH PROGRAMME 3 INVESTMENTS

- **Study Leading to the Review of the Space Affairs Act**
- **Cubesat Internship Project**
- **Training Seminar on Air, Space and Telecommunications Law**
- **Capacity Building in Space Regulation – Moot Court**
- **AISI Support of the NAC Bursary Programme**
- **Project Interns**

Study Leading to the Review of the Space Affairs Act

The South African Space Affairs Act (No. 84 of 1993) (hereinafter referred to as the SASAA) was enacted in 1993 and amended in 1995 (Space Affairs Amendment Act, No. 64 of 1995). This Act vests in the Minister of Trade and Industry the competence to determine South Africa's general space policy to meet all international commitments and responsibilities of the country in respect of the peaceful utilisation of outer space. Simultaneously, the DST is responsible for the implementation of space programmes through SANSA, which was established by the South African National Space Agency Act (No. 36 of 2008).

The SASAA also established the South African Council for Space Affairs (SACSA) and mandated it in particular to provide:

- An advisory function to the Minister of Trade and Industry
- A licensing function for space-related activities
- A supervisory function for space activities
- Compliance measures to fulfil international obligations.

Regulatory shortcomings and challenges
identified for industry benefit

Since the enactment of the SASAA, various developments have taken place in the space arena. At the time of the adoption of SASAA in 1993, South Africa was emerging from an era of intense military activity and capacity-building

and the SASAA was predominantly directed at regulating missile launching. Since 1994, national space-related priorities continued primarily in the areas of astronomy, telemetry, command-and-control services, as well as the utilisation of commercial services to source data required for earth observation. South Africa also development three satellites (it is currently developing the fourth), and entered into international agreements pertaining to outer space.

The pillars of South Africa's space programme are currently represented by the National Space Policy of 2008, the National Space Strategy of 2010 and the Ten-Year Innovation Plan of 2008. These documents envisage an important role for space technologies in transforming South Africa from a resource-based economy to a knowledge-based economy. They foresee the development and maintenance of a robust and appropriate set of space capabilities, services and products that will also make the country more self-sufficient in relation to its reliance on space technologies. In this context a key role is envisaged for the local satellite industry as a mechanism for positioning scientific and technological information at the heart of economic activity.

CubeSat Internship Project

The French South African Institute of Technology (F'SATI) established its Professional and Skills Retention (PDSR) Programme in 2011. Through the programme, graduates of the Cape Peninsula University of Technology's (CPUT's) Postgraduate Programme in Satellite Systems Engineering are employed as engineers in training, and are exposed to a high-technology laboratory environment. This gives them the opportunity to apply their academic skills to the full design cycle of a real satellite. CubeSats is used as the technology platform. Engineers-in-training are employed for a minimum of 12 months.

9 Jobs created

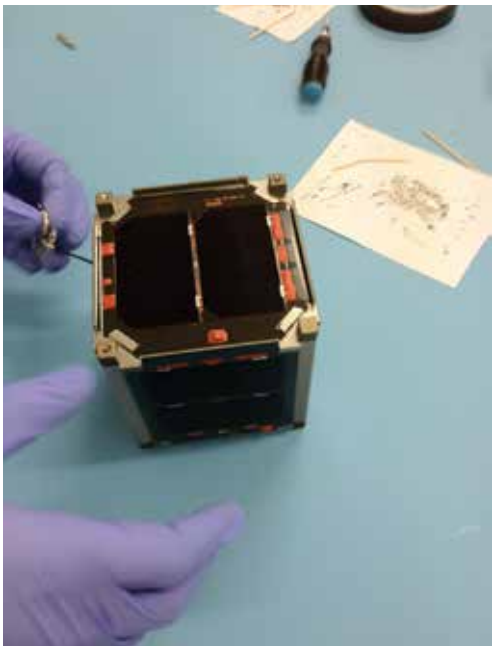
Job Creation/Retention

The specific mandate of the PDSR Programme is to develop and retain scarce skills for the South African space industry. While the local space industry is relatively small, the retention of skills is of strategic importance. With the support provided by the AISI, F'SATI developed and retained nine engineers in training. As a result, CPUT employed four of these candidates on a three-year contract as development engineers, effectively creating four job opportunities.

Skills Development

The PDSR team developed ZACUBE-1, South Africa's first nano-satellite. The team furthermore developed a suite of communications systems for the international CubeSat market. These products are being distributed through Clyde Space, Glasgow. Technical skills in a high-reliability environment are required for these projects.

Team of engineers in training who developed ZACUBE-1



ZACUBE-1 being integrated in the clean room

Testimonial

"F'SATI at CPUT is very proud of its relationship with AISI, which has been fostered over the past 3 years. Having established an applied research-focused programme in nano-satellite engineering, F'SATI has systematically broadened its activities to include professional development of our graduates through an internship programme. With the generous support from AISI, this programme has not only prepared our engineers-in-training for the local space industry, and established an advanced manufacturing capability, but has also developed a wide range of CubeSat communications systems that is being sold internationally through strategic partnerships. AISI furthermore supports our prestigious Space Industry Seminar series, which provides a unique, shared national platform for academia, government and industry. Our relationship with AISI is clearly a textbook case for the benefit that can be derived for the aerospace industry from such support programmes. We extend our gratitude to the management of AISI for sharing our vision and enabling us to be an effective and productive contributor to the national space industry, now and in future. "

– Robert van Zyl, Director: F'SATI, CPUT

Transformation

The internship programme started in 2011 with a group of nine interns, of whom two were black students (one from South Africa and one from Lesotho). The programme has since grown to a group of ten engineers-in-training, with the following demographics:

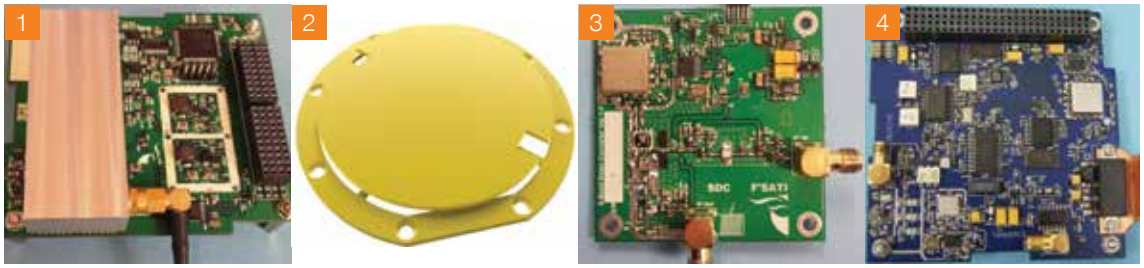
- Three junior engineers-in-training (all South African citizens): One black male, one coloured male and one white male
- Three senior engineers-in-training (two South African citizens, one permanent South African resident): One black male, one coloured male and one white male
- Four development engineers (all South African citizens): One black male and three white males
- Overall demographics of the ten interns: Three black males, two coloured males and five white males.

It is evident that progressively more black interns are entering the programme, which points to the transformation that is being achieved. Gender redress is still lacking and is being addressed.

Technology Advancement

The internship programme has enabled F'SATI to establish a technology innovation hub. Since its inception, the programme produced the following advanced communication subsystems for CubeSats, which are being marketed through Clyde Space, Scotland:

1. STX: S-band transmitter engineering prototype
2. SANT: S-band antenna standalone engineering prototype
3. SDEM: S-band demodulator engineering prototype
4. CMC and CMCi: VHF/UHF transceiver radios.



Socio-economic Impact

Through the internship programme, more than ten engineers-in-training have been advanced to being productive engineers and technologists in industry. Furthermore, the programme developed South Africa's first nano-satellite, ZACUBE-1, which will be launched in 2013. This in itself will serve to attract youngsters to related high-technology industries. The science mission of ZACUBE-1 will provide valuable data to scientists to better their understanding of the ionosphere in the region.

Additional contracts as a result of AISI-funded projects

2 Additional contracts secured

CPUT:	R1.100 million (CPUT Innovation Fund)
National Aerospace Centre (NAC):	R1.080 million (2012/2013)

To date, F'SATI has received an order through Clyde Space for its communications systems (R80 000). Numerous orders for its current suite of communications systems are pending and are being prepared for the second half of 2013.

Testimonials

Intern/Student Name: Zak Blomerus • **Field of Study:** Electrical Engineering • **Highest Qualification:** MTech: Electrical Engineering • **Area of Employment:** CPUT Bellville Campus, F'SATI Laboratory

"I am currently employed as an Electronics Engineer at ZaPOP Media (Pty) Ltd in the New Business Development Department. The nature of the work I do is very diverse and can be rather demanding at times.

I am happy to testify that my time spent in the PDSR Programme at F'SATI has helped me to develop many of the skills that I use today. These skills range from Printed Circuit Board (PCB) layout design, to dealing with manufacturers and component suppliers. Apart from the skills that fall within my job description, I would like to add that the programme has helped to build my character, confidence and work ethic.

I am immensely grateful for the opportunity I was given to be part of the programme, and I can recommend it wholeheartedly to anyone who wishes to develop their professional skills. It is with this calibre of internship programmes that we can produce the best that industry in this country has to offer."

Intern/Student Name: Jacques Dawid Kleynhans • **Field of Study:** Electrical (Satellite Systems Engineering) • **Highest Qualification:** MTech and MSc • **Area of Employment:** Mining

"The time spent in the PDSR Programme shaped me into the engineer I am today. The training, opportunities, camaraderie and exceptional mentoring by the F'SATI programme director; faculty and visiting professors groomed me for the challenging world of engineering.

Working under pressure has focused me, as the time I spent in the training programme was a pressure cooker with strict deadlines and high quality standards due to the fact that I was part of a team of engineers building a working satellite.

The PDSR programme has proved invaluable in both my personal and professional life, giving me the necessary insight to excel at anything thrown my way. The high standards of this programme have taught me a procedural way of troubleshooting, which I found extremely useful in the multidisciplinary field of mining where I am currently employed. I can highly recommend this programme to any postgraduate student within the fields of electrical or mechanical engineering."

Intern/Student Name: Enrico Fransco Louw • **Field of Study**: Electrical Engineering • **Highest Qualification:** BTech • **Area of Employment**: Satellite Systems Engineering

"Through the PDSR Programme I have gained experience in working in a team of development engineers. The programme afforded me the opportunity to participate in all the stages of the product development cycle. As a result, I have improved my skills set in the development of communication systems, technical documentation and time management."

Intern/Student Name: Jason Quibell • **Field of Study:** Electrical Engineering • **Highest Qualification:** MTech: Electrical Engineering • **Area of Employment:** CubeSat Development (Africa Space Innovation Centre)

"The PDSR Programme allowed me to learn and develop professional engineering techniques that have become an invaluable addition to my professional toolbox. I was taken through the process of learning industry standard PCB and Field Programme Gate Array/Very High Speed Integrated Circuits (VHSIC) Hardware Description Language (FPGA/VHDL) design procedures. The programme also exposed me to mechanical design and integrity. The clear direction set out in the programme, combined with the freedom to create and experiment, led to a rewarding learning experience.

The skills learnt during the PDSR Programme have lent themselves to my current duties at CPUT. The programme accelerated my understanding of the practical implications of spacecraft design, putting theory into practice.

The skills developed were not only of a practical nature. The development of soft skills was encouraged during the programme and this has carried through to my current workplace. Communication and interpersonal skills were highlighted as factors that encourage effective project completion."

Intern/Student Name: Nyameko Royi • **Field of Study:** Electrical Engineering, Satellite Systems • **Highest Qualification:** MTech: Electrical Engineering • **Area of Employment:** Development Engineer, Satellite Engineering

"The AISI project helped me to acquire advanced skills as a Junior Electronic Engineer in the field of communications systems for nano-satellites. It also enhanced my non-technical skills such as time management, report writing and interacting with fellow colleagues in a high-technology and professional environment. I am extremely grateful to AISI for having afforded me the opportunity to be part of the team that developed South Africa's first nano-satellite. I am proud to have contributed to this milestone."

Nyameko Royi

Training Seminar on Air, Space and Telecommunications Law

The Summer School on International Air, Space and Telecommunications Law took place between 11 and 22 February 2013. It was organised by the Institute for International and Comparative Law in Africa (ICLA) at the University of Pretoria (UP), in collaboration with the Institute of Air and Space Law at the University of Cologne (Germany). It was the third consecutive year that this course was offered for a maximum of 25 participants. The course was attended by 18 participants from various backgrounds within government, academia and private industry. Of the 18 participants, half were previously disadvantaged individuals (PDIs) and a third were female.

Most of the first week was devoted to air law and most of the second was devoted to space law. One day was devoted to international and national communications law. Most of the lectures were presented by Prof. Stephan Hobe from the Institute of Air and Space Law. One full day was presented by Mr Kim Gorringe, a member of the South African Council of Space Affairs, who focused on national legislation and challenges to air law. The lecture on communications law was presented by Ms Justine Limpitlaw, a private practitioner based in Johannesburg.

The main purpose of the course was to improve the understanding of the regulatory environment of air, space and telecommunications law in South Africa, and to assist industry role players and academia, especially those involved in the development of policies, to understand the legal framework within which technology pertaining to air, space and telecommunications law has to be developed. It therefore assists these individuals in effectively utilising the legal framework in which they function and thus to function more productively.

18 Participants trained by international experts in niche field

The Summer School has led to the introduction of an elective in air, space and telecommunications law in the Master's Programme on International Law at the UP Faculty of Law. The elective was offered for the first time in 2013, and was successfully completed by six individuals out of a class of 15, of which one person was black. Two individuals (one black female and one white male) have also enrolled for a doctorate in international space law at the UP Faculty of Law in 2013.

It is envisaged that the number of Master's and Doctoral students from all demographic backgrounds will increase over time. The elective was very well received and as the programme becomes more well-known (also through the Summer School which serves as a very good basis for exposure), the numbers will grow.

It is worth mentioning that the Summer School and the elective are the only ones of their kind on the African continent. The UP Faculty of Law is also the only faculty in the country where individuals can specialise in international air and space law. As the number of qualified students from different backgrounds grows, so will the number of individuals who can optimise this knowledge within industry.

Testimonial

"I am happy to say that without the support of the AISI, we would not have been able to facilitate the Training Seminar.

The support for the Training Seminar made it possible for us to bring in international expertise such as Prof. Hobe, without whom we could not have offered the course or introduced the elective in the Master's Programme."

– Prof. Erika de Wet, UP Faculty of Law

Capacity Building in Space Regulation – Moot Court

The project entailed the organisation of the first-ever African Rounds of the Manfred Lachs Space Law Moot Court Competition. This competition is organised annually by the International Institute of Space Law (IISL). It was first organised for law students from North America by the Association of US Members of the IISL (AUSMIISL) during the first World Space Congress held in Washington DC, USA in 1992. One year later the competition was extended to include European students, and in 2000 the Asia-Pacific Round was added. In 2012 the competition was finally extended to Africa.

In August each year, selected scholars of space law produce the Manfred Lachs Space Law Moot Court problem for the following year, which is released to participating universities. Law schools in each region then register for the regional rounds and submit written manuscripts on the Moot problem in February. Regional rounds are held between March and June, and the winning teams of these rounds meet in the international final round in October, which is held in conjunction with the annual IISL Colloquium on the Law of Outer Space.

In the regional rounds each team with two speakers presents oral arguments before panels of three judges. Written memorials and oral arguments each carry a weight of 50% of the total score of a team. The respective winning teams of the regional rounds move on to the final round (i.e. one team from each region is present at the final round). This is held in October of each year, in conjunction with the International Astronautical Congress and the IISL Colloquium on the Law of Outer Space.

The 2012 Africa Round

As in previous years, the competition was based on a hypothetical space law dispute before the International Court of Justice. The problem is written by a member of IISL upon invitation by the Organising Committee of the Competition, alternating between the regions.

16 Students participated in capacity building

Four African teams entered the competition – one team from Kenya, one from Nigeria and two from South Africa (UP and North-West University (NWU), Potchefstroom campus). The UP team had two black male members and one white female member, while the NWU team had two white female members.

Each of the teams competed twice (once as applicant state and once as respondent state). There were three judges during the preliminary rounds (one black male, one white male and one white female).

Based on a combination of the scores of the written manuscripts and the verbal arguments, the teams of the Obafemi Awolowo University (Nigeria) and UP advanced to the final round of the Africa Round. Three new judges presided during the final round (two black males and one white female).

The team of the Obafemi Awolowo University in Nigeria was announced as the winner at a gala reception that was held at the Faculty of Law on 18 May 2012. This team represented Africa at the International Astronautical Congress and the IISL Colloquium on the Law of Outer Space in October 2012 in Naples, Italy.

Assessment and Lessons Learnt

Overall, the Africa Round was a great success. The standard of the competition was very high, despite the limited capacity in the area of international space law in Africa. The Moot Court exercise definitely contributed significantly to increasing the knowledge of the participants regarding outer-space regulation, and drew attention to its importance. Their knowledge and capacity were enhanced, particularly regarding the obligations of states and space operators to promptly perform system repair actions consistent with international law and transparency. They also had to reflect on the legal regimes that apply if private industry, when contracted by government or otherwise, performs collision avoidance or non-co-operative removal services. Finally, they were faced with the issue of damages that should be allowed for destruction of a satellite.

The Moot Court drew attention of law schools on the African continent to the importance of a sound regulatory framework for the functioning of the satellite industry and the need to develop capacity within this very specialised field.

Testimonial

"The AISI support for the Moot Court facilitated the support of Kenyan and Nigerian teams, as well as that of international judges of high repute. Had it not been for this financial support, we would not have been able to host the Africa Round of the Lachs Moot Court and integrate African teams into this competition."

– Prof. Erika de Wet, UP Faculty of Law

AISI Support of the NAC Bursary Programme

22 Students supported

14 PDI students

4 Participating universities

Number of Students Supported or Involved in the Project

A total number of 22 students were supported at four different universities across the country. Of these students, 19 were pursuing undergraduate and three postgraduate degrees.

Transformation

15 of the students supported are PDIs and four are female.

Technology Advancement

The fields of study that these students are engaged in include mechanical, electrical, electronic, mechatronic and aeronautical engineering.

On completion of their studies, these students will be equipped to make a meaningful contribution to technology advancement in the aerospace and related industries.

The postgraduate students' topics had to have an aerospace focus, and comprised studies in aircraft wing trailing vortex strength and parafoils flight tests.

Competitiveness Improvement

The NAC bursars were encouraged, from the undergraduate level, to engage in projects relating to the aerospace industry. A mentor with experience in industry and/or academia was assigned to each student to monitor and guide them closely, thus creating the relevant skills to solve real problems. This mechanism therefore builds an industry with the necessary human resources to increase competitiveness.

Socio-economic Impact

Most of the students come from an historically disadvantaged background, and the opportunity of obtaining an education had a positive impact on their lives.

These students are now able to contribute to the economy and even create new opportunities for others.

Testimonial

"The contribution made by the AISI to the NAC Bursary Programme has allowed the organisation to fund 22 students for the remainder of their studies. The NAC was able to recruit the best candidates in time and provide a more secure opportunity for each successful candidate."

– Phillip Haupt, Director: National Aerospace Centre

2012 NAC Students

Item	Title	Name	Surname	Degree	Year of Study in 2012	Gender	Race	Institution
1	Mr	Taariq	February	BEng	2	Male	Coloured	SUN
2	Mr	Frederick	Botha	BEng	2	Male	White	SUN
3	Ms	Melody	Van Rooyen	BEng	3	Female	White	SUN
4	Mr	Hugo	Biermann	BEng	4	Male	White	SUN
5	Mr	Emile	Lochner	BEng	4	Male	White	SUN
6	Mr	Alwyn	Burger	BEng	4	Male	White	SUN
7	Mr	Wiehan	Agenbag	BEng	3	Male	White	SUN
Stellenbosch University (SUN) (Total – 7 students)								
8	Mr	Khaleel	Hendricks	BEng	2	Male	Coloured	UCT
9	Mr	William	Tipping-Woods	MEng	1	Male	White	UCT
10	Mr	Roberto	Gomes	MEng	1	Male	White	UCT
University of Cape Town (UCT) (Total – 3 students)								
11	Mr	Kearabetswe	Mabe	BHons	1	Male	Black	UP
UP (Total – 1 student)								
12	Mr	Neo	Mofoka	BSc	5	Male	Black	Wits
University of the Witwatersrand (Wits) (Total – 1 student)								
13	Ms	N	Moloisane	BSc	3	Female	Black	UP
14	Mr	S	Motlhuki	BSc	3	Male	Black	WIts
15	Mr	R	Daries	BSc	3	Male	Coloured	UCT
16	Ms	T	Motaung	BSc	2	Female	Black	UCT
17	Mr	MS	Mathekga	BSc	3	Male	Black	Wits
18	Ms	S	Subiah	BSc	2	Female	Indian	Wits
19	Mr	C	Wright	BEng	2	Male	Indian	UP
20	Mr	N	Nkhundhlande	BSc	2	Male	Black	Wits
21	Mr	S	Kupa	BSc	1	Male	Black	Wits
22	Mr	J	Carelse	BEng	2	Male	Coloured	SUN
Denel Dynamics (Total – 10 students)								
TOTAL – 22 students								

Project Interns

AISI provided funding to support project interns in the fields of laser science, manufacturing and materials science, and non-destructive testing. These interns have been used to support aerospace-related projects. Mentorship is provided to train these interns by industry experts in their respective fields.

The purpose of this programme is to assist the interns to acquire industrial experience on projects, to provide them with exposure to high-technology research and development (R&D) environment and to get them ready for a future career in aerospace-related manufacturing or R&D.

The programme provides the opportunity to evaluate the potential of the interns for future permanent positions in industry or R&D teams, whilst they contribute to milestones and deliverables on existing projects.

The programme proved to be valuable and successful; some interns have been appointed while others have been retained to complete postgraduate studies.

The interns were employed at the following Council for Scientific and Industrial Research (CSIR) units:

- National Laser Centre
- Material, Science and Manufacturing
- Defence, Peace, Safety and Security.

6 Project interns supported

4 PDI interns

AISI project interns

Testimonials

Intern/Student Name: Nanette Visagie • **Field of Study:** Chemical Engineering • **Institute where qualification received/ enrolled:** University of Pretoria • **Highest Qualification:** BEng Chemical Engineering • **Area of Employment:** National Laser Centre – Laser Material Processing, CSIR

During my time as an intern I worked on two projects, both related to powder used in the additive manufacturing process for aerospace applications. I was part of the team that worked on powder benchmarking, powder processing and powder handling, and specifically focused on hopper design, powder placement and powder equipment. I have also learnt a lot about lasers, which were not in my specific field of study. This broadened my horizons, which is always a good thing.

The internship has given me the opportunity to deal with a part of the engineering industry that I had not worked in before. I have met a wide variety of new people, and have learnt a lot about how to work with people in order to get the best out of them, and what responsibility means in the work environment. The internship has been valuable to me, both as a professional and as a person.

Intern/Student Name: Buyisile Kholisa • **Field of Study:** Chemical Engineering • **Institute where qualification received/ enrolled:** CPUT • **Highest Qualification:** Bachelor of Technology (BTech) • **Area of Employment:** Materials, Science and Manufacturing (MSM): Light Metals, CSIR

My internship at the CSIR has been great so far. My senior colleagues have taken the time to teach and mentor me and have given me meaningful work that has challenged me to grow as a professional. I really feel like I am part of the CSIR community. I would like to thank my colleagues for their encouragement. Even when I make mistakes, they constantly remind me that my main goal is to learn as much as possible and that any useful contribution would be appreciated.

The most enjoyable part of my internship is having the opportunity to observe how a chemical plant is designed and the installation of the equipment. It is one thing to see a picture or learn the theory behind a process, but the actual hands-on experience gives you an entirely different perspective. I got to see how reactors work, which really got me excited about how I can apply the theoretical side of my studies. Also, living completely on my own for the first time, I enjoyed exploring a new place and making new friends.

I really enjoy working with the great people at the CSIR and working for a company that takes care of their employees.

Intern/Student Name: Christina Kgomo • **Field of Study:** Metallurgical Engineering • **Institute where qualification received/enrolled:** Tshwane University of Technology • **Highest Qualification:** BTech Metallurgical Engineering • **Area of Employment:** Materials, Science and Manufacturing (MSM): Light Metals, CSIR

The internship opportunity broadened my practical knowledge within the field of materials testing and metallurgy. It further increased my passion for working in the laboratory. I have acquired advanced skills in conducting tests for light metal, performing laboratory experiments and in technical report writing. With the exposure that I received, I strongly believe that I am now ready for the job market and can apply my technical knowledge and skills.

The internship has not only been helpful in equipping me career wise, but on a personal level as well. I am now able to conduct myself in a professional manner and can work with a wide range of people, in a variety of teams as well as on my own initiative. The ten months that I have spent at the CSIR have left me with valuable experience.

Intern/Student Name: Manugu Khalirendwe Calvin • **Field of Study:** Metallurgical Engineering • **Institute where qualification received/enrolled:** Vaal University of Technology • **Highest Qualification:** National Diploma • **Area of Employment:** Aeronautical Systems Competency, CSIR

I am very grateful for the opportunity to be an intern at the CSIR, I have learnt a lot and see this internship as an opportunity to grow and be a future expect in the field of non-destructive testing. In my books, the CSIR is the ideal employer.

Intern/Student Name: Duwan Bester • **Field of Study:** Metallurgical Engineering • **Institute where qualification received/enrolled:** University of Pretoria • **Highest Qualification:** BEng Mechanical Engineering • **Area of Employment:** LMP at the National Laser Centre, CSIR

I worked on a hopper and scraper design for the proof of concept of the Aeroswift project, which is a large powder bed laser. I learnt about the current capabilities of Laser Enabled Manufacturing (LEM) and what the possibilities for the future may be.

Intern/Student Name: Tlatsetso Daniel Dhlamini • **Field of Study:** Chemical Engineering • **Institute where qualification received/enrolled:** Vaal University of Technology • **Highest Qualification:** National Diploma: Chemical Engineering • **Area of Employment:** Materials, Science and Manufacturing, CSIR

Through the internship I gained valuable experience in a number of fields, including high-temperature processes, laboratory experimentation, the use of different process separation equipment and mixing techniques, as well as commissioning designs to improve the titanium metal process technology and process safety. I acquired several professional skills such as report writing, research principles, literature studies and obtaining information from different sources. I also worked with various process equipment such as pumps, valves, fittings, pipes and other items.

During my internship I completed five courses, namely Social Intelligence, Research and Innovation Core Skills, Creativity, Basic Fire Fighting, and Basic Life Support.

During my tenure at the CSIR, I met many of the great minds in the organisation. These people not only motivated me, but inspired me to aim for greatness. The knowledge transferred from my supervisors is invaluable and I believe that this internship has been one of my best career choices to date.

PROGRAMME 4

Sector Strategic Support Initiatives

Sector Strategic Support Initiatives creates a platform for industry to facilitate interactions which under normal circumstances would not have been possible, and enables industry, academia and government to engage with potential clients, partners and thought leaders. The Aerospace Industry Support Initiative (AISI) utilises existing outlets to enhance the presence of the South African aerospace and defence industry, which enables both local and international role players to gain an understanding of the value proposition and competence offered in the country.

The sustained support provided by the AISI benefited industry through cost savings, the collective presence created under the AISI banner, and the initiative's proximity to key local and international players in the aerospace and defence industry. Since 2006, the AISI has facilitated the continuous participation of small, medium and micro enterprises (SMMEs) in industry events, specifically the Africa Aerospace and Defence Show 2012 (AAD 2012) . This show is the largest event of its kind on the African continent, and the AISI ensures that these small businesses showcase their capabilities, which they otherwise would not have been able to do.

Aerospace SMME Participants at AAD 2012

Through funding provided by the AISI, twenty-four South African SMMEs got the opportunity to engage with local and international players in the aerospace industry at AAD 2012 held from 19 to 23 September 2012 at the Waterkloof Airforce Base in Pretoria.

Through its support of these businesses, the AISI aims to integrate South Africa's aerospace industry with global markets by providing an institutional platform to facilitate partnership and innovation between government, academia, science councils and industry.

The following SMMEs from across the country (mainly Gauteng and the Western Cape) were hosted on the AISI's pavilion for the show's three trade days as well as the open days:

- Aero Services
- Aerotechnic (Pty) Ltd
- African Astronautics (Pty) Ltd
- African NDT Centre
- ATASA
- BaxMod Models
- Collaborative Xchange
- Daliff Precision Engineering
- HMR High Tech Machine Tools (Pty) Ltd
- Litson and Associates
- Lefa Engineering and Security Services
- Lelebotse Projects and Engineering
- Marcom Aeronautics and Space (Pty) Ltd
- Marksman Trainer (Pty) Ltd
- MCC Aviation
- Megaray Limited
- Pamodzi Aviation
- Radio Tracker
- Robin Coss Aviation (Pty) Ltd
- SRS Aviation
- Space Advisory Company
- Sunspace & Information Systems
- Thorax
- Veecraft Marine (Pty) Ltd.

Eight South African universities with active aerospace research programmes, **the dti** and two aerospace initiatives funded by **the dti**, National Aerospace Centre (NAC) and Centurion Aerospace Industry (CAV), exhibited on the AISI pavilion, bringing the total number of participating organisations, supported through the collective Integrated **dti** Aerospace Programme (IDAP), to 36.

- Blue Crane Development Agency
- Central University of Technology
- Cape Peninsula University of Technology (CPUT) (UAV-SYSCO)
- French South African Institute of Technology (F'SATI)
- Stellenbosch University
- University of Cape Town
- University of Pretoria
- University of Witwatersrand

36 Organisations supported

Joint Aerospace Steering Committee (JASC) launch

During AAD 2012, the AISI hosted a media announcement of the establishment of JASC. JASC takes its mandate from the Aerospace Sector Development Plan (ASDP) and plays a co-ordinating role in the aerospace sector. The JASC was established as a result of the findings of the ASDP to strategically position the aerospace and defence industry in South Africa. JASC aims to improve the country's aerospace and defence industry by continuously monitoring and evaluating progress.

Summary: AAD 2012 Support

- Individual stands for SMMEs and **the dti**.
- Shared display space for the universities.
- Island displays for NAC and CAV.
- Logistics support.
- Prepared branded material.
- Multimedia displays, tables, chairs, staff room and storage space.
- Meeting rooms.

Testimonials

"I would like to thank the AISI for the opportunity showcase our aerospace technologies to the local and international aerospace industry and to the public in general.

Exhibitions such as AAD 2012 are extremely important in forging new and existing working relationships with partners and suppliers, marketing our capabilities and showcasing our technology. In this respect, we were approached by numerous local suppliers with manufacturing capabilities which we thought could only be sourced internationally.

In addition, a number of international agents visited our booth and were very surprised that South Africa has a company developing liquid rocket engine technologies.

The service received from AISI personnel in organising our marketing material, furniture requirements and multimedia hardware was excellent and we found the overall AISI stand and branding modern, open and professionally executed.

All in all, the experience was professionally executed and lent invaluable support to SMMEs such as ourselves, without which we would not have been able to attend such important exhibitions."

– Mark Comninos, Managing Director: MARCOM Aeronautics and Space (Pty) Ltd

"Without the tremendous support received through the AISI, it would not have been possible for Robin Coss Aviation (RCA) to attend AAD 2012 as an exhibitor.

Having a very visible presence on the AISI pavilion made it possible for the company to engage with potential customers and strengthen business relationships with existing clients.

As a direct result of exhibiting at AAD 2012, RCA was able to promote the sale of its locally manufactured light aircraft for student pilot training to African airforces and civilian aviation training organisations, as well as the manufacture of specialised emergency medical evacuation equipment used in rotor and fixed wing air ambulances in both the civilian and military environments.

The allocated stand space and the display of locally manufactured products on the pavilion enabled RCA to maximise its exposure at this amazing event.

Credit must also go to Marketing Merchants, which was responsible for the manufacture and project management of the AISI stand at AAD 2012.

The design and layout of each individual stand and the entire AISI pavilion was of a very high calibre and comparable to world-class standards.

RCA appreciates the exposure provided in the highly professional AISI Exhibitor Profile brochures.

I want to compliment the entire AISI management team on the tremendous effort and support provided in making AAD 2012 a highly successful event and a platform to promote local aviation manufacturing capabilities to the world market."

– Mr Rob Cook, Business Development Manager: Robin Coss Aviation (Pty) Ltd

PROGRAMME 5

Co-ordination, Promotion and Awareness

The Aerospace Industry Support Initiative (AISI) plays a pivotal role in co-ordinating information regarding the aerospace sector in South Africa, which enables it to promote industry capability to relevant stakeholders and interested parties through its networks. The Integrated **dti** Aerospace Programme's (IDAP's) offerings are jointly promoted through the AISI's channels to ensure that the Department of Trade and Industry's (**the dti's)** aerospace initiatives are well presented through a wide variety of appropriate forums.

To support its strategic intent in this regard, the AISI creates awareness through a number of mechanisms, such as print and electronic media, and selected events and networking opportunities which creates opportunities for thought leadership.

In line with government's strategic objectives, the AISI supported several outreach activities during the year to create awareness of aerospace and the requirements for aerospace careers amongst less privileged communities.

General Impact by Awareness Creation

Continuous awareness of AISI value offerings

Various activities are in place to promote the AISI among space and aerospace role players in both the national and international sphere.

A strong link exists between the promotion of the AISI and its activities and the events it supports.

One such event was the 63rd International Astronautical Congress (IAC), which took place in Naples, Italy, between 1 and 5 October 2012. In an effort to maintain a South African presence in the global space and aerospace community, the AISI organised an exhibition, in collaboration with South African National Space Agency (SANSA), at the IAC. This served as a gathering point for senior representatives and delegates from South African organisations active in the space and aerospace domain, including Denel and the Space Advisory Company. These delegates attended the event to interact and network with peer organisations from around the globe.

The AISI also made a number of contributions to both print and online publications during the year. While projects enjoyed modest coverage, more exposure in technical publications must be pursued in coming years.

Thought leadership was one of the key drivers of AISI publicity, as is evidenced by the interview with Marié Botha, AISI Programme Manager, and Desmond Barker, Competency Area Manager, Aeronautics Systems, CSIR, in the *Financial Mail*.

The AISI engaged in outreach activities, thereby sharing messages relating to aerospace and space activities in South Africa. The target market was aeronautics clubs at local schools and less privileged schools – the latter benefited from donations of previously used AISI material.

Testimonial

"I would like to express my sincere thanks and appreciation for the manner in which the AISI, an initiative of **the dti**, created an opportunity for SANSA to also be part of the national presence at the International Astronautical Congress in Naples, Italy. The approach of a national presence at this type of event was indeed the way to go; not only was the pavilion well suited to the needs of the country as a whole, but the AISI officials present did a great job of also acting in our interests. This was hugely appreciated, especially in consideration of the fact that the intensity of the various sessions and International Accreditation Forum (IAF) meetings that were held during the event did not allow for SANSA officials at the pavilion at all times."

– Francois Denner, Space Programme Manager: SANSA

Some publicity highlights are detailed below.

Type of Contribution	Article Name	Publication
Four articles relating to the theme Research and Development for Industry: Advanced Manufacturing	• The Aerospace Industry Support Initiative: providing industry with skills and scope to soar • Focus on supply chains and logistics for the aerospace industry • Reducing the development costs of Unmanned Aerial Vehicles (UAVs) • A strong new hybrid material that is also lightweight	CSIR *ScienceScope* magazine (printed)*
Contributions regarding innovative material combinations for aircraft (metal fibre laminates) and the reach and proficiency of local small, medium and micro enterprises (SMMEs) in airline galley design		CSIR Annual Report 2012/13 (printed)*
• South Africa proud host of the first African Round of the Manfred Lachs Space Law Moot Court Competition • AISI hosts pavilion at African Aerospace and Defence Show 2012 (AAD 2012) (two releases) • First African team participates in the finals of the Space Law Moot Court Competition • South African team researching and testing Unmanned Aerial Systems (UASs)		CSIR eNews (electronic)*
Clips of the Law Moot Court Competition and AAD 2012 were posted on YouTube. The competition clip was hailed a good example to other regional hosts		Social media
Advertising and print media		*African Pilot*
AAD 2012 supplement		*The Star*, *Pretoria News*, *Cape Argus*, *Daily News* and *DFA*
Article	Reaching for new highs	*Financial Mail*
Corporate Social Investment donation made to schools for disabled children: material from the AAD 2012 stand for repurposing		*New Age*, Bizcommunity.com, allAfrica.com
Revision of the AISI brochure to include all partners		
Constant updating of photo library		

* CSIR external publications with a wide distribution to stakeholders, clients and partners in government, academia, industry and the media.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AISI Management Framework and Strategic Intent

The Aerospace Industry Support Initiative (AISI) is a programme of the Department of Trade and Industry (**the dti**), managed and hosted by the Council for Scientific and Industrial Research (CSIR) Strategic Initiatives Implementation Unit (SIIU), to support the South African aerospace and defence. The Department is guided by the Industrial Policy Action Plan 2012/13–2014/15 (IPAP) and co-commissioned the Aerospace Sector Development Plan (SDP). A number of milestones were developed through the SDP, which are identified in the IPAP document.

A key milestone of IPAP for quarter four is the "*review and implementation of optimised support mechanisms and instruments to support competitiveness improvement and commercialisation within the local aerospace and defence industry*". Within the context of this need for competitiveness improvement and commercialisation, the Integrated **dti** Aerospace Programme (IDAP) was established as an optimised support structure. Though the programme, **the dti** aims to ensure the achievement of the objectives as set out in IPAP and SDP, to the benefit of the South African aerospace and defence industry.

The IDAP is a continuation and development of the existing successful aerospace support mechanisms within **the dti**, namely the AISI and the National Aerospace Centre (NAC). Lessons achieved through sector-specific support initiatives, such as the Automotive Industry Development Centre (AIDC), was taken into consideration whilst formulating the IDAP. The IDAP is a growth and impact strategy, based on historical experience as developed through the AISI and NAC.

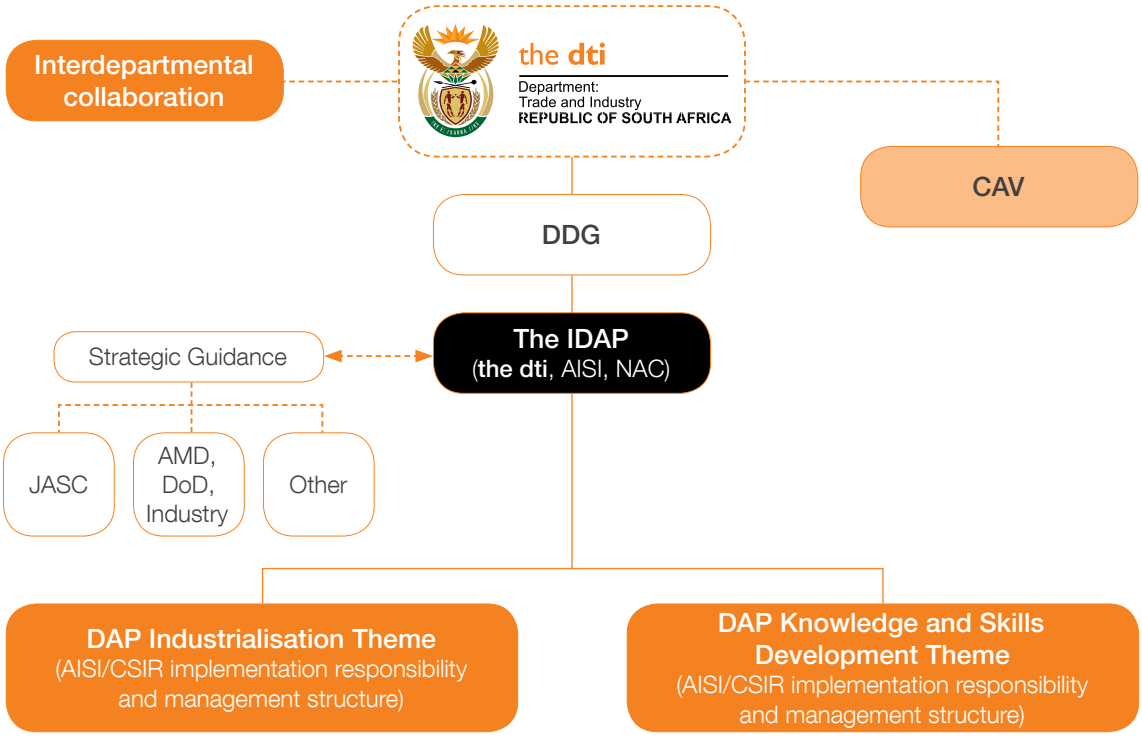

Figure 1: IDAP Strategic Framework

The CSIR and the University of the Witwatersrand (Wits) will continue to host the AISI and NAC respectively. The relationship between the AISI and the CSIR is managed through a bilateral agreement with **the dti**, and the relationship with Wits as the host of NAC was established through a Memorandum of Agreement, with oversight by an advisory board. The two initiatives align their operational plans to maximise the value proposition of IDAP.

The CSIR is one of the leading scientific research and technology development organisations in Africa. In partnership with national and international research and technology institutions, the CSIR undertakes directed and multidisciplinary research and technology innovation that contributes to the improvement of the quality of life of South Africans. The AISI at the CSIR utilises national assets and experts based within the organisation to act on behalf of **the dti** to ensure impartial guidance and support to the South African aerospace and defence industry.

As a fully government-funded mechanism, the AISI is guided by a Management Committee (MANCO) and an Operations Committee (OPCO) comprising representatives from **the dti**, the CSIR and the NAC. Projects are managed by the CSIR and strictly adhere to all Public Finance Management Act (PFMA) principles within the CSIR's policy and procedural framework.

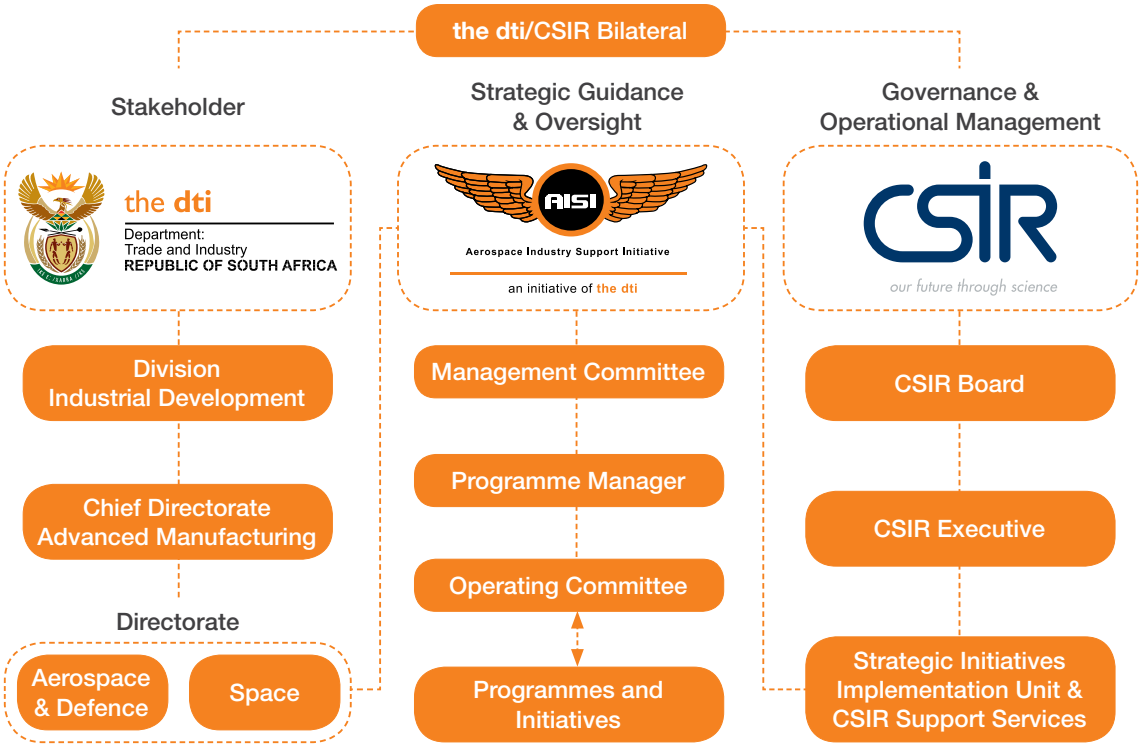

Figure 2: AISI Operational Structure

Wits hosts the NAC, which is a fully government-funded mechanism to support human capital development through bursaries and scholarship, as well as focused research and development to support the local South African aeronautical and space industries. The NAC is guided by an Advisory Board, holds quarterly meetings with **the dti** and has its own dedicated management team. It strictly adheres to all PFMA principles within the Wits policy and procedural framework. The NAC works across all South African tertiary institutions and with local and international aerospace industries. The Advisory Board comprises Wits and other South African university representatives, currently Stellenbosch University and the University of Cape Town, industry members, **the dti**, Gauteng Provincial Government and representatives from the National Research Foundation. It has collaboration agreements in place with the two main commercial aircraft OEMs as well as other international organisations.

AISI Strategic Intent

The strategic intent of AISI can be defined as achieving government's key objectives, with specific emphasis on industry transformation, job creation, and industrialisation of technology in the aerospace, and defence industry.

The AISI will emphasise the achievement government's growth targets by influencing, supporting and enabling the aerospace and defence sectors via:

- Programmes to improve competitiveness through industrialisation;
- Supporting the development and commercialisation of new technologies;
- Promotion of domestic and foreign investment;
- Small, medium and micro enterprise (SMME) and broad-based black economic empowerment (BBBEE) development, promotion and integration;
- Industry-focused skills development and associated research and development (R&D);
- Job retention, creation and poverty alleviation;
- Sector skills development and retention;
- Integration and development of cluster models; and
- Export promotion.

The AISI undertakes certain activities in close collaboration with the South African Council for Space Affairs (SACSA), Department of Science and Technology (DST), South African National Space Agency (SANSA), and the National Earth Observation and Space Secretariat (NEOSS) to support local space initiatives and human capital development, in line with the National Space Policy, the Space Affairs Act, SANSA Act and the National Space Plan (NSP). As the host of the Joint Aerospace Steering Committee (JASC) and its secretariat, the AISI will ensure alignment with the strategic direction provided by JASC, and transfer this strategic direction to all IDAP operations. The alignment of human capital development in the aerospace and defence domain is imperative to ensure sufficient expertise in the South African aerospace and defence industries.

Alignment with Government's Key Objectives

Through the AISI and NAC, the IDAP takes its mandate from the national priorities of government, and aims to ensure that growth targets, equity, job retention and creation, and other imperatives are achieved.

The AISI will also influence aerospace and defence policies through inputs and implementation of the relevant imperatives into, among others:

- National Industrial Policy Framework (NIPF) of **the dti**;
- IPAP;
- Department of Defence's (DoD) White Paper on Defence and the White Paper on Defence-related Industries;
- The Department of Public Enterprise's (DPE's) turnaround activities for Denel (SA) and aerospace and defence activities in the interest of the broader industry and Competitive Supplier Development Programme (CSDP). This will be done in conjunction with the Aerospace, Maritime and Defence Industries' Association (AMD);
- National Industrial Participation Programme (NIP) of **the dti**;
- DoD's Defence Industrial Participation Programme (DIP);

- DST's White Paper on Science and Technology;
- Designation Programme of **the dti**, derived from the Preferential Procurement Policy Framework Act, No. 5 of 2000 (PPPFA);
- Department of Transport's Building a Strategic Aviation Capacity for the South African Aviation Transport Sector;
- ICAO: The ICAO Comprehensive Regional Implementation Plan for Aviation Safety in Africa (African-Indian Ocean Region (AFI) Plan) incorporates a framework for harmonisation of training in the AFI region; and
- Government's 12 Priority Outcomes. The following are relevant:
  - All people in South Africa are and feel safe;
  - Decent employment through inclusive economic growth;
  - A skilled and capable workforce to support an inclusive growth path;
  - An efficient, competitive and responsive economic infrastructure network;
  - Environmental assets and natural resources, which are well protected and continually enhanced;
  - Create a better South Africa and contribute to a better and safer Africa and World;
  - An efficient, effective and development-oriented public service and an empowered, fair and inclusive citizenship; and
  - Triple challenges of unemployment, poverty and inequality facing South Africa.

AISI Deliverables and Key Success Factors

Linkages

Create, foster and grow relationships with local and global stakeholders to acquire the necessary technologies and skills.

Leverages

Move beyond a static subcontractor–contractor relationship to a new paradigm where the subcontractor is a partner, leveraging on government procurement of aerospace products or completed aircrafts.

Learning

Use partnerships with domestic and international institutions to improve existing technologies while simultaneously mastering the production process related technologies needed to build new sustainable platforms. This will allow the local industry to design and build its own technology, which will ensure its sustainability and support research base, rather than building to plan, which does not allow local growth.

The AISI utilises its experience gained through the past operations and projects, and has identified a number of key success factors, which were identified as pivotal to its continued successful operationalisation:

- Focused strategic direction;
- Extensive consultation and interaction with stakeholders and efficient and effective stakeholder processes;
- Effective publicity for the AISI and the industry and academia it represents;
- Effective communication regarding successful projects, as well as AISI offerings;
- Leverage the extensive international and local networks, including OEMs, universities, science councils, and other relevant organisations, through the processes, systems, infrastructure and capabilities of the hosting institutions, namely the CSIR (AISI); and
- Continuous repositioning to ensure relevance to national and sector strategic priorities for enhanced impact.

AISI Financial Results

AISI Financial Results for the Period 2012/2013

	Period ending 31 March 2013 R
Funds available at the beginning of the period 01 April 2012	**15 340 077**
FUNDS RECEIVED	**18 729 824**
Funds received	18 729 824
- funds transferred	21 352 000
- less: VAT payable to the South African Revenue Service (SARS)	(2 622 176)
INTEREST RECEIVED – 31 MARCH 2013	**917 755**
TOTAL FUNDING BEFORE EXPENSES	**34 987 656**
TOTAL EXPENSES	**23 434 918**
OVERHEAD COSTS	**3 003 983**
Direct overhead costs	2 503 983
Financial and operations management	500 000
PROGRAMME COSTS	**20 430 935**
New Industry Development and Technology Support	8 929 709
Supplier Development	2 776 021
Space Regulation and Human Capital Development	3 682 032
Sector Strategic Support Initiatives	3 753 306
Co-ordination, Promotion and Awareness	1 289 867
Funds available but contracted at end of period, including interest received	**11 552 738**

The Aerospace Industry Support Initiative (AISI) has had it most successful year in terms of strategic investments made in South African industry. This contributed towards achieving the strategic objectives of the AISI, such as technology advancement, supplier development and human capital development.

Funding totalling R18 729 824 was received from the Department of Trade and Industry (**the dti**), for the AISI's operations. This funding, along with funding received from previous financial periods, totalled R34 987 656. This was allocated and committed to programmes and projects as defined in the AISI Business Plan. At the end of the 2012/2013 financial period, R11 552 738 was committed and contracted to specific projects, to be invested during the following financial year.

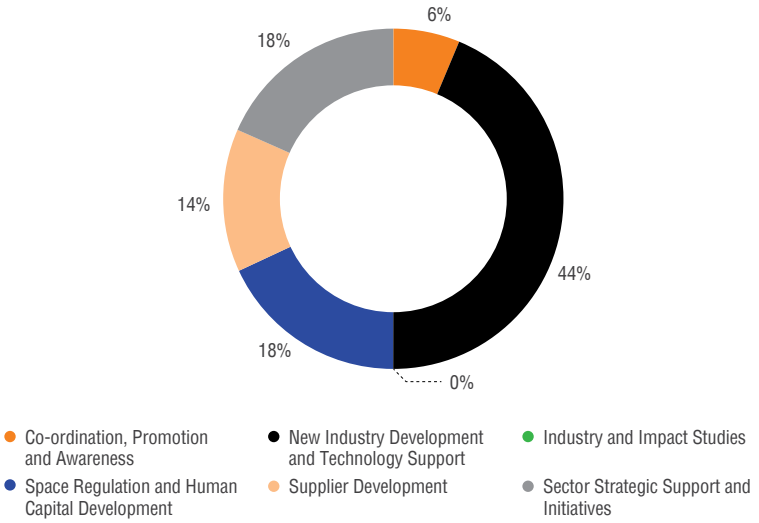

Figure 1: AISI programme spending 2012/13

The AISI set specific investment targets for each of its programmes, and was successful in achieving its pre-determined targets. The largest investment was in New Industry Development and Technology Support, with strategic focus areas of supplier development, space regulation and human capital development. A strategic decision was made not to invest in industry and impact studies, but rather to allocate the budget to other programmes.

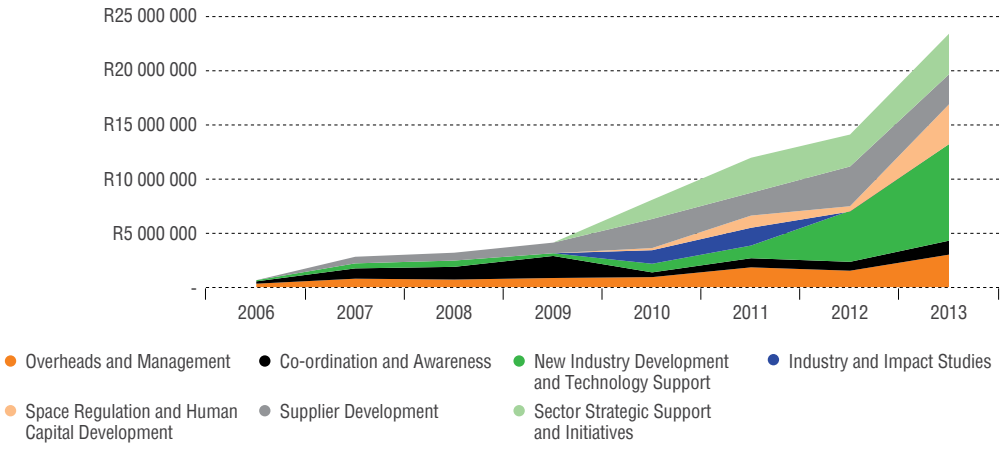

Figure 2: AISI cluster spending 2006–2013

It is evident from the figure above that investments have significantly increased over the past seven years. The strategic focus of the investments has changed to mirror the objectives of the AISI. During 2011, the investment in new industry development and technology support has increased and has become the predominant area of investment. This is to address **the dti's** mandate of industrialisation of technology. Supplier development has constantly remained an important investment area, with space regulation and human capital development increasing in importance. The AISI is committed to keeping co-ordination, promotion and awareness activities constant.

Summary of Organisations Supported

Organisation name	Project name	SMME
Adept Airmotive	• Special Projects Support • Support for Integrity Casting to ADEPT Airmotive's 320T Engine • LABAMA Support Programme	Yes
Advanced Material Technology	• E-Business Web Portal	Yes
Aero Services (Pty) Ltd	• Green Supply Chain Audit of the SA Aerospace & Defence Industry • AAD 2012	Yes
Aerospace Training Academy of South Africa Pty (Ltd)	• AAD 2012	Yes
Aerosud Aviation (Pty) Ltd	• CFRTP Clip Manufacturing Phase II • Deep Drawn Press Technology Phase II • Transfer of Airline Galley Design, Certification and Manufacturing Capability to SA Sub-Tier Suppliers • E-Business Web Portal	No
Aerosud ITC	• LABAMA Support Programme	No
Aerotechnic (Pty) Ltd	• Supply Chain Improvement and Optimisation Interventions • AAD 2012	Yes
African Astronautics (Pty) Ltd	• AAD 2012	Yes
African NDT Centre (Pty) Ltd	• Standards, Accreditation and Certification Support • AAD 2012	Yes
Albetron Precision Engineering	• LABAMA Support Programme	Yes
Alcoa Fastening Systems	• E-Business Web Portal	Yes
Applied Services	• E-Business Web Portal	No
Aquajet Profiles	• E-Business Web Portal	Yes
Auvergne Aeronautique Slicom	• E-Business Web Portal	Yes
Avex	• E-Business Web Portal	Yes
BaxMod Models	• AAD 2012	Yes
Blue Crane Development Agency	• AAD 2012	
Business Enterprises at the University of Pretoria (Pty) Ltd (BE at Up (Pty) Ltd)	• Study Leading to the Review of the Space Affairs Act	No
Cape Peninsula University of Technology (F'SATI)	• Cubesat Internship Project • Advanced Nano-Satellite Communication Systems (F'SATI Space Programme) (AISI/NAC Projects) • AAD2012	No
Central University of Technology	• AAD 2012	No
Cliff'sway Engineering (Pty) Ltd	• Standards, Accreditation and Certification Support • E-Business Web Portal	Yes
Compumach Engineering CC	• Standards, Accreditation and Certification Support • E-Business Web Portal	Yes
Collaborative Xchange	• E-Business Web Portal • AAD 2012	Yes
CSIR (host of AISI)	• Special Projects Support • Guidelines for Type Certification of Aircraft Engines • Support for Integrity Casting to ADEPT Airmotive's 320T Engine • Type Certification Test Flight Requirements • Development of Fibre Metal Laminates for Aerospace Application • Development of a Stiffness Tailored UAS Wing • Supply Chain Analysis and Benchmarking • Status of Supply Chains of the SA Aerospace and Defence Industry • Laser Shock Peening • LABAMA Support Project • Project Internships	No
CMI	• E-Business Web Portal	Yes
DW Industrial	• E-Business Web Portal	Yes

Organisation name	Project name	SMME
Daliff Precision Engineering	• AAD 2012	Yes
Denel Aviation	• LABAMA Support Programme	No
Heyns Laboratories	• E-Business Web Portal	Yes
HMR High Tech Machine Tools (Pty) Ltd	• AAD 2012	Yes
ISCAR South Africa (Pty) Ltd	• E-Business Web Portal	No
Jackpack Trading CC	• E-Business Web Portal	Yes
Lefa Engineering and Security Services	• AAD 2012	Yes
Lelebotse Projects & Engineering	• AAD 2012	Yes
Litson & Associates	• AAD 2012	Yes
M Square Precision Manufacturing	• LABAMA Support Programme	Yes
MARCOM Aeronautics and Space (Pty) Ltd	• AAD 2012 • LABAMA Support Programme	Yes
Marksman Trainer (Pty) Ltd	• AAD 2012	Yes
MCC Aviation	• AAD 2012	Yes
Megapack	• E-Business Web Portal	Yes
Megaray Limited	• AAD 2012	Yes
National Aerospace Centre (NAC)	• AISI/NAC Projects • AISI/NAC Studentships	No
Northern Bolt & Tool	• E-Business Web Portal	Yes
PPG Coatings South Africa (Pty) Ltd	• E-Business Web Portal	No
Pamodzi Aviation	• AAD 2012	Yes
Rheinmetall Denel Munition	• Green Supply Chain Audit of the SA Aerospace & Defence Industry	No
Robin Coss Aviation (Pty) Ltd	• AAD 2012	Yes
Radio Tracker	• AAD 2012	Yes
Rosslyn Sandblasting & Engineering	• E-Business Web Portal	Yes
Rost Engineering	• LABAMA Support Programme	Yes
SAAB Grintek Defence	• LABAMA Support Programme	No
Safety First	• E-Business Web Portal	Yes
Safomar Industrial Brands	• Transfer of Airline Galley Design, Certification and Manufacturing Capability to SA Sub-Tier Suppliers	No
SRS Aviation	• AAD 2012	Yes
Space Advisory Company	• AAD 2012	Yes
Stellenbosch University	• AAD 2012	
Sunspace & Information Systems	• AAD 2012	Yes
Sondor Industries	• E-Business Web Portal	Yes
the dti	• AAD 2012	No
Tiffy Safety	• E-Business Web Portal	Yes
TiTamed (Pty) Ltd	• Standards, Accreditation and Certification Support	Yes
Tony Beverley Agencies	• E-Business Web Portal	Yes
TP Agencies	• E-Business Web Portal	Yes
Tshwane University of Technology	• Development of High-Strength High-Temperature Shape Memory Nanocomposites (AISI/NAC Projects)	No
Turbomeca Africa	• Green Supply Chain Audit of the SA Aerospace & Defence Industry	No
Thorax	• AAD 2012	Yes
University of Cape Town	• AAD 2012	No
University of Pretoria	• Training Seminar on Air, Space and Telecommunication Law • Capacity Building in Space Regulation – Moot Court • AAD 2012	No
University of Witwatersrand	• Helicopter Main Gear Box Refurbishing Based on Human Capital And Knowledge Development (AISI/NAC Projects) • AAD 2012	No
Veecraft Marine (Pty) Ltd	• AAD 2012	Yes
Wesco	• E-Business Web Portal	No
West Engineering	• E-Business Web Portal	No

Abbreviations

AAD	Africa Aerospace and Defence Show 2012
AFI	African-Indian Ocean Region
AIDC	Automotive Industry Development Centre
AISI	Aerospace Industry Support Initiative
AMD	South African Aerospace Maritime and Defence Industries Association
APS	Aerosud Procedures Systems
ASDP	Aerospace Sector Development Plan
ASN	Advanced Ship Notice
AUSMIISL	Association of US Members of the IISL
BAE	British Multinational Defence, Security and Aerospace Company
BBBEE	Broad-based Black Economic Empowerment
BFE	Buyer Furnished Equipment
BINDT	British Institute for Non-Destructive Testing
CAF	Central Analytical Centre
CAV	Centurion Aerospace Village
CFRTP	Carbon Fibre Reinforced Thermoplastics
CMM	Co-ordinate Measurement Machine
CNC	Computer Numerical Control
CPUT	Cape Peninsula University of Technology
CSDP	Competitive Supplier Development Programme
CSIR	Council for Scientific and Industrial Research
CT	Computed Tomography
DIP	Defence Industrial Participation
DoD	Department of Defence
DPE	Department of Public Enterprise
DST	Department of Science and Technology
EADS	European Aeronautic Defence and Space Company
EASA	European Aviation Safety Agency
EDI	Electronic Data Interchange
ERP	Enterprise Resource Planning
F'SATI	French South African Institute of Technology
FAA	Federal Aviation Administration
FML	Fibre Metal Laminates
FPGA/VHDL	Field Programme Gate Array/Very High Speed Integrated Circuits (VHSIC) Hardware Description Language
FTE	Full Time Equivalents
GRN	Goods Received Notification
HCD	Human Capital Development
HEI	Higher Education Institutions
IAC	International Astronautical Congress
IAF	International Accreditation Forum
IAQG	International Aerospace Quality Group
ICAO	International Civil Aviation Organization
ICLA	Institute for International and Comparative Law in Africa
IDAP	Integrated **dti** Aerospace Programme
IDC	Industrial Development Corporation
IISL	International Institute of Space Law
IPAP	Industrial Policy Action Plan
IR	Infrared
IRT	Infrared Thermography Testing
ISO	International Standards Organisation
JASC	Joint Aerospace Steering Committee
LABAMA	Laser-Based Manufacturing
LMP	Laser Materials Processing
LSP	Laser Shock Peening
MALE	Medium Altitude Long Endurance
MANCO	Management Committee
MSM	Materials, Science and Manufacturing
NAC	National Aerospace Centre
Nadcap	National Aerospace and Defence Contractors Accreditation Programme
NCPC-SA	National Cleaner Production Centre
NDT	Non-Destructive Testing
Necsa	South African Nuclear Energy Corporation
NEOSS	National Earth Observations and Space Secretariat
NIP	National Industrial Participation
NIPF	National Industrial Policy Framework
NRF	National Research Foundation
NSP	National Space Plan
NWU	North-West University
OEM	Original Equipment Manufacturer
OPCO	Operations Committee
OPPS	Organisational Processes and Procedures System
PCB	Printed Circuit Board
PCN	Personnel Certification in Non-Destructive Testing
PDSR	Professional Development and Skills Retention
PFMA	Public Finance Management Act
PPPFA	Public Preferential Procurement Act
PPS	Processes and Procedures Systems
PT	Penetrant Inspection
QMS	Quality Management System
R&D	Research and Development
RAASA	Recreation Aviation Administration – South Africa
RCA	Robin Coss Aviation
RDM	Rheinmetall Denel Munition
RFQ	Request for Quotation
SACSA	South African Aerospace Maritime and Defence Industries Association
SANSA	South African National Space Agency
SDP	Sector Development Plan
SKA	Square Kilometre Array
SMME	Small Medium and Micro Enterprise
SASAA	South African Space Affairs Act
SUN	University of Stellenbosch
SWOT	Strengths, Weaknesses, Opportunities and Threats
TCU	Telemetry Control Unit
TEI	Tertiary Education Institutions
the dti	Department of Trade and Industry
UAS	Unmanned Aerial System
UAV	Unmanned Aerial Vehicle
UCT	University of Cape Town
UP	University of Pretoria
UT	University of Technology
Wits	University of the Witwatersrand
YTD	Year to Date

Notes

Notes

K-10998 [www.kashan.co.za]

Aerospace Industry Support Initiative

an initiative of **the dti**

An intiative of the Department of Trade and Industry managed by the CSIR.

the **dti**
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Trade and Industry
REPUBLIC OF SOUTH AFRICA

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