# ANNUAL REPORT 2012/13

sansa

SOUTH AFRICAN NATIONAL

SPACE AGENCY

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# Legislative and Strategic Overview

# Board Chairperson

# Message from Board Chairperson

During its two years of operation, the Agency has reached a satisfactory level of maturity. The internal control arrangements are stabilizing at a level that promotes good corporate governance. There is now a clear shift from establishment mode, to a steadier operational sphere.

Increasingly, the Agency is now looking at the more strategic issues and better ways of fulfilling its strategic and legislative mandates.

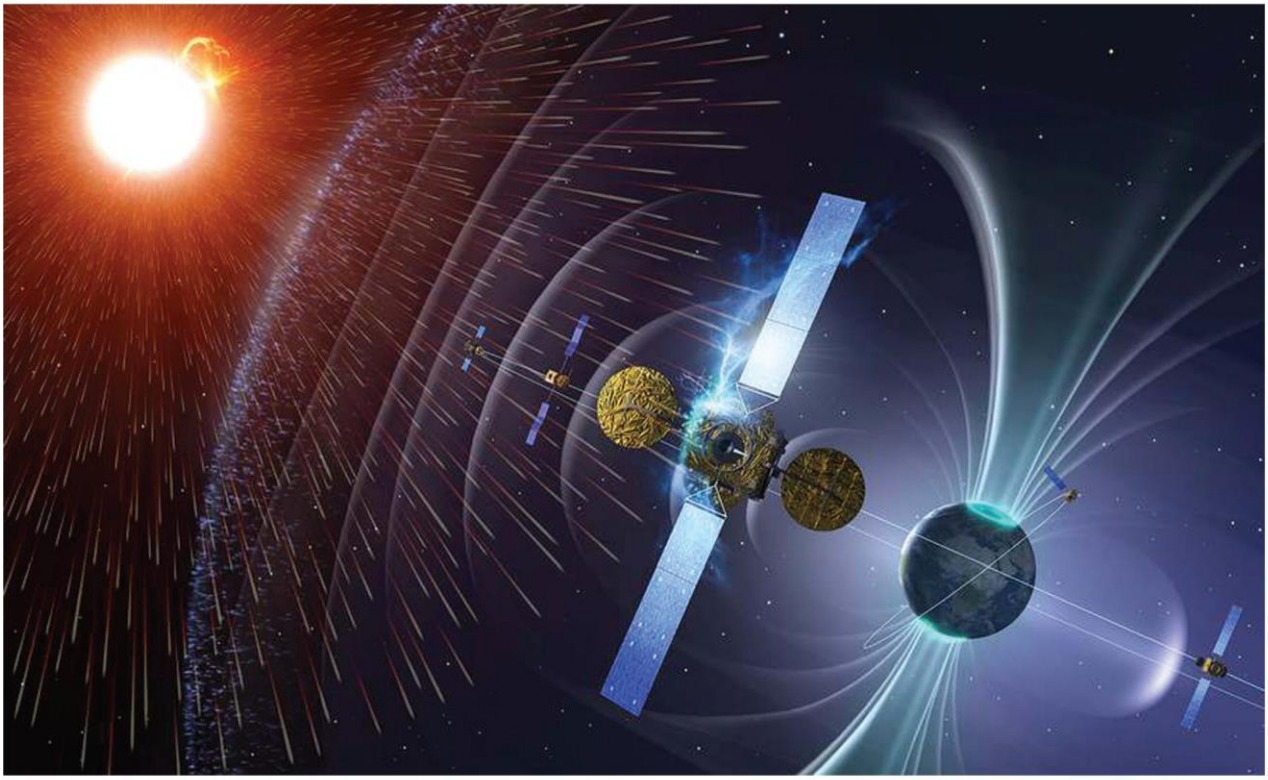
In my second term as the Board Chairperson to SANSA, I have been impressed by the passion and commitment from the organisation's leadership and staff to ensure products and services offered to stakeholders have been at a high standard and relevant to meeting their needs. The relationships and partnerships established between the entity and local and global space stakeholders have opened even greater opportunities for SANSA to contribute to the knowledge economy, stimulate the local space economy and enable South Africa to be well positioned amongst the global space community.

The SANSA board members have provided strategic input into the operation of the Agency, as it has focused on streamlining processes while ensuring that the Agency meets government priorities as set by the Department of Science and Technology (DSI).

SANSA has contributed products and services to various government departments and reached numerous learners to excite them about a future in the space science and technology industry. Through the commitment and support of the DST, I foresee a more successful year for SANSA as the Agency grows to significantly contribute to the Department's strategic plan and South Africa's national Imperatives.

My gratitude and appreciation is to the Department of Science and Technology, my fellow board members, SANSA leadership and staff, and to all our stakeholders for their continued support and contribution to ensuring an impactful year for the Space Agency. We are certain that during this financial year, you will learn more about this young organisation and the remarkable contribution it is making an effort to leave an Indelible Impact on the citizens of this country.

Mr Maurice Magugumela
Chairperson of the SANSA Board
Accounting Authority



# Chief Executive Officer

# Message from the Chief Executive Officer

As we review the performance of the South African National Space Agency (SANSA) during its second year of operation, I marvel at the extent of contribution made by our staff and stakeholders in elevating the Agency to a young and aspirational organisation, which, notwithstanding certain challenges, has been able to make valuable contributions to the country.

In the past year, SANSA has reached a level of stability and maturity that has enabled the organisation to take advantage of collaborative opportunities locally and internationally while making an impact on the local economy and scientific community.

SANSA's directorates have each excelled in their respective areas against the organisations strategic goals that are aligned to those of the Department of Science and Technology (DST). The SANSA Earth Observation directorate has provided a noteworthy amount of satellite imagery to government departments, clients, higher education institutions (HEI's) and stakeholders that have been used in addressing national priorities such as human settlement mapping and infrastructure development, as well as providing relevant data for the management of natural disaster, such as the flooding which has been experienced in certain areas of the country and part of the African continent.

SANSA Space Operations has provided high quality telemetry, tracking and command, as well as the provision of much-needed support to numerous space agencies and organisations. The facility has seen growth and development in response to the opportunities identified by the global market.

During the period of solar maxima which we have been experiencing since 2012,and which is predicted to continue into 2013/l4,SANSA Space Science has provided regular and high calibre monitoring and warning service to our stakeholders across the continent. The facility also contributed to the research output in South Africa and developments in the field of cubesats through SANSA's engagement with HEis.

Following completion of stakeholder engagements to determine user requirements for the next South African satellite, SANSA has initiated the development process of this Earth observation satellite. This endeavour will provide immense opportunities for stimulating the local industry, develop the necessary and scarce skills as well as create excitement among citizens in space science and technology.

Our mandate dictates that SANSA commit to integrating and supporting the efforts of our stakeholders in this industry through maintaining, developing and sustaining space science and technology opportunities for South Africa. We are continuing our efforts to finalise and implement the National Space Programme for the country, which promises to have a significant Impact on South Africa's National Development Plan: Vision for 2030. The document which ought to have been approved in the last year encountered a further review, and has been scheduled for tabling in this financial year.

I feel admiration and appreciation for the staff at SANSA, for their resilient pursuit of excellence in ensuring that we deliver 'in service of humanity' for SANSA. I acknowledge the hard work and support by our partners and stakeholders during this past year, and look forward to developing and strengthening old and new relationships for the Agency.

In conclusion, I would encourage you to connect with SANSA and follow this young agency as we strive to achieve beyond our targets and goals to truly make South Africans proud of the South African National Space Agency

Dr Sandile Mallnga
SANSA Chief Executive Officer

# Legislative Mandate

SANSA derives its legislative mandate from the South African National Space Agency Act (SANSA Act No. 36 of 2008). The object of SANSA is to:

1. promote the peaceful use of space;
2. support the creation of an environment conducive to industrial development in space technology;
3. foster research in space science, communications,navigatlon and space physics;
4. advance scientific, engineering and technological competencies and capabilities through human capital development (HCD), outreach programmes and Infrastructure development ; and
5. foster International cooperation in space-related activities.

## Strategic Mandate

SANSA primarily derives its strategic mandate from the:

1. Ten-Year Innovation Plan;
2. National Space strategy; and
3. South African Earth Observation Strategy.

## Vision

To be the leader in ensuring that space science and technology benefits society, the environment, the economy and the global community through products and services; research and development; and human capital development.

## Mission

To use space science and technology to:

1. deliver space-related services and products to the citizens of South Africa and the region;
2. support, guide and conduct research and development In space science and engineering and the practical application of the innovations they generate;
3. stimulate Interest In science and develop human capacity in space science and technologies in South Africa;
4. create an environment that promotes Industrial development, and
5. nurture space-related partnerships to enhance South Africa's standing in the community of nations.

SANSA's mission is succinctly captured in the Agency's motto:

**In service of humanity**

## Values

1. **S**ervice
2. **T**eamwork
3. **R**espect
4. **I**ntegrity
5. **P**ersonal growth
6. **E**xcellence

These values are fostered through an "earn your STRIPE's" campaign.

## Value Proposition

Towards the realisation of its mission, SANSA has defined a five-point value proposition to create:

1. Societal Capital
2. Intellectual Capital
3. Human Capital
4. Economic Capital
5. Global Capital.


## Strategic Goals

The 2012-2013 SANSA Annual Performance Plan indicates how the respective business units within SANSA intend to contribute towards achieving the following strategic goals:

1. World-class and efficient services and societal benefits. (**Societal Capital**)
2. Cutting-edge research, development, innovation, technology and applications. (**Intellectual Capital**)
3. Effective development of human capital, transformation, science advancement and engagement of the citizenry. (**Human Capital**)
4. Globally competitive national space industry. (**Economic Capital**)
5. Make South Africa a recognised global space citizen (**Global Capital**)

Section 2

# Corporate governance

# Governing Board

The Board is the accounting authority of SANSA In terms of the Public Finance Management Act (PFMA.Act No. 1 of 1999). It is the responsibility of the Board to provide strategic direction and leadership to SANSA and to ensure good corporate governance. The Board places strong emphasis on achieving the highest standards of conduct. In reporting. Financial and risk management.

Within the powers conferred upon the Board by legislation and, in particular. As stipulated in Section 9 of the SANSA Act (Act No.36 of 2008).the Board has determined its main function and responsibility as adding significant value to SANSA as follows:

1. Perform any function imposed upon it in accordance with a policy direction issued by the Minister and in terms of the SANSA Act.
2. Oversee the functions of the Agency.
3. Monitor the research priorities and programmes of the Agency.
4. Give effect to the strategy of the Agency, in the performance of its functions.
5. Notify the Minister immediately of any matter that may prevent or materially affect the achievement of the objectives of the Agency.
6. Establish or disestablish organisational divisions of the Agency as appropriate after consultation with the Minister.

The other responsibilities of the Board are as outlined in the Board Charter.

The SANSA Board has eleven members appointed by the Minister of Science and Technology. All the current members of the Board are non-executive and served throughout the year under review. The CEO is an ex officio member of the Board.

All non-executive Board members have been assessed as Independent during the year under review.

The Board is assisted in discharging its duties through the following committees:

Finance. Audit and Risk Business.
Planning and Governance Human Resources

The roles and responsibilities of the Committees are reflected in the charter for each committee.

The membership of the Board and attendance record in the 2012/13 financial year is reflected in Table 1 below.

| Board Member | 30/05/12 | 19/06/12 | 26/07/12 | 23/10/12 | 24/01/13 |
|---|---|---|---|---|---|
| Mr Maurice Magugumela (Chairperson) | ,,, | ,,, | ,,, | ,,, | ,,, |
| Mr Leeandran Annamalai | ,,, | ,,, | ,,, | ,,, | ,,, |
| Mr Potlaki Maine | ,,, | ,,, | ,,, | ,,, | ,,, |
| Ms Louisa Mogudl | ,,, | ,,, | ,,, | ,,, | ,,, |
| Dr Robert Scholes | ,,, | ,,, | ,,, | X | ,,, |
| Ms Joy-Marie Lawrence | ,,, | ,,, | ,,, | ,,, | ,,, |
| Mr Vincent Gore | ,,, | X | ,,, | X | ,,, |
| Capt Mpho Mamashela | ,,, | X | X | ,,, | ,,, |
| Mr Mthoblsl Zondl | ,,, | ,,, | ,,, | ,,, | ,,, |
| Dr Elizabeth Gavin | ,,, | ,,, | ,,, | ,,, | ,,, |
| Adv Tsheko Ratsheko | 181 | X | ,,, | X | ,,, |

Table 1

../ Attendance X Apology

## Finance, Audit and Risk (FAR) Committee

The FAR Committee fulfils a vital role in corporate governance by assisting the Board in discharging its duties relating to the safeguarding of assets. Overseeing internal controls. The assessment of a going-concern status .the reviewing of and reporting on financial information. And the review of the Annual Financial Statements for recommendation to the Board.

The membership of the committee and its attendance record In 2012/13 Is reflected In Table 2 below:

| Board Member | 18/04/12 | 22/05/12 | 17/07/12 | 24/07/12 | 17/10/12 | 15/01/13 |
|---|---|---|---|---|---|---|
| Ms Joy-Marie Lawrence (Chairperson) | V | V | V | V | V | V |
| Mr Leeondron Annomolol | V | X | V | V | V | V |
| Adv Tsheko Rotsheko | V | V | V | V | X | V |
| Mr Mthobisl Zondi | X | V | V | V | V | V |
| Mr Vincent Gore | V | V | V | X | V | X |

Tobie 2
V Attendance X Apology

## Business, Planning and Governance (BPG) Committee

The main function of the BPG Committee is to provide strategic direction to the executive management team by recommending and reviewing strategic actions to the Board and monitoring organisational performance. The membership of the committee and its attendance record in 2012/13 is reflected in Table 3 below:

| Board Member | 25/04/12 | 21/05/12 | 17/07/12 | 17/10/12 | 15/01/13 |
|---|---|---|---|---|---|
| Mr Leeandran Annamalai (Chairperson) | ;; | ;; | ;; | ;; | ;; |
| Dr Elizabeth Gavin | ;; | ;; | ;; | ;; | ;; |
| Dr Robert Scholes | ;; | ;; | ;; | ;; | ;; |
| Ms Joy-Marie Lawrence | X | ;; | ;; | ;; | ;; |
| Capt Mpho Mamashela | X | X | X | ;; | ;; |

Table 3
V Attendance X Apology

## Human Resources (HR) Committee

The primary objective of the HR Committee is to develop and monitor the implementation of a competitive human resources strategy to ensure that SANSA is able to attract, retain and develop the best possible talent to enable organisational performance. The membership of the committee and its attendance record in 2012/13 is reflected in Table 4 below:

| Board Member | 05/06/12 | 20/09/12 | 16/01/13 |
|---|---|---|---|
| Adv Tsheko Ratsheko (Chairperson) | ;; | X | ;; |
| Ms Louisa Mogudi | ;; | ;; | ;; |
| Mr Potlaki Maine | ;; | ;; | ;; |

Table 4
V Attendance X Apology

## Statement of Responsibility of the Accounting Authority

The Accounting Authority is required by the Public Finance Management Act 1 of 1999 (PFMA), to maintain adequate accounting records and is responsible for the content and integrity of the annual financial statements and related financial information included in this report. It is the responsibility of the Board to ensure that the annual financial statements fairly represent the state of affairs of SANSA as at the end of the financial year.

The external auditors are engaged to express an Independent opinion on the annual financial statements and were given unrestricted access to all financial records and related data. The Board believes that all the representations made to the independent auditors during the audit under review were valid and appropriate. The financial statements of SANSA have been prepared In terms of GRAP and GAAP as stipulated by section 40 of the PFMA.

To enable the Accounting Authority to meet the above responsibilities, the SANSA Board set standards and Implement systems of Internal control. The controls are designed to provide cost-effective assurance that assets are safeguarded, and that liabilities and working capital are efficiently managed. The standards include the proper delegation of responsibilities within a clearly defined framework, effective accounting procedures and adequate segregation of duties to ensure an acceptable level of risk. These controls are monitored throughout SANSA and all employees are required to maintain the highest ethical standards In ensuring that the Agency's business Is conducted in a manner that, in all reasonable circumstances, is above reproach.

Based on the information and explanation given by management, the Accounting Authority is of the opinion, that the internal accounting controls are adequate to ensure that the financial records may be relied upon for preparing the financial statements, and accountability for assets and liabilities Is maintained.

In the opinion of the Accounting Authority, based on the information available to date, the financial statements fairly present the financial position of SANSA. The financial statements of SANSA for the year ended March 2013 have been approved by the Board of Directors and signed on its behalf by:

Mr Maurice Magugumela
Chairperson: Board of Directors

Dr Sandlle Mallnga
Chief Executive Officer

## Finance, Audit and Risk Committee Report

The Committee Is pleased to present Its report for the financial year ended 31 March 2013.

The FAR Committee consists of five members and met six times during the year under review.

## Responsibilities of the Finance, Audit and Risk Committee

The Committee's responsibilities arise from section 5 1 (1) (a) (ll) of the Public Finance Management Act and Treasury Regulations
27.1.10. The Committee adopted a charter, approved by the Board, which encapsulated its legislative and corporate governance responsibilities.

## Effectiveness of internal control

Through the review of the Internal audit actlvlty. the committee is satisfied that an adequate system of internal control is in place to mitigate risks to an acceptable level. These controls have been effective during the period under review. The system Is designed to manage rather than eliminate .the risk of failure and to maximise opportunities to achieve business objectives. This can provide only reasonable but not absolute assurance.

## Risk management

The Committee Is satisfied that SANSA has an on-going risk management process. Focused on identifying, assessing, managing and monitoring all known forms of significant risk across all operations. This has been in place for the year under review and up to the date of approval of the Annual Financial Statements.

## Internal audit

The committee has evaluated the internal control environment and based on the Information provided has assessed the internal controls as effective to mitigate related risks. In line with the PFMA, the internal audit coverage plan was informed by the risk management process. The Committee met with the Internal auditors as often as necessary to discuss Issues of concern arising from internal audit reviews.

## Evaluation of annual financial statements

In respect of the SANSA annual financial statements, the Committee has:

reviewed and discussed the audited annual financial statements to be included in the annual report, with the external auditors;
reviewed the Agency's management letter and management's response to it;
reviewed changes In accounting policies and practices;
considered the applicability of the going concern assumption;
reviewed the Agency's compliance with legal and regulatory provisions; and
reviewed significant adjustments resulting from the audit.

The Committee concurs with and accepts the external auditor's report included in the annual financial statements. It holds the opinion that the audited annual financial statements should be accepted and read together with the report of the external auditors.

## External Auditors

The Committee has met with the external auditors and are satisfied that there are no unresolved issues arising from the external audit.

Ms Joy-Marie Lawrence
Chairperson

# SANSA BOARD MEMBERS

Mr Maurice Magugumela
(Board Chairperson)

Dr Sandile Malinga (CEO)

Ms Joy-Marie Lawrence
Board member

Dr Robert Scholes
Board member

Dr Elizabeth Gavin
Board member

Mr Mthobisi Zondi
Board member

Ms Louisa Mogudi
Board member

Mr Potlaki Maine
Board member

Mr Leeandran Annamalai
Board member

Adv Tsheko Ratsheko
Board member

# Corporate Management

## Corporate Executive

The Corporate Executive Management, under the CEO,is the executive committee of SANSA and is responsible for the executive leadership and day-t day operational management of SANSA. It consists of:

Dr Sandlle Malinga, Chief Executive Officer (CEO) Ms Bulelwa Pono, Chief Financial Officer (CFO) Mr Zweli Ndziba, Executive Director (ED): Corporate Services Ms Sare'' Grobler, Board Secretary

Dr Sandlle Mallnga,Chief Executive Officer

Ms Bulelwa Pono, Chief Financial Officer

Mr Zweli Ndziba,Executive Director: Corporate Services

Ms Sare' Grobler,Board Secretary

## Senior Management

The Corporate Senior Management under the CEO is the second highest management committee of SANSA and is responsible for the operational management of SANSA. It consists of

Dr Sandile Malinga, CEO
Ms Bulelwa Pono, CFO
Mr Zweli Ndziba,ED
Dr Lee-Anne McKinnell, Managing Director ( MD): SANSA Space Science
Mr Raoul Hodges,MD: SANSA Space Operations
Dr Jane Olwoch MD: SANSA Earth Observations

## Management Forum

The Management Forum consists of the Senior Management. Middle management and key staff members. It meets twice a year and is a platform for discussing and implementing corporate-wide and operational strategies and actions.

# Governance Principles and Instruments

## Shareholder Compact

The Accounting Authority for a public entity listed In Schedule 2,3B or 3D, must annually conclude a shareholder's compact In consultation with Its Executive Authority. Notwithstanding the fact that SANSA is a Schedule 3A entity, and therefore excluded from this requirement. Cabinet recommended that it should conclude a shareholder's compact with its Executive Authority. In line with this recommendation, the SANSA Board has signed a shareholder's compact with the Executive Authority, the Minister of Science and Technology.

## Materiality and Significance Framework

In terms of Treasury Regulation 28.1.5,the Accounting Authority must develop and agree to a framework of acceptable levels of materiality and significance with the relevant Executive Authority in consultation with the external auditors. The best indicator with regard to SANSA business activity is revenue, excluding ring-fenced allocations. For this reason, a framework of acceptable levels of materiality and significance for SANSA has been set at 0,5% and 10% of revenue respectively.

## Planning and Performance Management

Supported by management. The Board is responsible for the strategic planning and performance management of SANSA. The Corporate Office,through the Planning and Performance Management unit, assists the Board by preparing the Strategic Plan, the Annual Performance Plan, Quarterly Reports and the Annual Report. In 2012/13, SANSA implemented a Performance Management Framework which will ensure consistency in planning and performance management throughout SANSA.

## Audit and Risk Management

The mandate and core functions of a risk management function are informed by the Public Finance Management Act. And the guiding principles of the King Ill Report on Corporate Governance. The unit is responsible for managing risk identification, mitigation and monitoring, for the development and implementation of the annual Internal audit plan,as well as for the monitoring of SANSA's compliance to the legislative frameworks and Internal policies and procedures.

The Public Sector Risk Management Framework, issued by National Treasury, and the related guiding principles, tools and templates, are the primary source of guidance for risk management within SANSA. The SANSA risk register, dashboards and policies have been developed utilising the National Treasury templates.

SANSA's audit and risk management is governed by the following:

1. Enterprise Risk Management Policy and Strategy
2. Enterprise Risk Management Charter
3. Code of Business Conduct
4. Fraud Prevention Plan

The top ten risks of SANSA are approved by the Board on an annual basis and reviewed regularly.

## Safety, Health, Environment and Quality (SHEQ) Management

SANSA is committed to providing a safe and healthy working environment. and to maintaining formal occupational health and safety, environmental and quality systems that are designed to meet legal and other related requirements. Each SANSA Directorate publishes Its occupational health and safety policy to regulate health and safety activities,including the function of the occupational health and safety and environmental committees, conducting SHEQ audits, training,risk assessments and regular communication. Through the committees, Directorates ensure optimal participation and Involvement of employees In the SHEQ programme.

## Policy

The Senior Management committee is the highest policy committee of SANSA and Is assisted by focused area policy committees. All policies undergo regular review and are presented for final approval to the Board.

Section 3

# HUMAN RESOURCES

During the 2012/13 financial year, the Human Resources function successfully developed and implemented a range of human resource management and development programmes to facilitate optimal performance by the Agency's workforce.

## 1. Organisational Effectiveness and Performance

The SANSA Management Forum, comprising of all Managers, Managing Directors and the Executive, engaged in workshops focusing on ensuring team cohesion and improved organisational effectiveness and performance. Through the engagements, a number of organisational performance improvement Initiatives were identified and prioritised *tor* development and implementation. Key amongst these Initiatives were the Policies and Business Processes Review and Improvement project, and the Leadership Development Intervention.

## 2. EMPLOYEE SATISFACTION

SANSA continually gauges its organisational climate and level of employee satisfaction in order to ensure pro-ractive measures to manage employee morale, and to alleviate any issues that may adversely affect the desirable organisational culture. An employee satisfaction survey was successfully conducted in April/May 2012, and as an on-going effort, management seeks to address issues raised by staff.

Each SANSA Directorate developed an action plan to address findings and implement relevant recommendations of the survey. For example, in response to the staff survey, a comprehensive remuneration survey was conducted to benchmark salaries with the external market to ensure competitive remuneration ,and the findings indicated that SANSA currently remunerates most of its employees at or above the market median, indicating that SANSA salaries are generally aligned and compare relatively well to its industry comparison sector. Any remuneration packages below the 1Oth percentile of the market are targeted for review.

## 3. EMPLOYEE WELLBEING

SANSA places great value in ensuring employee well-being to ensure continued productivity. Even though a fully comprehensive employee assistance program has not yet been developed, an employee awareness of health and well- being workshop for prevalent diseases, such as cholesterol, diabetes and hypertension was conducted. In addition, HIV/AIDS voluntary testing and counselling services was offered to staff in December 2012.

## 4. EMPLOYEE RELATIONS AND DIVERSITY MANAGEMENT

all SANSA Directorates have on-going team building and diversity management sessions. These interventions contribute significantly to the efforts of building a culture of inclusiveness and appreciation of diversity among SANSA employees.

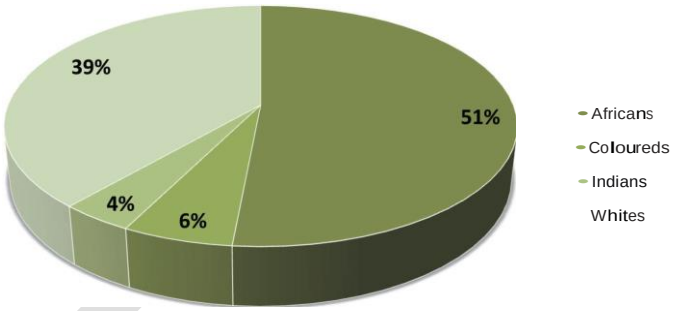
## 5. EMPLOYEE PERFORMANCE MANAGEMENT AND DEVELOPMENT

A performance management and development system is embedded across the organisation to ensure a culture of high performance and achievement of goals and objectives. The Implemented system provides for all employees to have agreed performance targets. Which are supported by personal development plans. The system applies a five point scale, where a rating of one (1) is poor and five (5) is excellent.

## 6. SANSA WORKFORCE PROFILE AS AT 31 MARCH 2013

### 6.1 Overall Employment Equity Profile

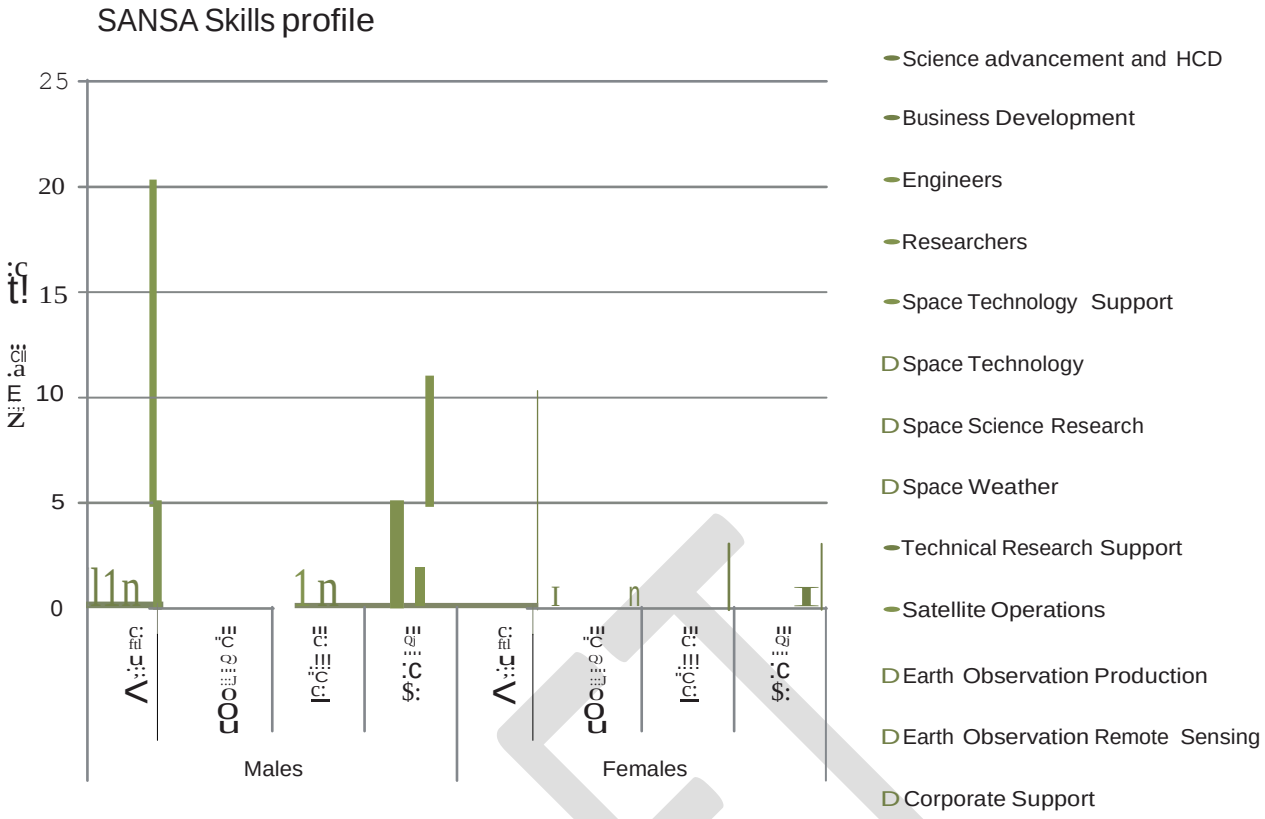
The SANSA overall Employment Equity Profile



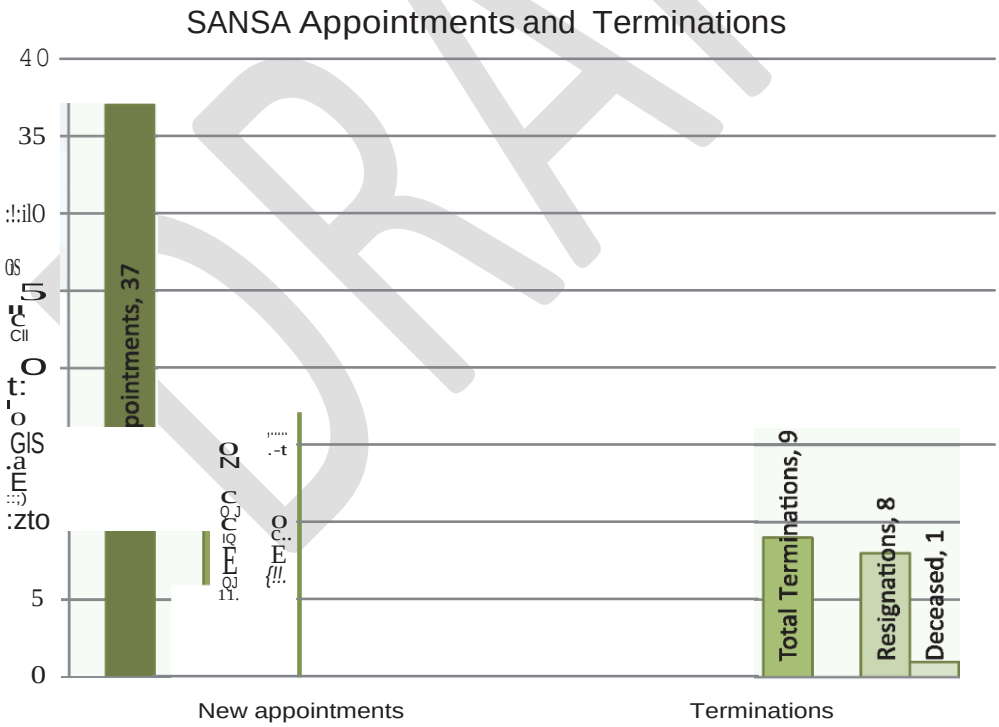

### 6.2 Employment Equity Profile by Occupational Category

| Occupational Levels | Males | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | A | C | I | W | A | C | I | W | Total |
| Top Management (Executive) | 2 | | | | 1 | | | | 3 |
| Senior Management | | | | 2 | 1 | | | 1 | 4 |
| Professionally qualified and experienced specialists and middle management | 4 | | | 16 | 10 | 3 | 3 | 9 | 45 |
| Skilled technical and academically qualified workers, junior management, supervisors, foremen and superintendents | 15 | 3 | 2 | 16 | 3 | 1 | | 5 | 42 |
| Semi-skilled and discretionary decision- making | 20 | 2 | 1 | | 9 | | | 4 | 36 |
| Unskilled and no decision- making | 2 | | | | 2 | | | | 4 |
| Total permanent | 41 | 6 | 3 | 32 | 26 | 4 | 3 | 19 | 133 |
| Total non-permanent | 13 | | | 6 | | | | 4 | 22 |
| Grand Total | 54 | 6 | 3 | 38 | 26 | 4 | 3 | 23 | 155 |

## 6.3 Skills Profile




## 6.4 Appointments and Terminations






## 7. KEY CHALLENGES

The key challenge facing the Agency in the area of human resources relates to shortages of specialised technical skills, such as remote sensing specialists, space science researchers, satellite operations technicians, and satellite engineers, which are required in SANSA's core business areas. Scarce skills In the aforementioned areas are in high demand both globally and in South Africa, and this situation poses a risk to business continuity and the Agency's sustainability. To respond to this challenge, SANSA has embarked on developing a comprehensive workforce plan to Identify how future staffing and skill needs will be met, via external recruitment, internal deployment, succession planning ,talent management strategies, and skills and career development opportunities.

Section 4

# Impact Report

# Serving Society

*What is the use of a house if you haven't got a tolerable planet to put it on?*

***Henry David Thoreau***

***SANSA aims to bring the benefits of space knowledge and investment back to our fellow citizens to ensure we may continue to live sustainably on Earth.***

**16 840** scenes of data distributed to Government and HEI's this past year for use in addressing service delivery, disaster management and knowledge sharing objectives.

**2,9Tb** of science data acquired and archived for research

Over 1 million satellite images are in SANSA's archive.

400 km/s is the average speed of solar wind. That is equivalent of traveling from Johannesburg to Cape Town in 3 seconds

**Between 1980 and 2010, over eighteen million people were affected by disasters, out of these over one million were killed. Economic loss emanating from destruction of infrastructure and lives was estimated to be three billion (3,394,070,000). Advancing the understanding of why and where disasters occur in South Africa has potential to improve preparedness and save lives and resources.**

During January 2013 South Africa and its neighbouring countries Mozambique and Zimbabwe experienced heavy rains causing serious flooding in parts of Limpopo, Mpumalanga and southern Mozambique. These heavy rainfalls, which are common during the summer season, are the result of sub-tropical depressions and intense cyclones associated with El Nina and often result in loss of human life and devastating effects to the environment and infrastructure. In order for disaster management services to effectively respond to these events they require accurate and fast methods to assist in estimating and predicting the extent of the disaster.

Remote sensing supports flood management by providing detailed information for production of assessment maps which aid in identifying high risk areas. The satellite images are also used to monitor land use or land cover changes and to quantify the change. Further risk assessments can be done for relocation and hazardous area demarcation.

## Satellite information assists in determining appropriate actions for rescue and rehabilitation missions.

A simple analysis can be done through visual interpretation of data to compare the changes before and after flooding and a more sophisticated approach, which requires specialised processing tools, allows computation of statistical information of all affected land cover.

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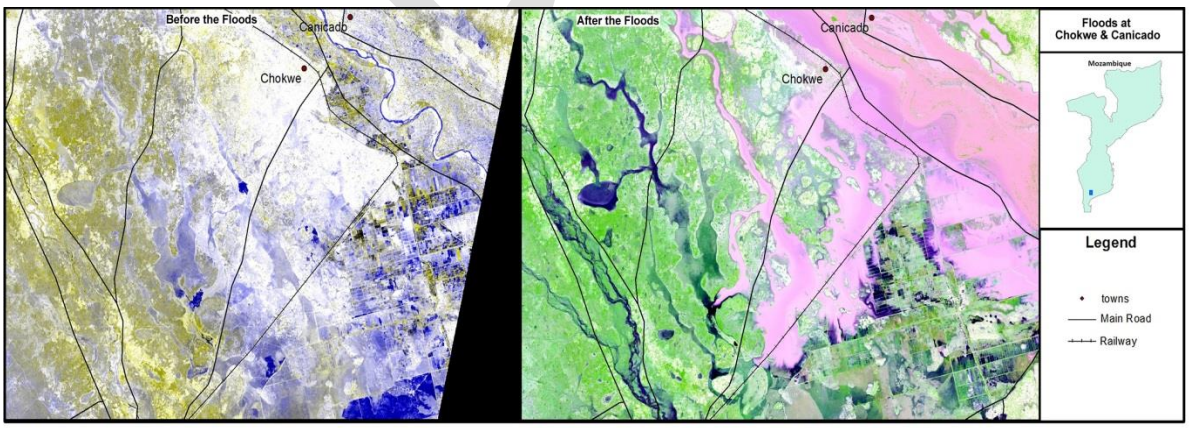



**Figure 1:** The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) satellite image showing Chokwe before (02-04-2005) and after (25-01-2013) the floods (source: http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=80297).

In Mozambique, the city of Chokwe was devastated in the recent floods as shown in Figure 1. This agricultural town is noted for its tomato farming and we can see in Figure 1 how the extent of the flooded area has affected the agricultural fields, infrastructure

(roads and railway) and the surrounding towns. In Figure 2, the area has been classified into three classes - water, vegetated and non-vegetated areas. This analysis indicates the flood extent of the Limpopo River.

This classified image enables SANSA to quantify the loss of production in the agricultural fields, as well as the extent of the damage to infrastructure and even quantify the surface area of settlements destroyed by the floods. Through such analysis, it is possible to make informed decisions on evacuation, rescue and food aid operations.

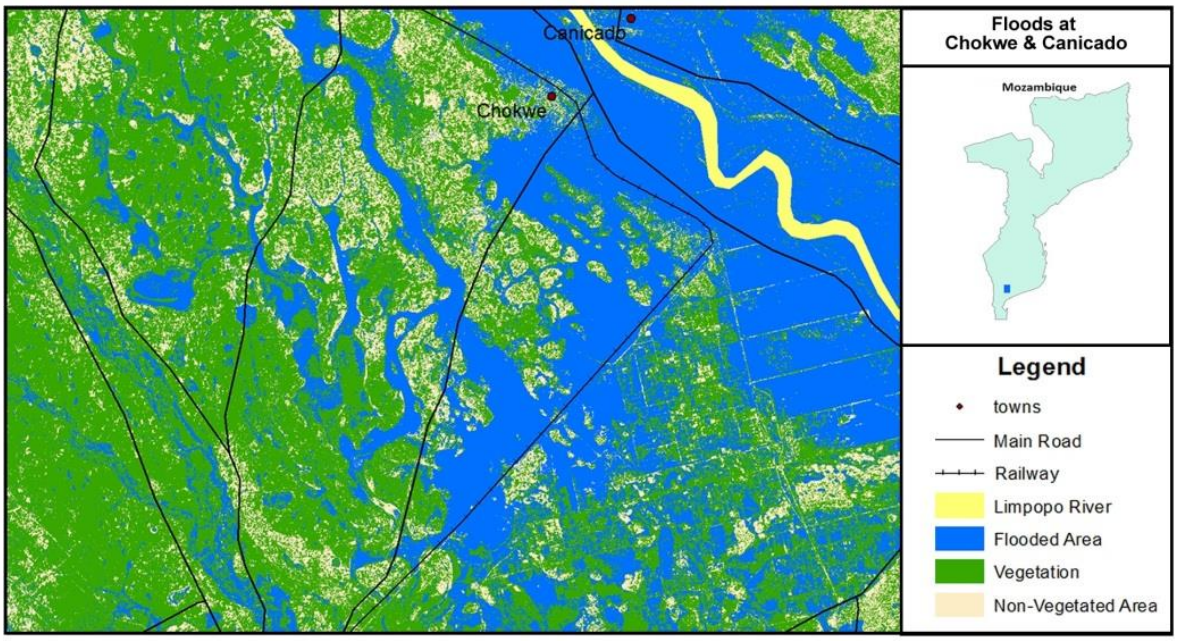



**Figure 2**: Classified ASTER image of the flood affected areas around Chokwe in Mozambique.

### *Space Weather heating up*

**There is no greater influence on the Earth and its space environment than that of our local star, the Sun. Just like Earth, space has weather too. Space weather can have devastating effects on space and Earth-based technological systems, which can result in disturbances to Global Positioning System (GPS), radio communications, the internet, cell phones and Digital Satellite Television (DStv).**

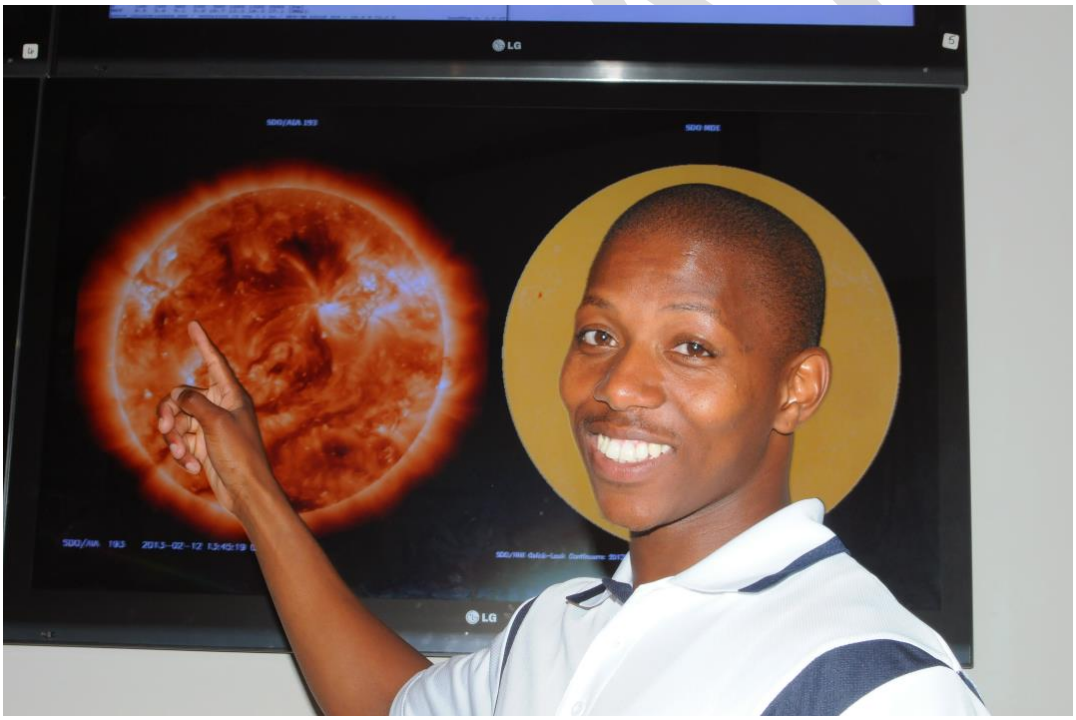
## The centre has made strides as the only Regional Space Weather Warning Centre in Africa

The SANSA Space Weather Centre monitors solar activity providing early warnings and forecasts on space weather events, playing an important role in protecting satellite technology, communication and navigation systems, as well as electrical power grids.

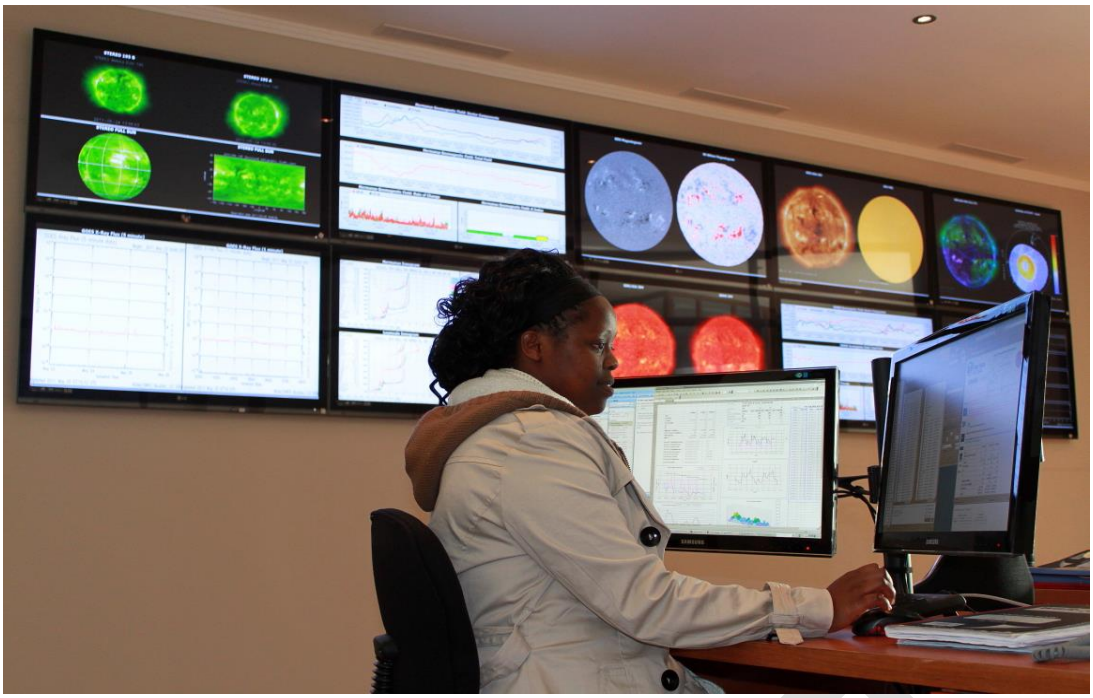
SANSA's Space Weather team has developed a number of new space weather warning products and services, such as the SANSA SMS Warning System and the SANSA Space Weather Information Centre, which provides accurate forecasts and predictions to the defense, aeronautics, navigation and communication sectors.

## A coronal mass ejection releases energy that is equivalent to a billion atomic bombs

Since its inception in 2010, the Centre has made significant strides as the only Regional Space Weather Warning Centre in Africa keeping an eye on the Sun's activity and informing the nation on any significant eventuality arising from solar activity.



Monitoring and forecasting space weather conditions helps protect satellite communication technology



SANSA Space Science is host to the only Space Weather Regional Warning Centre in Africa

### *Mapping the growth of national informal settlements*

**South Africa has a 62% urban population and an annual urbanization rate of above 1%. As more and more people flock to the cities increased strain is put on housing and other social amenities. SANSA provides support to local, provincial and national departments as they try to address these challenges.**

A South African national informal settlement database currently targeting 45 municipalities as identified by the Cabinet is being developed by SANSA. This database will enable government to make informed decisions when monitoring informal settlements as well as in service delivery projects. The mapping of the informal settlements using the 2006 and 2011 SPOT 5 2.5m satellite imagery involved capturing the extent of growth of the informal settlements for the stated period. The verification of data was done through municipal workshops.

## SANSA has satellite imagery that dates as far back as 1972

An environmental status analysis of the location of informal settlements indicated areas with high environmental risks. A change detection analysis highlighted the growth rate and the dynamics within the informal settlements. A dwelling inventory which is planned will provide mapping of individual dwellings within priority informal settlements and requires very high resolution imagery.

In this project, SANSA has completed seven out of nine provinces and, within them, 35 municipalities were captured. Limpopo and Northern Cape are the only provinces which have been validated. Preparation to release the completed informal settlement database captured in the 45 municipalities is currently underway. KwaZulu-Natal and the Eastern Cape will be completed during the 2013/14 financial year.

This database will form part of the Department of Human Settlements' informal settlements monitoring tool. The results will assist the government in monitoring the growth of the informal settlements, as well as monitoring service delivery in the informal settlements as part of the informal settlements upgrading project.

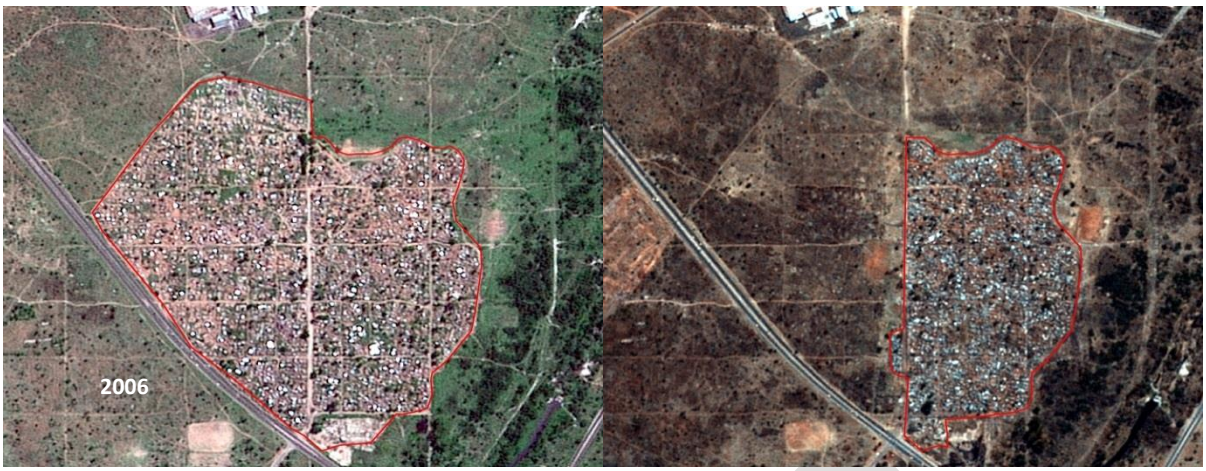



**Figure** 8: One of the informal settlements in Polokwane municipality in Limpopo, where in 2006, 16 informal settlements existed and 2011, 24 existed.

# Knowledge Creation

The only real security that a man can have in this world is a reserve of knowledge, experience and ability.

**Henry Ford**

SANSA aims to contribute significantly to moving our country from a largely resource economy to that which holds power through its offering of knowledge and skilled workforce

39 formal R&D reports and publications by SANSA Earth Observation

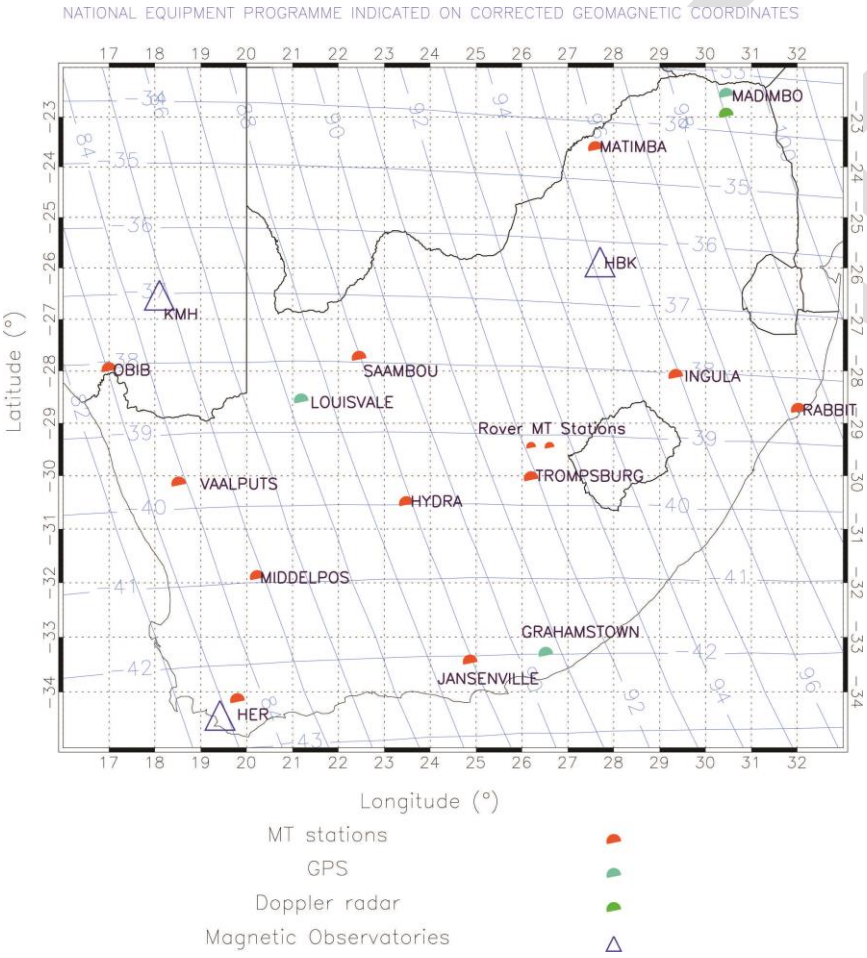
2.56 peer reviewed journal articles produced per researcher which is higher than the national norm for physics

19 short courses held to develop skills in space related topics

*Tools to probe deeper into the unknown*

**To solve the mysteries of the universe, probe even deeper into the unknown, address longstanding and challenging scientific questions, create a full picture of the space environment, and train the next generations of scientists, South Africa and the African continent require specialised and cutting-edge research equipment.**

SANSA has spent in excess of R4 million to ensure the country achieves this objective. During the year under review, SANSA, in collaboration with partner universities, acquired and installed equipment for a single analytical research system to observe the link between the magnetosphere, the ionosphere and the Earth's surface. Known as the **South African Ionospheric, Geophysics and Geomagnetic Experimental Resource (SNIGGER)**, this system which consists of a variety of specialised equipment, such as Magnetotelluric (MT) Stations, GPS Scintillation Receivers and a High Frequency Doppler Radar, will turn South Africa, its neighbouring countries and the South Atlantic Ocean into a giant geophysical laboratory in order to study the space environment.




The locations of the National Equipment Programme instrumentation which makes up the SNIGGER network.

## Creating a research platform for future bright minds

South Africa is the only African country with an Antarctic scientific base called SANAE. This is a location of immense scientific geographic advantage in that the convergence of the Earth's magnetic field in the polar region allows scientists to probe very deep into the space environment. To take advantage of this, South Africa has a wide suite of instrumentation including magnetometers, scintillation monitors, riometers, and auroral cameras. One of the major instruments at SANAE is an analogue High Frequency (HF) radar.

This radar is part of the **Super Dual Auroral Radar Network (SuperDARN)**, which is an international network of over 30 radars involving scientists and funding agencies across 16 countries. SANSA is currently constructing a digital High Frequency (HF) radar, which will replace the current analogue radar.

This R3.5 million in-house project has enabled SANSA to develop internal radar development skills and establish an HF Laboratory which will be utilised for future space science equipment upgrades and in-service training projects.

The new radar will have the ability to process information at greater speeds, allow scientists to observe and study anomalies in a far superior way than was previously possible, and allow for parallel radar tasking to simultaneously meet global SuperDARN commitments and national specific experimentation.

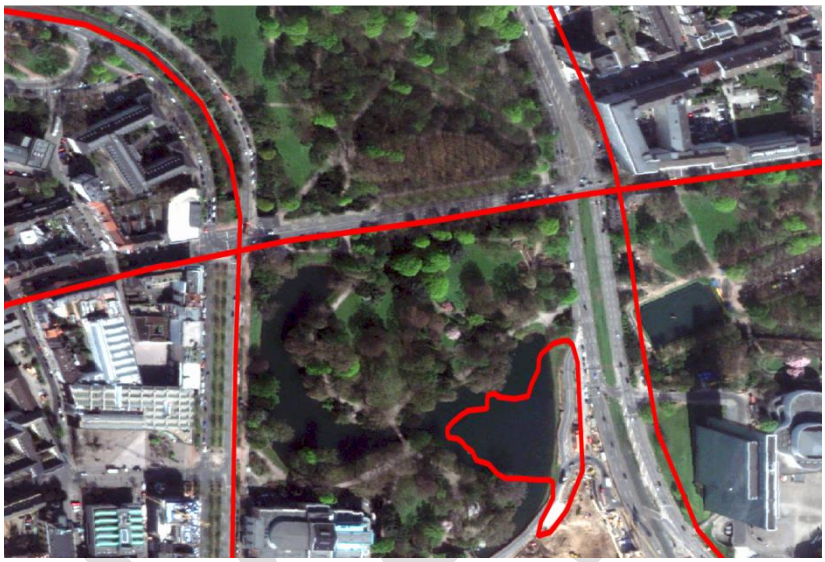
Post graduate student and in-service trainee testing a radar component in the SANSA RF laboratory.

### *Optimising the information extracted from satellite imagery*

**South Africa spends in excess of R25 million per year to acquire satellite imagery that is used for a number of applications in agriculture, human settlement monitoring, disaster management, natural resource management and other applications. It is therefore important that the country continually optimizes the extraction of decision-making information from the imagery and ensure value for money for the country.**

SANSA has developed an in-house capacity to ensure that value added procedures are applied to satellite Earth observation data that is received from international satellite vendors Some vendor supplied Remote Procedure Call (RPC) for High Resolution satellite images contain positional errors due to biases that exist in exterior orientation determination and errors in satellite attitude determination. To remedy this, SANSA developed open source tools called **SATLIB** for bias compensation in RPCs. An illustration is given in the figures. Also developed is a bundle adjustment method for 3D point resection that is useful for Deep Space Maneuver (DSM).

This work provides a cost-effective and efficient way of processing tools for stakeholders. It also allows for ongoing research and improvements on image processing since full control of the tools rest within SANSA. The interest generated in the application has resulted in a decision to migrate some of the proprietary software scripts to open source in order to encourage research and knowledge exchange with other space agencies and stakeholders.



Orthorectification with unrefined RPCs. The image is off position as shown by the roads

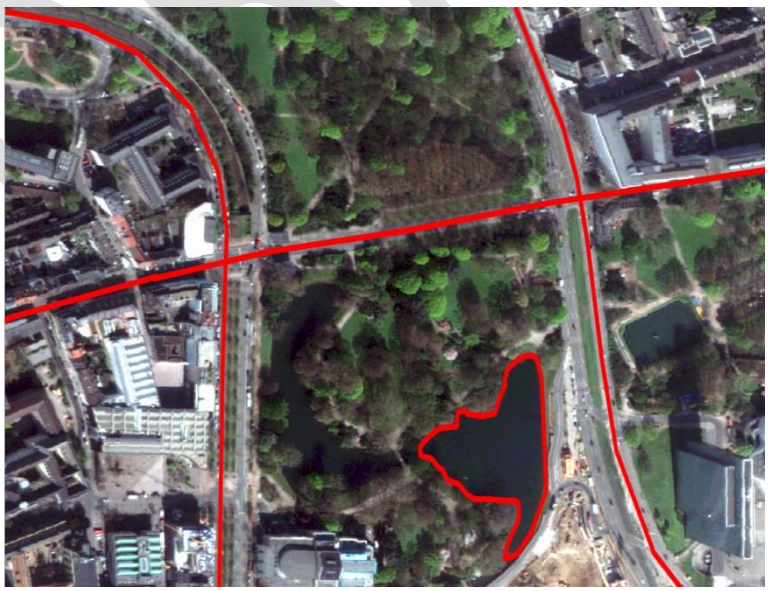


Image shows correct road positions with refined RPCs

**Is it possible for humanity to be wiped from the face of the earth by the Sun's emissions?**

**Will the reversal of the earth magnetic field cause commotion on earth?**

**How do changes in the space environment affect communication systems, navigation, or electric power distribution?**

These are some of the burning questions that SANSA scientists try to solve as the Agency extends the frontiers of knowledge and increase South Africa's global knowledge share by pursuing a number of flagship projects.

SANSA is a key player in the South African National Antarctic Programme (SANAP) and has several on-going space science and space weather related projects in Antarctica, as well as Marion Island and Gough Island. SANSA scientists successfully launched 13 helium-filled balloons as part of NASA's Balloon Array for Radiation belt Relativistic Electron Losses (BARREL) project. The project, works in conjunction with NASA's Van Allen Probes, and aims to track where radiation goes when it escapes the Van Allen Radiation Belts, as the charged particles within the belts can damage satellite technology.

SANSA researchers also conducted other ground breaking research in areas of geomagnetism, the atmosphere, the ionosphere, magnetosphere and plasmasphere. The productivity of the research was recoded at 2.56 publications per researcher which is higher than the national norm for physics. This is a noble achievement noting the stated objective to transform South Africa to a knowledge based economy and increase South Africa's global knowledge share.

Launching the first payload of the 2012-2013 austral summer at SANAE IV (image credit Claire Antel)

# Reaching Society and Building Capacity

Education is the passport to the future, for tomorrow belongs to those who prepare for it today.

Malcolm X

**SANSA aims to advance scientific, engineering and technological competencies and capabilities through the development of our Human capital via outreach programmes and public engagement**

**36** postgraduate students, supported by SANSA, registered for degrees in the field of space science at universities around the country

**10** SANSA-supported students graduated from the Universities of KwaZulu-Natal, Fort Hare and Rhodes

*Taking space science to schools*

**South Africa has a need to increase the uptake of maths and science by learners across the country. While the government tackles this challenge through educational interventions, SANSA uses the appeal of space to encourage these young minds to have an interest and appetite for science and maths at schools.**

Learners from Spartan High School being welcomed by Dr Sandile Malinga at Hartebeesthoek

*SANSA is committed to encouraging our learners to take up Maths and Science at school as a guarantee to feed into the knowledge and skills base currently lacking in South Africa. Using space as an exciting tool to explore concepts and gather new knowledge on our planet, the universe and our existence is the objective for the Agency.*

*This is managed through direct engagement with learners through school visits to the SANSA facilities, practical demonstrations in schools located in rural areas by the mobile space laboratory as well as participation at national festivals and events.*

*The agency also participates in initiatives that encourage and showcase careers in the space industry with special focus on girl children and people with disabilities.*

## The team reached 962 learners in the Mopani district for the duration of the Limpopo Road Show week

## *SANSA has participated in Cell C's Take a Girl Child to Work initiative for a second year and hosted children through the Reach for a Dream programme.*

Lethabo Moropa's (a four year old boy suffering from Kidney cancer) wish of being a Satellite Engineer was fulfilled as he visited the SANSA Space Operations ground station as part of a Reach for a Dream Foundation initiative.


Lethabo dreams of space travel

Under the theme "The Role of Science in Economic Development", SANSA hosted a number of activities in concurrence with National Science Week. During the year under review, SANSA Science Advancement teams managed to visit a number of schools in the areas around South Africa.

### *Investing in young bright minds*

> **Globally SA ranks approximately 111th out of 142 countries for its availability of scientists and engineers. According to the Engineering Committee of South Africa (ECSA) currently one engineer serves over 3000 people in South Africa compared to 227 in Brazil and 543 in Malaysia.**

## SANSA embarked on a nation-wide Research Road Show visiting 27 campuses of 21 universities covering seven provinces of South Africa.

This was to drive awareness of the research carried out at SANSA and the various opportunities available to students.

Over 1360 students were reached during this road show, and this has resulted in a 44% increase in the number of bursaries allocated to space science postgraduate students in the fields of physics, maths, computer science and engineering. SANSA is now supporting a total of 36 postgraduate students registered for degrees in the field of space science at universities around the country.

SANSA and the University of KwaZulu-Natal (UKZN) recently signed a MoU relating to joint staff appointments and collaboration in the Antarctic based SuperDARN radar project. Human Capital Development is essential in achieving SANSA's strategic goals, this initiative will present opportunities for SANSA to collaborate with Schools situated within UKZN's College of Agriculture, Engineering and Science.

Almost 50% of SANSA bursaries for 2013 were awarded to students registered at UKZN, which was the largest allocation to any South African university.

During 2012, ten SANSA-supported students graduated from the Universities of KwaZulu-Natal, Fort Hare and Rhodes, which is the highest number of graduating SANSA students in a given year, and demonstrates the high calibre and academic competence of SANSA students.

SANSA Researchers with Physics students at the University of Fort Hare during the Research Road Show

### *Empowering our people and celebrating excellence*

*SANSA not only targets young learners to develop an interest and passion in space science, but affords the same opportunity to our students at HEI's.*

Scientists and researchers at SANSA are constantly looking for opportunities to grow their knowledge and skill in order to inspire their academic colleagues to aspire to greater levels of scientific awareness. A young SANSA Ionospheric Physicist, Zama Katamzi has received a NRF Thuthuka grant in the post- PhD track. . In addition this remarkable young scientist also won the Ikusasa Award for 2012, in the category BEST USE OF SCIENCE.


SANSA Ionospheric Physicist awarded for BEST USE OF SCIENCE.

Another extraordinary young engineer and SANSA's Mission Control Specialist, Gladys Magagula, has inspired women engineers as guest speaker at the Third Annual Women in Engineering Conference.


Gladys Magagula, Guest Speaker at the Women in Engineering Conference

### *Taking space to society*

SANSA participated in numerous festivals and exhibition around South Africa with the intention of creating awareness of the Agency and the impact of space investment in South Africa. These events also provide a platform for the organisation to present its abilities and progress to a variety of national and international partners and stakeholders. Some of the events SANSA had a

presence in include the Africa Aerospace and Defence (AAD), which took place at Waterkloof Air Force Base in Pretoria and attracted more than 40,000 trade visitors from 28 countries.

SANSA attracted many learners and public at the Annual SciFest, which was held in Grahamstown and the SANSA Science centre hosted various open days to the schools and public in the Western Cape.


SANSA at AAD 2012

SANSA’s SciFest team with SANSA’s MDs and CEO

# Shaping our Industry

Technology is a gift of God. After the gift of life it is perhaps the greatest of God's gifts. It is the mother of civilizations, of arts and of sciences.

**Freeman Dyson**

SANSA aims to support the creation of an environment conducive to industrial development of space technology.

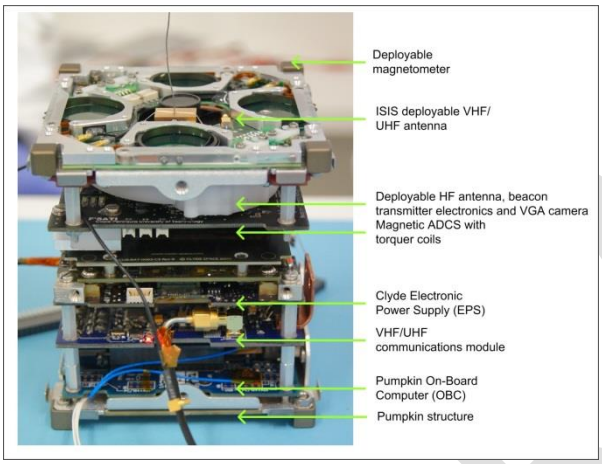
1.3Kg is the weight of South Africa's first nanosatellite

1 of only 5 global magnetic measuring devices used to calculate the Earth's Magnetic Field Intensity

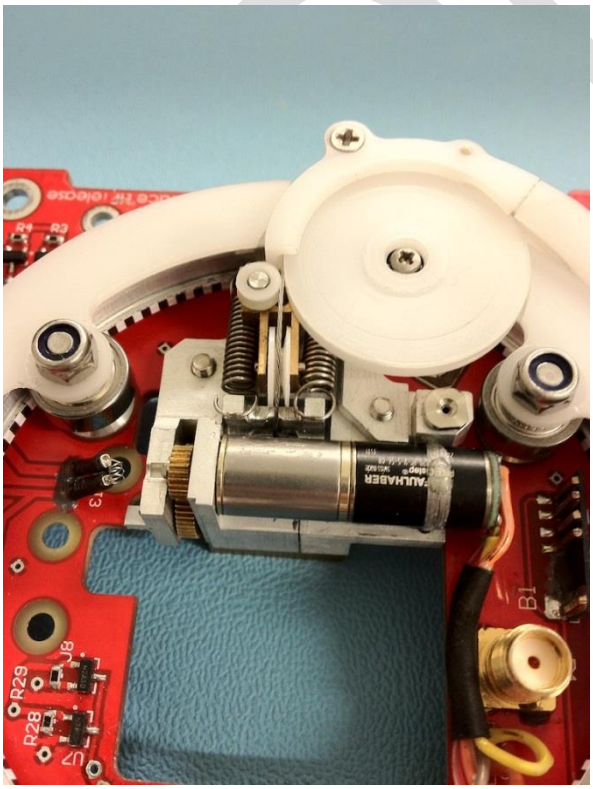
**What fits in the palm of your hand, weighs 1.3 kg and uses less power than a 5 watt light bulb? If you guessed ZACUBE-1, South Africa's first nanosatellite, then you are right.**

**ZACUBE-1** was designed and built mainly by postgraduate students at the Cape Peninsula University of Technology (CPUT) in conjunction with SANSA as part of the CubeSat programme. A CubeSat is a cube-shaped low-cost satellite measuring 10cmx10cmx10cm.

One of the payloads on-board ZACUBE-1 is a High Frequency (HF) radio beacon, developed in collaboration with SANSA to calibrate the HF radar in Antarctica. The CubeSat programme provides a number of useful applications such as education and training, technology demonstration, earth observation and space weather research. It is an ideal programme for students as they can be involved in all the phases of the development of a satellite. CubeSats are becoming increasingly popular with universities and technological institutes around the world, because of their considerable educational benefits.



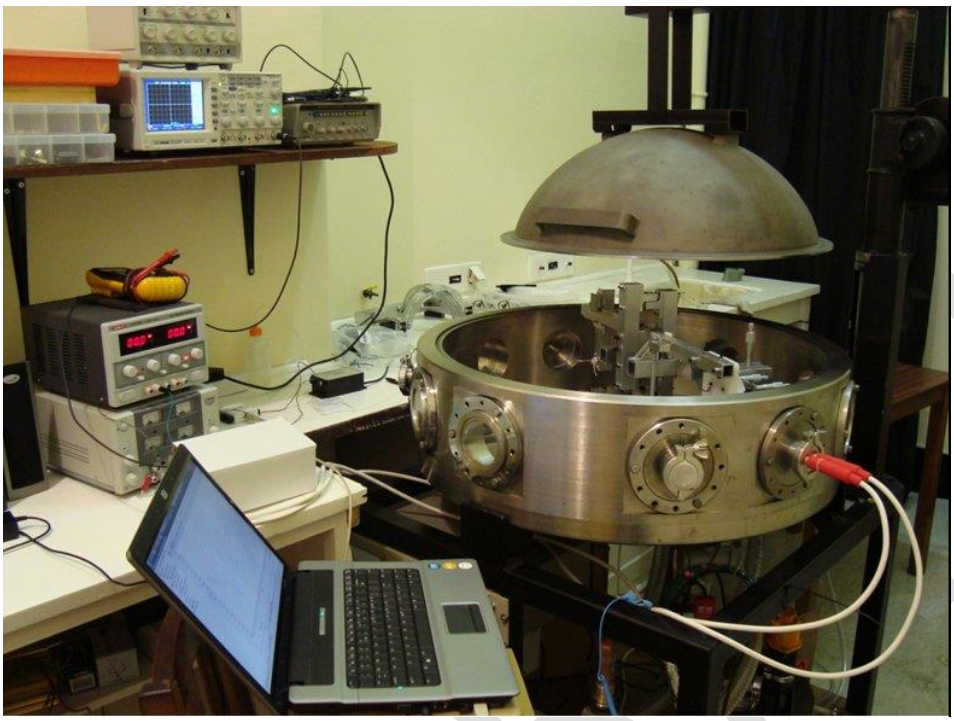

The components of ZACUBE-1



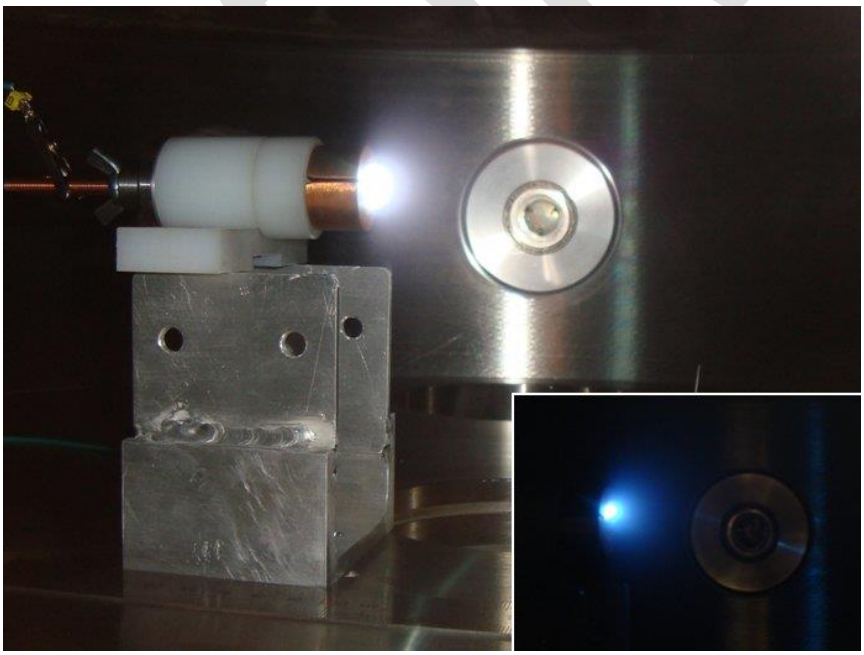
The antenna release mechanism of the HF Beacon on-board ZACUBE-1

SANSA PhD student is involved in studies on to develop a unique type of satellite propulsion system called **Vacuum Arc Thruster**. These small lightweight devices are used to help manoeuvre satellites in space by providing small pulses of thrust using only a few watts of power. This capability allows small satellites to position and orientate themselves with greater control and accuracy.

SANSA will be involved in the development of Wits' first plasma propulsion laboratory and the unique equipment required to test the prototype thruster.



Vacuum test chamber inside the Plasma Propulsion Laboratory at Wits University



Vacuum Arc Thruster firing a plasma jet pulse.

*Applying science to solve technical challenges*

**Compass Swing**

When flying an aircraft it is mandatory to have a functioning magnetic compass on-board in order to navigate effectively in the event of electronic navigation device failure. Electrical systems occasionally do fail, while the Earth's magnetic field never does. To obtain the greatest accuracy from a compass, it is important to determine the extent of its deviation errors and eliminate, or at least minimise, them by a process referred to as "swinging the compass". SANSA provides the necessary support and training for navigation clients.

A South African Air Force Avionics staff member conducting a compass swing procedure

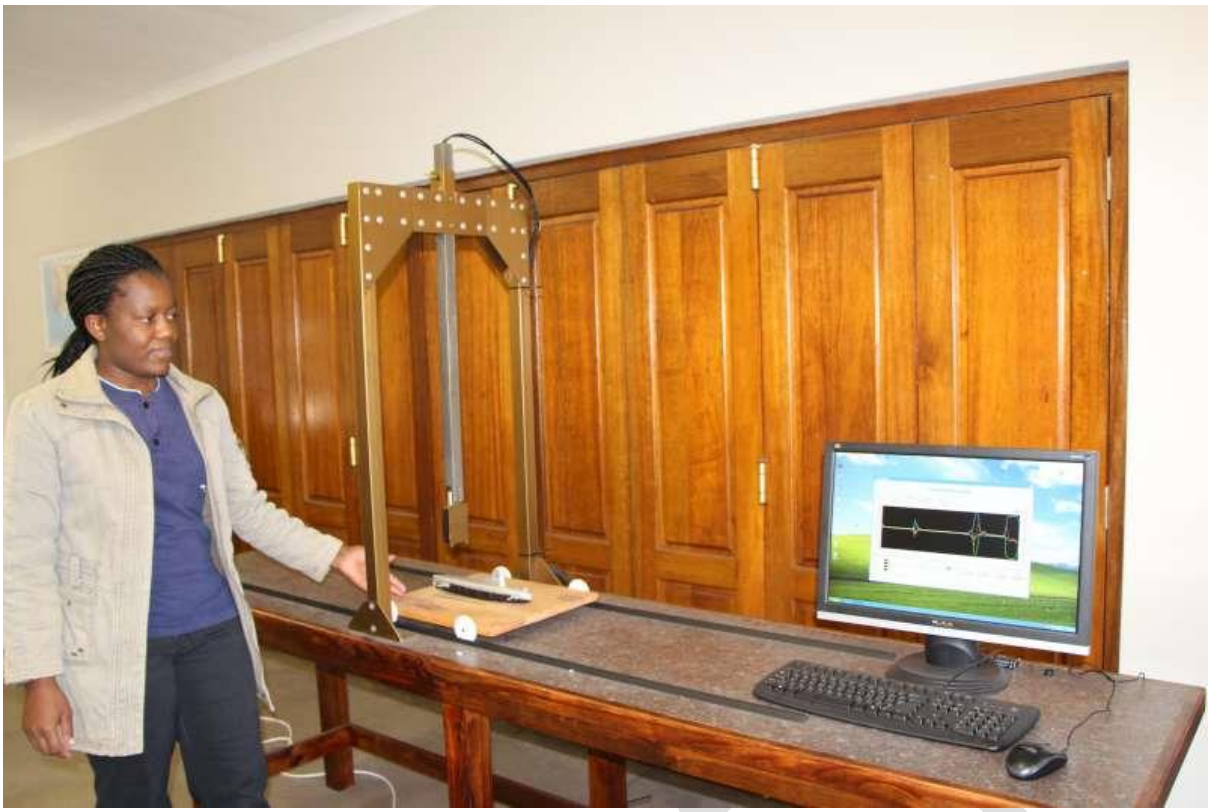
South African Air Force personal during the SANSA Compass Swing Training Course

**Demagnetising Ships for the Navy**

A steel-hulled ship is like a huge floating magnet with a large magnetic field surrounding it. The process of building a ship, within the Earth's magnetic field, develops a certain amount of permanent magnetism in the ship. When the ship moves, this field also moves and adds to or subtracts from the Earth's magnetic field. Essentially the moving ship builds up a magnetic signature which can trigger magnetic sensitive devices such as mines that are designed to detect these magnetic signatures. It is therefore necessary to reduce a ship's magnetic through a deperming procedure that uses larger current-carrying coils to enable the ship to pass over mines and other magnetic sensitive devices without triggering them.

A SANSA student has developed a small scale model of the deperming procedure. The model demonstrates how the procedure can be used on a larger scale for applications such as degaussing or deperming ships for the Navy.

A model ship is placed in the degaussing coil system designed to demonstrate how the magnetic signature of a ship can be reduced.

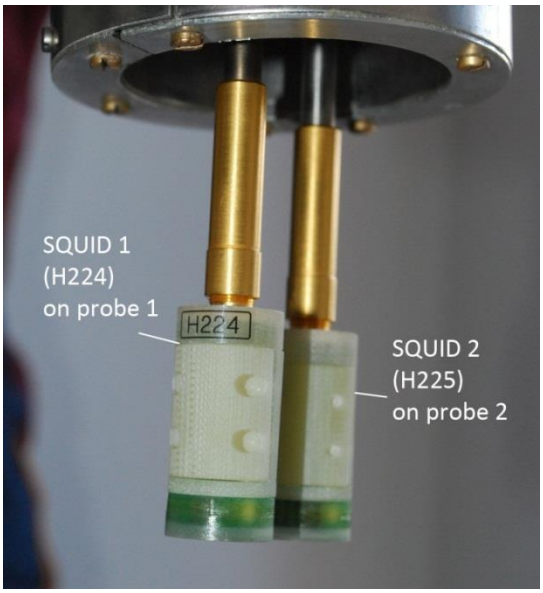


The model ship is then tested using a magnetic sensor to determine if it has been sufficiently degaussed.

**Superconducting Quantum Interference Device**

A High Temperature SQUID (Superconducting Quantum Interference Device) sensor was recently installed at SANSA in partnership with Laboratoire Souterrain à Bas Bruit in France and the University of Stellenbosch. SQUID sensors are used for various applications including earthquake prediction, geothermal energy surveying and measuring small variations in the Earth's geomagnetic field. SANSA aims to utilise this technology for measuring and predicting adverse space weather and other magnetic phenomena, with a specific long-term plan to predict precursors to earthquakes and student training.

SANSA team conducting a magnetic survey of the underground tunnels at the Laboratoire Souterrain à Bas Bruit in France




Superconducting Quantum Interference Device located at SANSA

**Taking GPS to the next level**

SANSA also completed three Satellite Based Augmentation System (SBAS) trials aimed to illustrate the necessity of an improved navigation system, by comparing the results of normal GPS to that of the SBAS system. The training sessions gave SANSA and the industry, who will serve as primary users, a strong background to the technical and programmatic aspects of the system.

A tractor installed with the normal GPS as well as the SBAS systems in Heidelberg

# Being a Global Player

SANSA aims to foster international cooperation in space-related activities for the benefit of South Africa.

10 IOTs and 22 Launch supports successfully provided to local and international clients

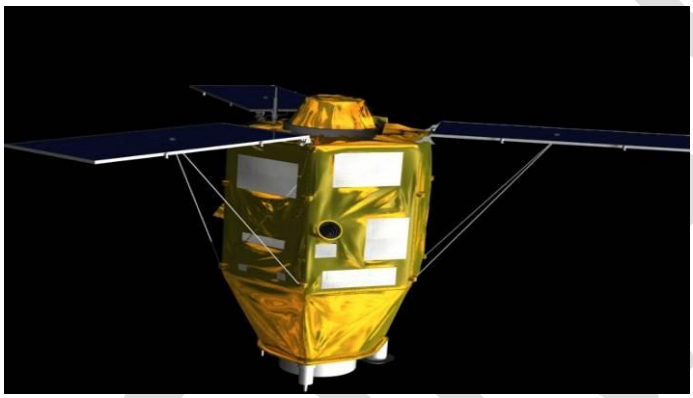
## *Cutting-edge products and services to the global space community*

**There is a race on patenting new innovative product and services globally as the world economy is shifting the value of knowledge above that of resources. To remain competitive South Africa needs to increase the output of such innovative technologies with space offering huge growth potential and opening up the global marketplace.**

SANSA took advantage of a favourable international market with a concerted effort to improve services to all clients. The forecasted growth in the IOT market indicates the increase in space mission investments around the world and the SANSA Space Operations facility offers state-of-the art ground facilities to host receiving antennae as well as the skill and latest technologies to support these space missions at launch and in orbit..

SANSA's satellite tracking, telemetry and command (TT&C) unit has been responsible for 10 IOTs and 22 TOS services this past year and a few of these are detailed below:

The Low Earth Orbiting Phase (LEOP) missions that SANSA completed during this financial year for international clients included the **Pleiades-1B** Earth observation satellite which was built by Astrium and launched aboard a Soyuz launcher from the European Space Centre in French Guiana. Pleiades-1B is the second dual-use, very-high-resolution satellite for the Pleiades constellation.



Transfer-orbit Support (TOS) services were provided to The Eutelsat **70B/W5A** telecommunications satellite which was from the Odyssey Launch Platform in the Pacific Ocean.

SANSA was responsible for the TOS support of Ariane's Skynet 5D communication satellite as well as the Amazonas-3

satellite.


Amazonas-3

Azersat-1

In-orbit Support (IOT) services were provided to **Astra 2F,** one of the Astra communications satellites owned and operated by SES. It was launched from CSG Kourou, French Guiana; to the Astra 28.2°E orbital slot. This satellite will provide free-to-air and encrypted direct-to-home (DTH) digital TV and satellite broadband services for Europe and Africa.

Below is a table of support services rendered to various clients. ,

| Satellite Name | Client | Service rendered |
|---|---|---|
| Nimiq-6 | Telesat | TOS |
| IS19 | Intelsat | TOS |
| FM 6 | Intelsat | TOS |
| Jupiter | Intelsat | TOS |
| Sirius | Intelsat | TOS |
| Sirius | SES | IOT |
| IS-23 | Intelsat | TOS |
| Hylas-2 | Intelsat | TOS |
| Hylas-2 | Intelsat | IOT |
| IS-20 | Intelsat | TOS |
| IS-20 | Intelsat | IOT |
| TC2D | CNES | De-orbit |
| IS-21 | Intelsat | TOS |
| ASTRA-2F | Intelsat | TOS |
| Skynet-5D | CNES | TOS |
| GalileoIOv2 | CNES | TOS |
| Spot 4 | CNES | De- Orbit |
| Jason-3 | Intelsat | TOS |
| Astra-5b | Intelsat | TOS |
| Astra-2G | Intelsat | TOS |
| Satmex 8 | Intelsat | TOS |
| IS-10 | Intelsat | IOT |
| Anik-G1 | Telesat | TOS |
| Skyterra | BSS | TOS |
| W3D | Intelsat | TOS |

## *Sharing scientific and technical know-how*

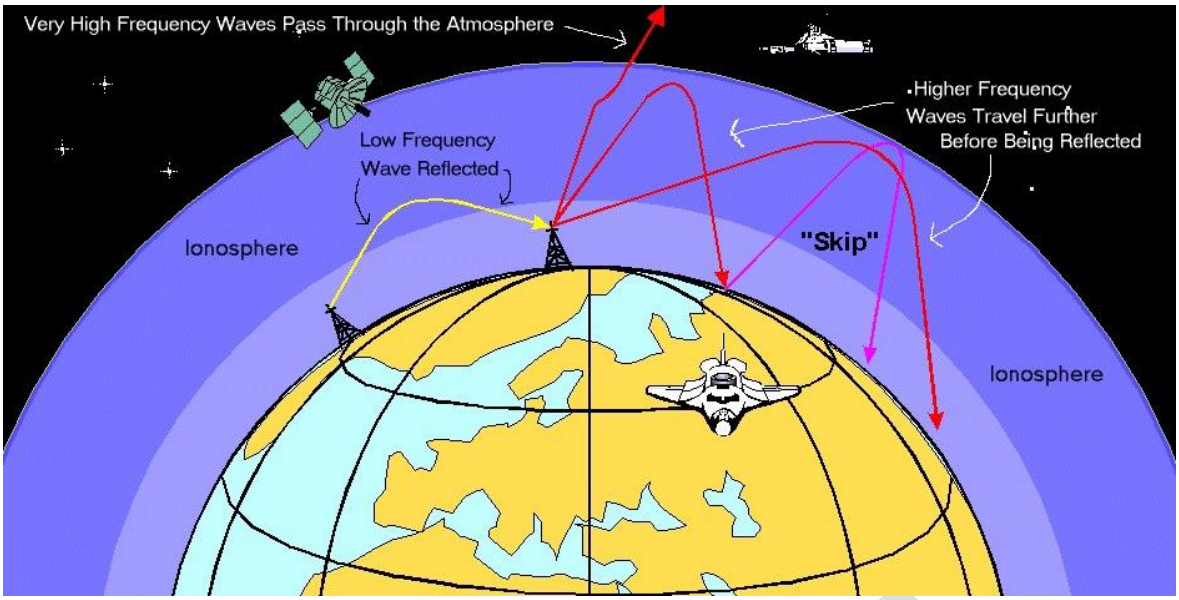
**No one nation can claim ownership of space or space knowledge as it requires collaborative engagement and knowledge sharing to ensure as a human race, we answer questions on our existence and evolution as well as our futute.**

SANSA realises the complexity of space and space investment which alludes to the need for global collaboration to maximise the impact for humanity. The Agency strived to develop strategic partnerships for the benefit of South Africa. These partnerships provide opportunities through the exchange of resources, the interchange of skills and knowledge as well as possible cost-saving by collaborative projects/ programmes.

SANSA has participated or hosted various significant workshops and meetings for the space community to ensure knowledge sharing and collaborative engagement on behalf of South Africa. Some of the events included participation as lead South African representative of. the **Scientific Committee on Antarctic Research (SCAR)**, an organisation charged with the mandate of initiating, developing and coordinating high quality international scientific research in the Antarctic region as well as the role of the Antarctic region in the earth system. SCAR members represent 36 nations with research activities in Antarctica and in the sub-Antarctic oceans and islands.

SANSA also hosted the 2013 **Ionospheric Monitoring in Africa Workshop** which brought together scientists from various European and African countries in an effort to highlight the current state of Africa's ground-based ionospheric monitoring network as well as the opportunities to improve mapping over the African continent.

SANSA and international delegates who attended the 2013 Ionospheric Monitoring in Africa Workshop hosted by SANSA Space Science.




A Google image depicting the Ionosphere.

SANSA representative delivered a space weather presentation at the fiftieth session of the **Committee on the Peaceful Uses of Outer Space (COPUOS)** was held for the development of laws and treaties governing space-related activities and comprises members from 74 nations. The Committee encourages continued research and the dissemination of information on outer space matters.

SA delegation at COPUOS at the United Nation Office in Vienna, Austria

In addition to these, SANSA hosted national and international delegates at the Lead **User Group workshop**, and hosted the **EU-South Africa Space Dialogue.**

The KSAT antenna was unveiled by the Norwegian Ambassador and since its inception in early 2012, this project has acquired over 1000 images with a 99.2% satellite pass tracking rate, ushering a new era in the partnership between SANSA, KSAT and the Norwegian Space Centre.

The KSAT Inauguration solidifies the increasing cooperation between South Africa and Norway, in the Space industry

A number of international entities visited SANSA during the financial year, including representatives from the UK Space Agency, US Government Officials, Boeing, USN, ARTEL, CNES; delegations from Ghana, Ukraine, Japan, the DST India, Norway and EGNOS The visits provide opportunities to collaborate in the all areas of space products and services as well as HCD.


The EU-SA Space Dialogue included delegates from SANSA, the DST and the European Union

By attending meetings and being part of the International Space committees, SANSA continues to build effective and mutually beneficial relationships. Such an opportunity presented itself when SANSA was invited to join the SpaceOps team as a member-at-large during the **Technical Interchange for Space Mission Operations and Ground Data Systems (SpaceOps) 2012**.

Swedish astronaut Christer Fuglesang visited the SANSA stand

The SpaceOps members gathered for a group photo outside of the Miraikan

# Annual Performance Information for 2012/13

29 May 2013

# Annual Performance Information for 2012/13
# 29 May 2013

## Executive summary

During the period under review, SANSA had a total of 43 key performance indicators in the core programmes of Earth Observation, Space Operations and Space Science. Out of the 43 performance indicators, 40 were achieved by the end of the 2012/13 financial year, translating to a 93% success rate.

**Goal 1: World-class and efficient services and societal benefits (Societal Capital)** was achieved at 100% across all constituent programmes. **Goal 2: Cutting-edge research, development, innovation, technology and applications (Intellectual Capital)** was similarly achieved fully (at 100%) in all programmes.

Two performance indicators out of 22 measuring **Goal 3 - Effective development of human capital, transformation and engagement of citizenry (Human Capital),** were partially achieved, resulting in an achievement of 91%. The reason for this was the challenges experienced in the recruitment of interns in space applications and the engagement of science educators.

**Goal 4 - Globally competitive national space industry (Economic Capital)** was achieved at 67%. This performance was also impacted by challenges faced in attracting additional external science contract income. There are measures in place to mitigate these challenges.

The achievement of **Goal 5 - Make South Africa a recognised global space citizen (Global Capital)** was a success at 100%.

| SANSA | | | | |
|---|---|---|---|---|
| | Name of Goal | Achieved | Target | % |
| Goal 1 Societal Capital | World-class and efficient services and societal benefits. | 9 | 9 | 100% |
| Goal 2 Intellectual Capital | Cutting-edge research, development, innovation, technology and applications. | 6 | 6 | 100% |
| Goal 3 Human Capital | Effective development of human capital, transformation, science advancement and engagement of the citizenry. | 20 | 22 | 91% |
| Goal 4 Economic Capital | Globally competitive national space industry. | 2 | 3 | 67% |
| Goal 5 Global Capital | Make South Africa a recognised global space citizen. | 3 | 3 | 100% |
| | | 40 | 43 | 93% |

| Earth Observation | | | |
|---|---|---|---|
| | Achieved | Target | % |
| Goal 1 | 3 | 3 | 100% |
| Goal 2 | 3 | 3 | 100% |
| Goal 3 | 6 | 6 | 100% |
| Goal 4 | 1 | 1 | 100% |
| Goal 5 | 1 | 1 | 100% |
| | 14 | 14 | 100% |

| Space Operations | | | |
|---|---|---|---|
| | Achieved | Target | % |
| Goal 1 | 3 | 3 | 100% |
| Goal 2 | 1 | 1 | 100% |
| Goal 3 | 6 | 7 | 86% |
| Goal 4 | 1 | 1 | 100% |
| Goal 5 | 1 | 1 | 100% |
| | 12 | 13 | 92% |

| Space Science | | | |
|---|---|---|---|
| | Achieved | Target | % |
| Goal 1 | 3 | 3 | 100% |
| Goal 2 | 2 | 2 | 100% |
| Goal 3 | 8 | 9 | 89% |
| Goal 4 | 0 | 1 | 0% |
| Goal 5 | 1 | 1 | 100% |
| | 14 | 16 | 88% |

# Programme Performance Overview

**During 2012/13 the South African National Space Agency (SANSA) recorded significant achievements in striving towards its strategic goals.**

- **Increased demand for satellite data distribution**

With increasing awareness and appreciation of the efficiency and productivity gains that can be derived from the use and application of satellite imagery, by an increasing number of end users, SANSA has seen a huge demand for its products and services. Satellite imagery is increasingly applied in addressing challenges in agriculture, water resource monitoring, mapping of natural disaster areas, the effects of climate change over time as well as planning of human settlement. To meet this demand SANSA distributed more than 164 000 scenes of processed satellite data to key stakeholders and customers against a distribution target of 42 000 for the year. This performance is attributable to an increase in requests for satellite data, the distribution of the Fundisa Discs to higher education institutions as well as the distribution of MISR (Multi-angle Imaging SpectroRadiometer) data to the CSIR.

- **Database of Informal Settlement and Environmental Condition Assessment improves quality of lives**

With urbanisation at 62% and increasing annually at a rate of 1.2%, putting a strain on urban amenities, SANSA is developing an Informal Settlement Environmental Condition Database. This will enable an environmental analysis of the development of informal settlements over a period of time. Satellite data will inform the extent of change over time and inform policy decisions regarding the dynamics of human settlements. A total of 45 municipalities were targeted and 35 municipalities have since been completed. Preparation for the full release of the completed informal settlement database is currently underway.

- **SANSA supports international launch market**

Satellite communication and broadcasting represents a substantial market of the space industry and is largely driven by satellite television.
The increasing growth in the launch of communication satellites is primarily driven by the number of households around the world who are direct broadcast satellite subscribers. SANSA has seen an increasing demand from global communication satellite manufacturers and operators for launch support services. This has resulted in the number of supported mission launches for international clients exceeding the annual target by 10% at year end. Increasing demands for Orbit Testing (IOT) services, which is the monitoring of the proper deployment of a satellite after it has been launched in space, saw the Agency performing 10 of these tests against an annual target of four.

- **High impact research outputs contributes to South Africa's science global knowledge share**

South Africa is progressively improving its position in international science rankings as it continuously contributes to more high impact research outputs in support of the National System of Innovation. Through directing research efforts in space science and technology, the number of ISI (Institute for Scientific Information) publications per SANSA researcher for the year was 2.56, well above the national average of 1.2 to 1.5 per researcher. This demonstrates the Agency's continuous strive to develop emerging researchers as well as maintain quality and impactful high research output.

- **Providing space weather knowledge through the National Equipment Programme**

In support of the Ten Year Innovation Plan and the National Research and Development Strategy, SANSA is undertaking world class research to study the link between the magnetosphere, the ionosphere and the earth's surface. This system is known as the South African Ionospheric, Geophysics and Geomagnetic Experimental Resource (SNIGGER). In collaboration with partner universities, SANSA has acquired equipment through funding from the National Research Foundation. The natural phenomena that will be studied with SNIGGER presents a unique opportunity that will lead to a better understanding of the space weather chain. Participating in this research will enable SANSA to contribute to research capacity development in space science and technology. National scientists will be empowered to answer long standing questions about the space environment and its effects on technology. Other questions to be answered through this ground-breaking science relate to a greater understanding of how the earth field shields and hence preserves humanity from solar bombardment.

- **Science Advancement and Student Support**

  To ignite a spark of awareness and appreciation in a young mind about the possibilities of earth observation technologies, satellite technology, and space science and space operations is what SANSA continuously strives to achieve. The Agency forges ahead, taking science outreach to far flung locations in South Africa such as the remote villages of Limpopo and the coastal towns of the Western Cape. During the year under review SANSA reached 6500 learners and 270 educators through direct engagements to create an awareness of space science and technology. As part of building the future skills pipeline of science and technology researchers and scientists, SANSA collaboratively trained a total of 46 students at the Agency's facilities. The students were exposed to earth observation techniques and applications, scientific research, data processing, electronics, satellite technology, space science and space operations.

- **Stimulating a sustainable local space industry**

  SANSA made an active contribution to the South African space industry through research, technological advancement, science advancement and local and global partnerships, as well as provided services that stimulated industry growth. The Agency provided 16 earth observation and space science end-user services and products to industry clients and partners against the annual target of 10 products and services, indicating the growth potential of this industry.

- **South Africa :Taking our place as an emerging space - faring nation**

  SANSA is the primary point of contact and the face of South Africa in the global space arena. It is a vehicle for strategically positioning the country among the community of space-faring nations. SANSA met with a total of seven space agencies including DLR (German Space Agency); JAXA (Japanese Space Agency); ISRO (Indian Space Agency); ASAL (Algerian Space Agency); ROSCOSMOS (Russian Space Agency); ESA (European Space Agency) and JRC, The European Commission's Joint Research Centre. Further, the Agency hosted foreign visitors from DLR, the UK Space Agency, JAXA, and the Ukraine Space Agency. SANSA also participated in various multi-national projects and forums including GEO, CEOS, SFCG (Space Frequency Coordinating Group), IAC (International Astronomical Congress) as well as in the African Union Space Working Group for the development of African space policy and strategy.

# Corporate Support Programm

The overall strategic purpose of the programme as aligned to the five SANSA goals is to: -

- ensure that SANSA is operationally efficient,
- managed cost-effectively,
- complies with good corporate governance principles, and
- enables seamless integration and collaboration between all SANSA directorates.

The programme is comprised of the CEO's Office, the Finance and Business Division as well as the Corporate Services Division.

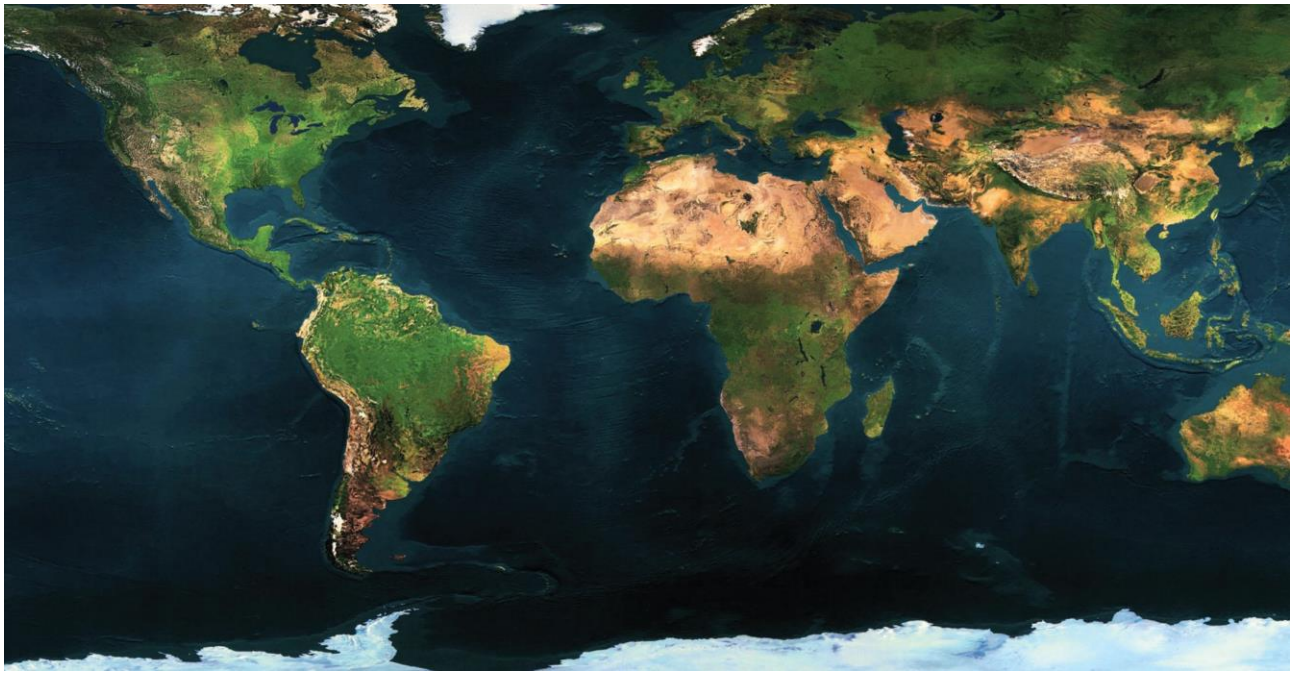
**Performance Highlights**

The Management and Leadership strategic objective was adequately achieved at about 90%, as all corporate leadership structures are in place and fully functioning. Considering that at least 80% of corporate and directorate enabling procedures and processes are in place and functioning, the strategic objective of Operational Excellence was achieved. The full development and implementation of a planning and performance management framework and the attendant processes and systems was partially achieved, facilitating Excellence in Planning and Performance Management. The framework was also approved by the Board and full implementation is in progress.

All legislated compliance plans, such as the developments of the Strategic Plan, Annual Performance Plan, Quarterly Reports and Annual Report were developed and delivered within the required timeframes. Effective performance monitoring and evaluation is on-going through performance reports and stronger exercise of the oversight role of management.

Progress was made in achieving the strategic objective of Excellence in Communication and Staff and Stakeholder Relations. Internal and external communication plans, the institutional cohesion plan, as well as the external stakeholder engagement plan, were implemented. Finally, the Risk Assessment was conducted and Audit corrective actions successfully undertaken in fulfillment of the strategic objective of Good Corporate Governance.

| Corporate Support | | | | | |
|---|---|---|---|---|---|
| Strategic Objective | Outputs | Activities | Target 2012/13 | Actual 2012/13 | Reason for Variance |
| Management & Leadership Excellence | Effective & efficient management & leadershipp structures, systems & processes<br>Efficient & effective administrative structures & processes | Management, administration & leadership | All corporate & directorate management & leadershipp structures in place & functioning at 100% (1CS1) | All management and leadership structures are in place and functioning at about 90%. | A few appointments were made after the end of the financial year |
| Operational Excellence | Efficient core operating units<br>Enabling user-friendly procedures, processes & systems<br>Fast turn-around times and accountability | Provision of operationally efficient, cost effective and accountable service offering | At least 80% of corporate & directorate enabling procedures & processes in place & functioning (1CS2)<br>At least 80% of corporate & directorate enabling operational systems in place & functioning (1CS3)<br>At least 90% attainment of the set turn-around times (1CS4) | At least 80% of corporate and directorate enabling procedures and processes and operational systems are in place and functioning | None |
| Excellence in planning and performance management | Strategic & Operational planning alignment<br>Intelligent business monitoring, evaluation, benchmarking & reporting | Development of strategic, performance & operational plans<br>Monitoring & evaluation of performance | Full development & implementation of a planning & performance management framework, processes & systems (1CS5)<br>Timely delivery of good quality plans and reports (1CS6)<br>Effective performance monitoring & evaluation (1CS7) | -Institutional planning & performance management framework approved and implemented.<br>- Effective performance monitoring and evaluation in place | None |
| Excellence in Communication; Staff & Stakeholder Relations | Internal & external communication excellence<br>Internal & external stakeholder relations excellence | Internal & external communication<br>Creation of a conducive working environment & an attractive employee value proposition<br>Engagement of external stakeholders | Effective internal & external communications (CS8) Good internal relations & institutional cohesion in a transformed environment (CS9)<br>Good & effective external stakeholder relations (CS10) | Internal and external communications, Institutional cohesion plan and external stakeholder engagement plan implemented. | None |
| 5 Good Corporate Governance | Risk assurance<br>Compliance with Legislation | Conduct maturity assessments<br>Develop and implement focused internal audit & corrective functions<br>Develop and implement compliance testing & corrective | Clean audit (CS11) | -Risk assessment conducted.<br>-Audit corrective actions successfully undertaken. | None |



# Earth Observation Programme

## Functional Focus

SANSA, through the SANSA Earth Observation directorate, distributes imagery to government under a multi-user license. This ensures the supply of cost- effective data to government in support of various national imperatives. In addition, the availability of processed imagery to stakeholders, such as research councils and academic institutions, enables these organisations to utilise all the multi- government licensed imagery at no additional cost. SANSA also provides HEIs with geospatial resources for student training through its Fundisa Disk Programme (FDP) to promote the use of spatial information at tertiary level.

Earth Observation,as a source for geo-information,contributes to the management, sustained utilisation, preservation and understanding of natural resources; improved health, safety and security; disaster forecasting, monitoring and mitigation; increased Research and Development (R&D) data stock and value-added data products and information; and the provision of decision-making, policy-making and planning instruments for government and other stakeholders. Collectively, these elements contribute to a vast array of socio-economic benefits and improved livelihoods.

The impact of Earth Observation lies in providing:

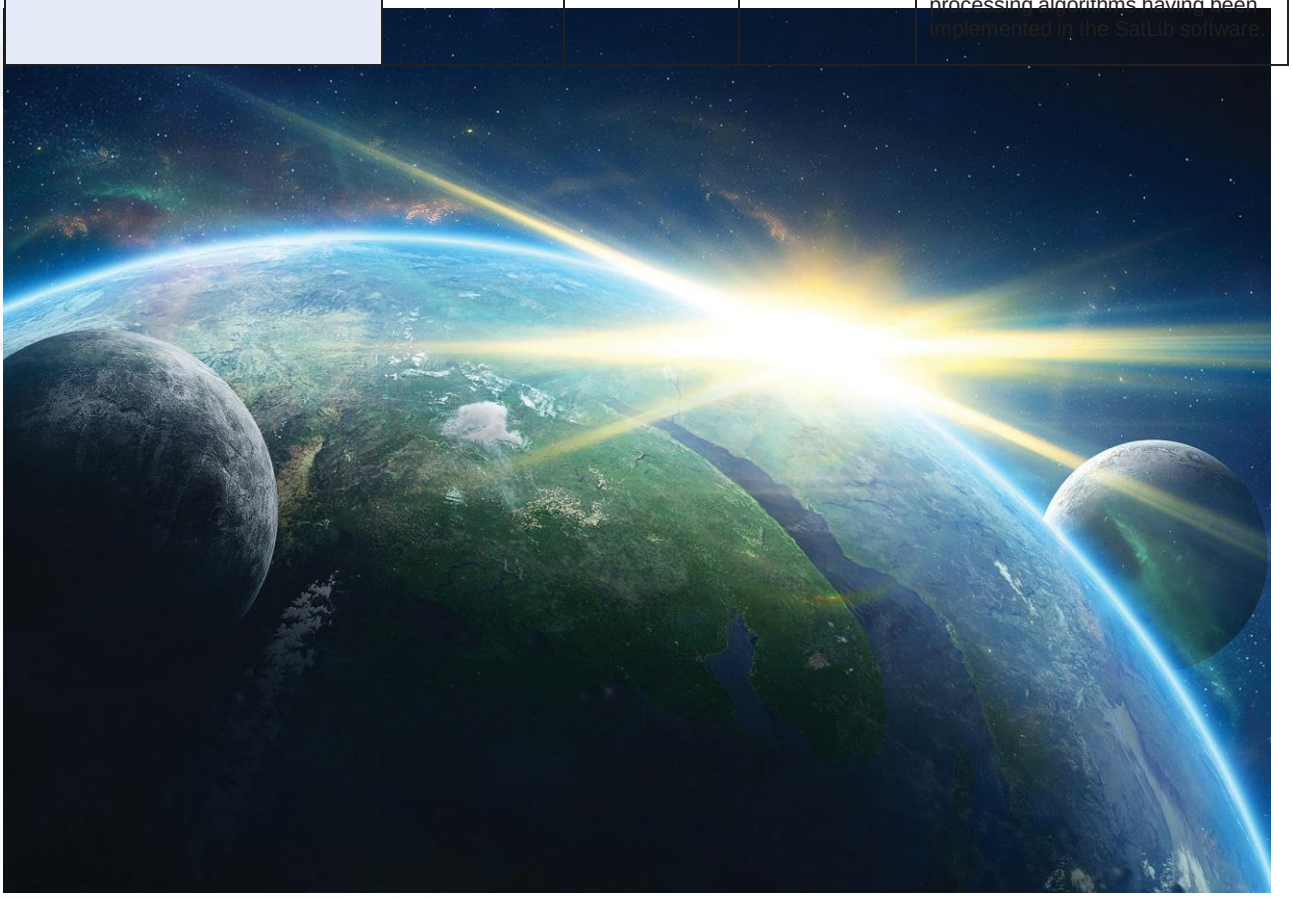
- essential Earth observation services for socio-economic benefit; including water, environmental and other resources management, disaster management and health, safety and security management.
- data and value-added remote sensing services for research and development in Earth observation applications.
- human capital development and science advancement in geo-informatics, image and data processing and remote sensing.

The core functions of the Earth Observation (EO) programme include:

- contributing to the implementation of the South African Earth Observation Strategy (SAEOS);
- data acquisition from South African and global earth observation satellites;
- coordinated procurement of satellite data and distribution of data/images to government departments, national R&D institutions and HEIs;
- the long-term archiving of all satellite data acquired;
- the processing and production of value-added satellite image products and services for various geo-information applications;
- continuous improvement of in-house reference datasets to higher geometrical accuracies using improved digital surface and elevation models;
- the development and maintenance of easily accessible and efficient distribution channels of value-added image products through catalogue systems;
- development of human capital to advance the above and meet the skills needs of the country;
- " the advancement of science amongst the youth and the public;
- " the development and maintenance of international partnerships for the advancement of the above objectives;
- " contributing to the development of innovative EO sensors; and
- " the development of EO applications as per stakeholder needs.

The delivery achievements of the Programme are depicted below.

| Programme | | Earth Observation | | |
|---|---|---|---|---|
| Performance Indicator | Baseline 2011/12 | Actual Performance against target | | Reason for Variance |
| | | Target 2012/13 | Actual 2012/13 | |
| Amount of data acquired and archived (Scenes) all forms (1EO1) | 4000 | 4200 | 16840 | The biggest contribution was from Multi-angle Imaging Spectro-Radiometer (MISR) data (Once off donation). Another portion was as a result of fixing a technical problem that prevented SANSA from receiving LandSat 7 data. |
| Amount of EO data distributed (Scenes) (1EO2) | 40000 | 42000 | 164841 | The higher performance is attributable to the MISR data which was distributed to the CSIR as well as Fundisa Discs distributed to universities. Four Fundisa Discs were sent out totalling 2257 images and 14152 MISR images. |
| Number of end-user applications/products (1EO3) | 3 | 3 | 9 | Since the appointment of a remote sensing applications developer, there is dedicated effort to develop image processing applications based on open source platforms. The higher performance is a result of image processing algorithms having been implemented in the SatLib software. |



| 7 | | Earth Observation | | |
|---|---|---|---|---|
| Performance Indicator | Baseline 2011/12 | Actual Performance against target | | Reason for Variance |
| | | Target 2012/13 | Actual 2012/13 | |
| Amount of data distributed for research (Scenes) (1EO4) | 15000 | 16000 | 41126 | Through targeted engagement activities with various stakeholders, SANSA has experienced an increase in requests for satellite data from Universities and research institutions. The higher performance is a result of the distribution of Fundisa Discs to South African universities. |
| Number of formal collaborative research projects or collaborations (1EO5) | 5 | 5 | 5 | |
| Number of formal R&D reports and publications (1EO6) | 10 | 12 | 39 | Joint publication with other research institutions has increased the number of peer reviewed journal publications. Out of the 39 reports produced, 10 were peer reviewed articles. Currently the success is mainly attributed to joint research and supervision of Masters and PhD students with University of Pretoria, CSIR Meraka respectively. |
| Number of students/interns supported/trained (1EO7) | 5 | 6 | 7 | Two additional interns were recruited than planned. |
| Proportion (%) of students/interns supported/trained from designated groups (1EO8) | 60% | 60% | 100% | All students interns are from designated groups. At SANSA there is a strong drive to provide employment opportunities to individuals from previously disadvantaged groups. |
| Number of short courses conducted (1EO9) | 2 | 2 | 4 | Performance was exceeded due to collaborative training with other institutions. One course on Hyperspectral in conjunction with Southern Mapping and a GIS short course for teachers in Limpopo Province were held. |
| Number of staff supported/trained through formal programmes (1EO10) | 5 | 5 | 11 | Short courses were provided to staff. Eight staff members attended the e-cognition course |
| Proportion (%) of supported /trained staff from designated groups (1EO11) | 75% | 75% | 100% | A large number of staff from designated groups were trained |
| Proportion (%) of staff from designated groups in the top three tiers of the organogram (1EO12) | 30% | 40% | 75% | Three quarters of SANSA Earth Observation management is diverse |
| Number of collaborative R&D projects with industry (1EO13) | 2 | 2 | 2 | |
| Number of multi-national projects (1EO14) | 2 | 2 | 2 | |

# Space Operations Programme

Figure 1: SANSA Space Operations in Hartebeesthoek, Roodepoort, South Africa

## Functional Scope

SANSA Space Operations operates state-of-the-art ground station facilities and provides services to the local and international space industry and governments. These services include launch support and early-orbit support (LEOP), in-orbit testing (IOT), satellite life-cycle support and mission control. The objective is to be the leading ground station in the African continent by focusing on:

- satellite ground services through telemetry, tracking and command (TT&C) for the various launcher and satellite support services, as well as hosting satellite ground infrastructure for various international and local clients.
- space applications in collaboration with government departments and private industry,specifically on:
  - o downloading Earth observation data from various LEO satellites (SPOT, Landsat and others), an application in which SANSA Space Operations is the leader in Africa.
  - o downloading datasets from Space Science payloads. o communication and data transmission, with the Department of Communications (DoC) and industry.
  - o positioning,navigation and timing,with National Geo- spatial Information (NGI), the Department of Transport (DoT) and industry.

SANSA Space Operations is uniquely positioned as the primary ground-receiving station and TT&C service provider on the African continent. It has the competitive advantage of covering the necessary geographical footprint, full coverage of the entire frequency range (L,S,C,ext C,X,Ku and Ka),and the operational and technical excellence to serve both local and international markets. Figure 2 demonstrates the favourable position of Hartebeesthoek for the TT&C of satellites launched from global launch sites.

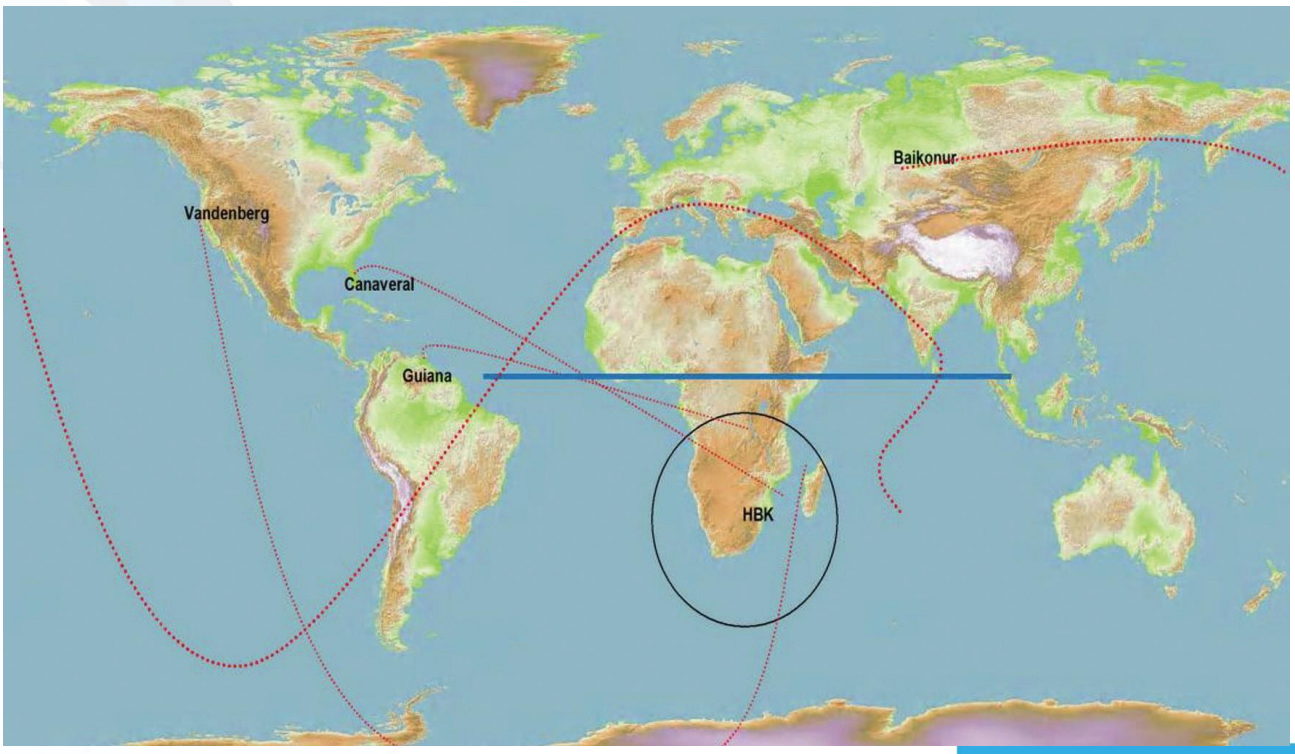



Figure 2: Map showing the favourable position of Hartebeesthoek

At present,SANSA operates, maintains and hosts 22 antennas for services rendered to local and international clients. The following table shows the telemetry,tracking and command clients and their associated market segment:

| | | | | | | | |
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| Customer | LEOP | IOT | Routine support | Monitoring | Launch support | Network providers | Hosting services | % workload per annum for 2012-2013 *(based on income and service required from client)* |
|---|---|---|---|---|---|---|---|---|
| SAS European satellite services | | | | | | | X | 1% |
| Boeing Launch Services | | | | | X | | | 0% |
| Boeing Satellite Services | X | | | | | | | 0% |
| CNES | X | | X | | | X | X | 12% |
| Eutelsat | | X | | X | | | X | 2% |
| Intelsat | X | X | | X | | X | X | 28% |
| SES Astra | X | X | | | | | | 1% |
| Telesat | X | | | | | | | 1% |
| USN | | | | | | X | | 1% |
| SANSA EO | | | X | | | | | 21% |
| Orbcomm | | | | | | | X | 1% |
| KSAT | | | | | | | X | 13% |
| Skytrax | | | | | | | X | 9% |
| HartRao | | | | | | | X | 3% |

In addition to its commercial (private) customers, SANSA Space Operations has additional public and institutional stakeholders. These include, but are not limited to, the European Commission (EC), European Space Agency (ESA) and Defence Geo-spatial Intelligence (DGI).

Over the years, SANSA Space Operations has made an impact on government and the satellite industry through quality and reliable services as well as partici pation in many international forums. SANSA Space Operations activities include:

- globally competitive space operations and applications, with services provided daily to satellite operators around the globe.
- launch support,tracking telemetry and command services, for example the LEOP services to Hughes Space and Communications.
- hosting and managing ground stations for international clients, for example the Orbcomm Gateway Station.
- applied research, development and innovation in key space operations and applications, for example the EGNOS project, which improves the accuracy, integrity and availability of existing GPS signals.
- human capital development and science advancement in space operations and applications, with many African countries regularly sending students for training and practical experience at SANSA.

## Core Functions

The core functions of the Programme are to:

- Render satellite launch and early orbits services,satellite in-orbit testing (IOT), satellite mission and life support.
- Provide hosting of mission support infrastructure,including the satellite mission control services e.g. SumbandilaSat.
- Remote sensing and satellite data reception.
- Space-based navigation augmentation, positioning and timing.
- Develop HCD and advance science.

The delivery achievements of the Programme are depicted below:

| Programme | | Space Operation | | |
|---|---|---|---|---|
| Performance Indicator | Baseline 2011/12 | Actual Performance against target | | Reason for Variance |
| | | Target 2012/13 | Actual 2012/13 | |
| Amount of data directly downloaded for SANSA Earth Observation (Scenes) all forms (1SO1) | 4000 | 4200 | 6471 | This target was exceeded mainly due to the acquirement of Landsat 7. |
| Number of mission launch activities supported (1SO2) | 20 | 20 | 22 | The directorate received more launch support requests from major clients than anticipated. |
| Number of in-orbit tests undertaken (1SO3) | 3 | 4 | 10 | This result is mainly due to the availability of Space Operations systems for the testing of ESVAS for international clients and good marketing. |
| Number of formal R&D reports and publications (1SO4) | 2 | 3 | 3 | |
| Number of interns trained (1SO5) | 6 | 6 | 3 | There are three major factors that contribute to this target not being achieved: the inability to find skilled staff that is best suited for the job; the fact that interns are required to work in shifts; and the remoteness of the site.<br><br>Proposed Action to Rectify Non- achievement<br>The directorate is currently engaging with higher learning institutions to create a database of possible candidates to build on the internship programme |
| Proportion (%) of trained interns from designated groups (1SO6) | 60% | 60% | 100% | Trained students were all from designated groups |
| Number of staff supported/trained through formal programmes (1SO7) | 5 | 5 | 5 | |
| Proportion (%) of supported/trained staff from designated groups (1SO8) | 75% | 75% | 100% | |
| Proportion (%) of staff from designated groups in the top three tiers of the organogram (1SO9) | 40% | 40% | 43% | |
| Number of learners engaged (excluding festivals) (1SO10) | 1000 | 1200 | 1847 | Despite a slow start, SANSA put a lot of effort into achieving this goal. This was managed by going to schools and dedicating staff to these visits. |
| Number of educators engaged (excluding festivals) (1SO11) | 50 | 60 | 66 | Despite a slow start SANSA placed a lot of effort into achieving this goal by going to schools and dedicating staff to this goal. |

| Programme | | Space Operation | | |
|---|---|---|---|---|
| Performance Indicator | Baseline 2011/12 | Actual Performance against target | | Reason for Variance |
| | | Target 2012/13 | Actual 2012/13 | |
| Proportion (%) income from industry (1SO12) | 70% | 70% | 100% | |
| Client performance rating (%) (1SO13) | 95% | 95% | 97% | SANSA's operational performance targets were exceeded over the fourth quarter in both the CNES 2Ghz LEO and GEO -stationary housekeeping operations. An overall three-months Performance of 98.35% was achieved in the LEO operations area of measure, whilst 100% was achieved in the GEO measurement category. |

# Space Science Programme

## Functional Scope

The SANSA Space Science directorate leads the space science programme by utilising the advantages of South Africa's geographic position in two areas, in particular. Firstly, South Africa is the only African country with a scientific base in Antarctica. Secondly, South Africa is ideally located for the study of the South Atlantic Magnetic Anomaly, an area over the South Atlantic Ocean where aircrafts, shi ps and satellites are exposed to increased radiation from space, leading to the interruption of, and damage to, communication systems.

SANSA is also part of the worldwide network of magnetic observatories. It is responsible for research, infrastructure and data for monitoring the near-Earth space environment. The scope of activities for Space Science includes fundamental and applied space physics research, post-graduate student development, science advancement, space weather monitoring, and the provision of geomagnetic field-related services on a commercial and private basis. SANSA's research and services are managed by means of various programmes.

Space Science Research Programme: The research areas covered by this programme are diverse and include studies on the variation of the Earth's geomagnetic field and its application to navigation; the propagation of waves in the various regions of the space environment and their effects; diagnostic information on the propagation media; ionospheric characterisation; basic and applied space weather; space plasmas; and radio wave propagation.

Space Weather Programme: SANSA is host to the only Space Weather Regional Warning Centre in Africa, which operates as part of the International Space Environment Service (ISES). The space weather products and services are required primarily for communication and navigation systems in the defence, aerospace, navigation and communication sectors.

Human Capital Development: SANSA contributes by means of summer and winter schools, the supervision of MSc and PhD students, and teaching at partner universities. It aims to build the scarce skills required for the country's Science, Engineering and Technology (SET) programmes. In addition, SANSA also runs various in-service courses in
navigational support and space weather for the defence force, training about 80 South African National Defence Force (SANDF) staff members each year. The Agency is instrumental in advancing science by promoting the teaching and learning of science, increasing public awareness, interest, appreciation and understanding of space science. It also provides policy- makers with scientific information and decision-making tools.

Electromagnetic Technology: The technology and geomagnetic services provided by SANSA contribute significantly to the work of the navy, airforce, and army, and thus to the safety and security of all South Africans. In addition, SANSA offers technical and geomagnetic services to private aviation companies, neighbouring national airports, exploration companies, and the Hydrographic Office of the South African Navy. Hence, it plays a key role in the navigation, communication and mineral exploitation sectors of the South African economy.

## Core Functions

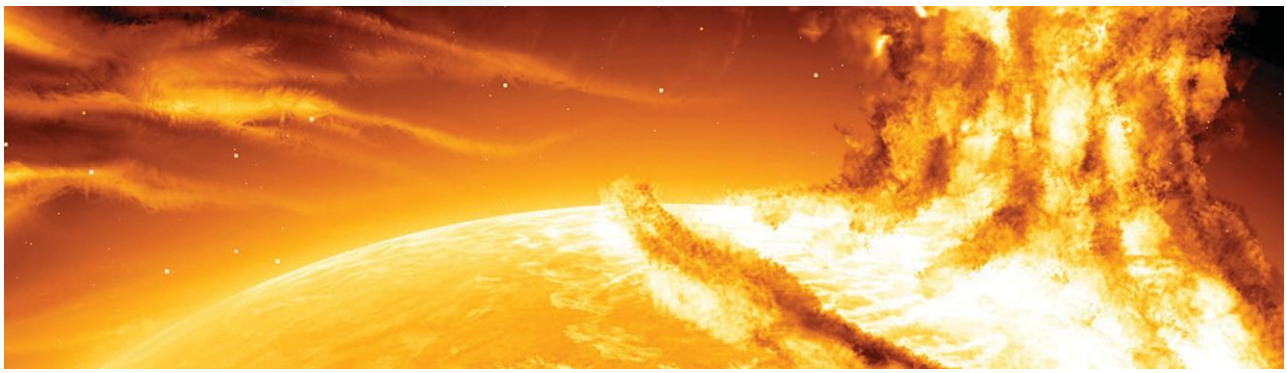
The core functions of the programme are the:

- Collection and distribution of data for research, knowledge-creation and human capital development;
- Provision of geo-space information and value-added data products and services for various stakeholders within, for example, the defence force and navigation sectors;
- Training of students and personnel in scientific research, data processing, data management, electronics and satellite technology;
- Science advancement programmes and activities; and
- Mutually beneficial international partnerships.

The delivery achievements of the Programme are depicted below.

| Programme | | Space Science | | |
|---|---|---|---|---|
| Performance Indicator | Baseline 2011/12 | Actual Performance against target | | Reason for Variance |
| | | Target 2012/13 | Actual 2012/13 | |
| Amount of Science data acquired and archived (1SS1) | 1 Tb | 2 Tb | 2.9 Tb | Since implementing the data archiving system and automating the process of acquiring and archiving the Antarctic and Islands data, target has been exceeded. |
| Amount of Science data distributed (1SS2) | 0.5Tb | 1 Tb | 3.91 Tb | The distribution of Antarctic Radar data is provided to universities on a disk and a large backlog of data was transferred in the fourth quarter resulting in the target being exceeded. |
| Number of end-user services/products (1SS3) | 5 | 7 | 7 | |
| Number of ISI publications per researcher (1SS4) | 2 | 2 | 2.56 | SANSA had more research outputs per researcher than planned due to a number of papers being finalised. |
| Number of formal collaborative research projects or collaborations per researcher(1SS5) | 0.5 | 1 | 1.1 | More collaborations were formalised per researcher than expected. |
| Number of students/interns supported/trained (1SS6) | 15 | 20 | 36 | The target was exceeded due to an overlap between 2012 student intake and 2013 student intake as the new academic year starts in January. |
| Proportion (%) of students/interns supported/trained from designated groups (1SS7) | 50% | 60% | 63.16% | The successes from 2012 programmes impacted on this target; hence SANSA exceeded expectations. |
| Number of students supervised per researcher (1SS8) | 1 | 1 | 4 | Due to the increased availability of researchers, SANSA had capacity to supervise more students. |
| Number of short courses conducted (1SS9) | 4 | 4 | 15 | SANSA was able to meet the additional requests to provide short courses in Compass Calibration. |
| Number of staff supported/trained through formal programs (1SS10) | 4 | 5 | 2 | Out of the five staff members who enrolled for training programmes, two were registered on university programmes and the remaining three undertook short learning programmes. |

| Programme | | Space Science | | |
|---|---|---|---|---|
| Performance Indicator | Baseline 2011/12 | Actual Performance against target | | Reason for Variance |
| | | Target 2012/13 | Actual 2012/13 | |
| Proportion (%) of supported /trained staff from designated groups (1SS11) | 50% | 75% | 79.09% | More staff from designated groups took up opportunities to be supported/trained than expected. |
| Proportion (%) of staff from designated groups in the top three tiers of the organogram (1SS12) | 30% | 40% | 44.4% | |
| Number of learners engaged (excl. festivals) (1SS13) | 3000 | 4000 | 4654 | SANSA participated in the Women in Physics in South Africa (WiPISA) initiative and World Space Week which increased the number of learners reached |
| Number of educators engaged (excl. festivals) (1SS14) | 200 | 200 | 85 | The Western Cape Education Department (WCED) implemented similar educators' training programmes. This affected the availability of educators for SANSA workshops.<br>Proposed Action to Rectify Non-achievement |
| Proportion (%) income from technology/applied science services (1SS15) | 30% | 30% | 20.45% | The external contract income remained unchanged as expected, however the overall income base of the Directorate increased due to receipt of additional research funding thereby<br>Proposed Action to Rectify Non-achievement<br>SANSA is putting measures in place to attract additional technology income |
| Number of multi-national projects (1SS16) | 5 | 5 | 8 | SANSA Space Science has put emphasis on engaging in multi-national projects and these projects have come to fruition. |



# Space Engineering Programme

## Functional Scope

Space science and technology is recognized globally as an essential and strategic tool to meet social, technological, economic, and foreign policy objectives. Accordingly, many governments around the world are increasing their investments in space activities, with the intention of advancing their space capabilities and benefit from space operations. The SANSA Space Engineering directorate will manage and lead the technical coordination of space system and sub-system development on behalf of SANSA. Further, it will provide a facility for space system assembly, integration and testing (AIT) for national and regional use. This role will be fulfilled through the upgrade of the current Houwteq facility in Grabouw, Western Cape.

The satellite development programme is to achieve the following objectives:
1. Develop a South African indigenous capability in space systems and hence create a certain level of self-reliance in satellite technology
2. Use satellite development as a vehicle to develop technologies that will have a wider impact on the economy (e.g. control technology).
3. Associated with technology development will be the development of rare skills and innovative capability.
4. Stimulate the local industry through the development of new technologies and skills, contracting opportunities, and increased export and import channels through SANSA partnerships.

## Core Functions

The core functions of the programme are to:
Drive the South African satellite development programme
Lead the development and commercialisation of new technologies
Development of skills
Interface with industry
Global partnerships
Collection & distribution of data for research, knowledge-creation and human capital development

Given that the satellite development programme was not granted funding at the time the Plan was developed ,measurable outputs and medium term output targets were no yet determined for the Space Engineering Programme.
Core Outputs
Well established directorate or project management office
Phase 1 of satellite development in place
The delivery achievements of the Programme on the defined core outputs are as follows:
Well Established Directorate or Project Management Office
Whilst it was apparent that no funding would be allocated to SANSA to allow for the establishment of a Space Engineering Directorate, a Space Programme Management Unit (SPMU) was established in the Corporate Office under the direct responsibility of the SANSA CEO. A Space Programme Manager and a Project Manager was recruited and appointed in 2012 and initial focus of work of this team was to engage the Department of Science and Technology to secure initial funding for satellite development activities and to develop a coherent approach to project management for SANSA.
By the end of 2012/13 the SPMU was functional and a number of agreements related to the retention of core capabilities in the South African space industry and satellite development were in place. The work on the development of a coherent project management approach was also well advanced and initial drafts were developed and were in various stages of review in support of a Space Systems Acquisitions Management Framework. These being
SPM-Proc-00: Acquisition Management Procedure
SPM-Proc-01: Products System Acquisition Management Procedure
SPM-Proc-02: Products System Management Procedure.
SPM-Proc-03: Technology Acquisition Management Procedure.
SPM-Proc-04: Technology Acquisition Project Management Procedure
SPM-Proc-05: Products System Baseline Management Procedure
Phase 1 of Satellite Development in Place
Satellite development activities in South Africa go hand in hand with the requirements to address the challenges in the South African space industry. An important element that therefore is part of the “Phase 1” satellite development projects requires strategic measures to be discussed in view of retention and upgrading of the national space industry and of facilities that are essential for satellite development to take place. SANSA engaged in detail with notably the Department of Science and Technology (DST) in this regard and this resulted in initial allocations to SANSA for a number of projects to be initiated during 2012/13 with special project funding allocations from the DST to SANSA.
The special project funding allocations from the DST to SANSA are disclosed on *Notes to the Financial Statements* in the Annual Financial Statement section of the Annual Report.

# Section *6*

# Annual Financial Statements

for the year ended 31 March 2013

# Annual Financial Statements

# AUDIT REPORT

# ANNUAL FINANCIAL STATEMENTS

# Section 7
# Acronyms

# Acronyms

| | |
|---|---|
| AEB | Brazilian Space Agency |
| AIT | Assembly,Integration and Testing |
| ALC | African Leadership Conference |
| AMESD | Africa Monitoring of the Environment for Sustainable Development |
| ARMC | African Resource Management Constellation |
| ASAL | Algerian Space Agency |
| ATNS | Air Traffic and Navigation Services |
| BPG | Business Planning and Governance |
| BRICS | Brazil,Russia,India,China and South Africa |
| CAA | Civil Aviation Authority |
| CAPEX | Capital Expenditure |
| CBERS | China Brazil Earth Resource Satellite |
| CEOS | Committee on Earth Observation Satellites |
| CME | Coronal Mass Ejection |
| COBIT | Control Objectives for Information and related Technology |
| CoC | Centre of Competence |
| CoE | Centre of Excellence |
| COP | Conference of Parties |
| COSPAR | Committee on Space Research |
| COST | Cooperation in the field of Science and Technology research (EU) |
| CPUT | Cape Peninsula University of Technology |
| CSA | Canadian Space Agency |
| CSIR | Council for Scientific and Industrial Research |
| DBSA | Development Bank of South Africa |
| DGI | Defense for Geospatial Intelligence |
| DIMS | Data Information Management System |
| DLR | German Space Agency |
| DoC | Department of Communications |
| DoT | Department of Transport |
| DSM | Deep Space manouvre |
| DST | Department of Science and Technology |
| DWA | Department of Water Affairs |
| EC | European Commission |
| EEP | Employment Equity Plan |
| EGNOS | European Geostationary Navigation Overlay Service |
| EGSA | Electrical Generating Systems Association |
| EO | Earth Observation |
| EODC | Earth Observation Data Centre |
| ERP | Enterprise Resource Planning |
| ESA | European Space Agency |
| EU | European Union |
| FAR | Finance,Audit and Risk |
| FDP | Fundisa Disk Programme |
| FP7 | Seventh Framework Programme for Research and Technological Development |
| FY | Financial Year |
| GEO | Group on Earth Observation |
| GEO | Geostationary Earth Orbiting |
| GEONetCab | Geostationary Earth Orbiting Network for Capacity Building |

| | |
|---|---|
| GEOSS | Global Earth Observation System of Systems |
| GIS | Geographic Information System |
| GMES | Global Monitoring for Environment and Security |
| GPS | Global Positioning System |
| HCD Development | Human Capital |
| HEI | Higher Education Institution |
| HMO | Hermanus Magnetic Observatory |
| HR | Human Resources |
| IAC | International Astronautical Congress |
| IBSA | India,Brazil and South Africa |
| ICT | Information and Communications Technology |
| INTERMAGNET | International Real-time Magnetic Observatory Network |
| IOT | In-orbit Testing |
| IRI | International Reference Ionosphere |
| ISES | International Space Environment Service |
| ISI | Institute for Scientific Information |
| ISRO | Indian Space Research Organisation |
| ITC | Institute Technology Centre |
| ITIL | Information Technology Information |
| Library ITU | International Telecommunications Union |
| JPSS | Joint Polar Satellite System |
| JRC | Joint Research Centre |
| KHTT | Know-how and Technology Transfer |
| KPI | Key Performance Indicator |
| KSAT | Kongsberg Satellite Services |
| (Norway) LEOP | Launch and Early Orbit Phase |
| LPGS | Landsat Processing Geological System |
| LTWG | Landsat Technical Work Group |
| MDGs Goals | Millennium Development |
| MEC | Member of Executive Council |
| MISR | Multi-angle Imaging Spectroradiometer |
| MODIS | Moderate resolution Imaging Spectroradiometer |
| MOST | Ministry of Science and Technology (China) |
| MoU | Memorandum of Understanding |
| MSL | Mars Science Laboratory |
| MT | Magnetotelluric |
| MTEF | Medium-term Expenditure Framework |
| NASA | National Aeronautics and Space Administration |
| NASRDA | Nigerian Space Agency |
| NASSP | National Astrophysics and Space Science Programme |
| NEP | National Equipment Programme |
| NGI | National Geospatial Information |
| NOAA | National Oceanic and Atmospheric Administration |
| NPP | National Polar-orbiting Operational Environmental Satellite System Preparatory Project |
| NRF | National Research Foundation |

| | |
|---|---|
| NSI | National System of Innovation |
| NSP | National Space Programme |
| NSS | National Space Strategy |
| PFMA | Public Finance Management Act |
| POES | Polar Operational Environmental Satellite |
| PSGI | Programmatic Support Grant Initiative |
| R&D | Research and Development |
| RF | Radio Frequency |
| RPC | Remote Procedure Call |
| RWC | Regional Warning Centre |
| SAAF | South African Air Force |
| SAASTA | South African Agency for Science and Technology Advancement |
| SAC | Satellite Applications Centre |
| SADC | Southern African Development Community |
| SAEOS | South African Earth Observation System |
| SAMA | South Atlantic Magnetic Anomaly |
| SAMSA | South African Maritime Safety Authority |
| SANAP | South African National Antarctic Programme |
| SANDF | South African National Defense Force |
| SANSA | South African National Space Agency |
| SAP | Systems Applications and Products |
| SAR | Synthetic Aperture Radar |
| SAPO | South African Post Office |
| SATSA | SBAS Awareness and Training for South Africa |
| SBAS | Satellite-based Augmentation System |
| SCM | Supply Chain Management |
| SCO | SANSA Corporate Office |
| SET | Science,Engineering and Technology |
| SHARE | Southern Hemisphere Auroral Radar Experiment |
| SHEQ | Safety,Health,Environment and Quality |
| SMP | Satellite Mega Programme |
| SNIGGER | South African Ionospheric Geophysics and Geomagnetic Experimental Resource |
| SO | Space Observation |
| SO | Space Operations |
| SOP | Standard Operating Procedures |
| SPOT | System for Earth Observation (Système Pour l'Observation de la Terre) |
| SSAU | State Space Agency of Ukraine |
| SUPARCO | Pakistan Space & Upper Atmosphere Research Commission |
| TM | Thematic Mapper |
| TOGAF | The Open Group Architecture Framework |
| TT&C | Telemetry,Tracking and Command |
| TU Delft | Delft University of Technology (Netherlands) |
| TUT | Tshwane University of Technology |
| TYIP | Ten-Year national Innovation Plan |
| UCT | University of Cape Town |
| USGS | United States Geological Survey |
| VITO | Flemish Institute for Technological Research |
| WCED | Western Cape Education Department |

| | |
|---|---|
| WRC | Water Research Commission |
| WSSD | World Summit on Sustainable Development |