



# CPUT Satellite Programme

## National and regional perspectives

United Nations / South Africa Symposium on Basic Space Technology 2017  
“Small satellite missions for scientific and technological advancement”  
Robert van Zyl, Director

SAY IT PROUD  
#WeAreCPUT





*It is up to us to ensure that Africans are not only treated as consumers of technology, but also as developers and managers of innovation.*

– Cyril Ramaphosa, Deputy President of South Africa (SFSA, 8 December 2017)

# National perspective



- Strengthening and expanding existing Human Capacity Development programmes like the satellite engineering programme at the **Cape Peninsula University of Technology**
- Manufacturing, integrating, testing and launching EOSat1 and **ZACUBE-2**.
- Manufacturing and launching **South Africa's first indigenous cube satellite constellation** to provide **automatic identification system** services to **Operation Phakisa** and the African continent.

# Regional perspective



## African Space Programme (AU)

- *African Space Policy, Strategy*
- *AIMS 2050*
- *Agenda 2063 - socio-economic transformation of the continent*

## Pan African University

- **Space sciences – Southern Africa**
- Water and Energy Sciences
- Basic Science, Technology and Innovation
- Earth and Life Sciences
- Governance, Humanities and social sciences



# CPUT Satellite Programme

SAY IT PROUD  
#WeAreCPUT

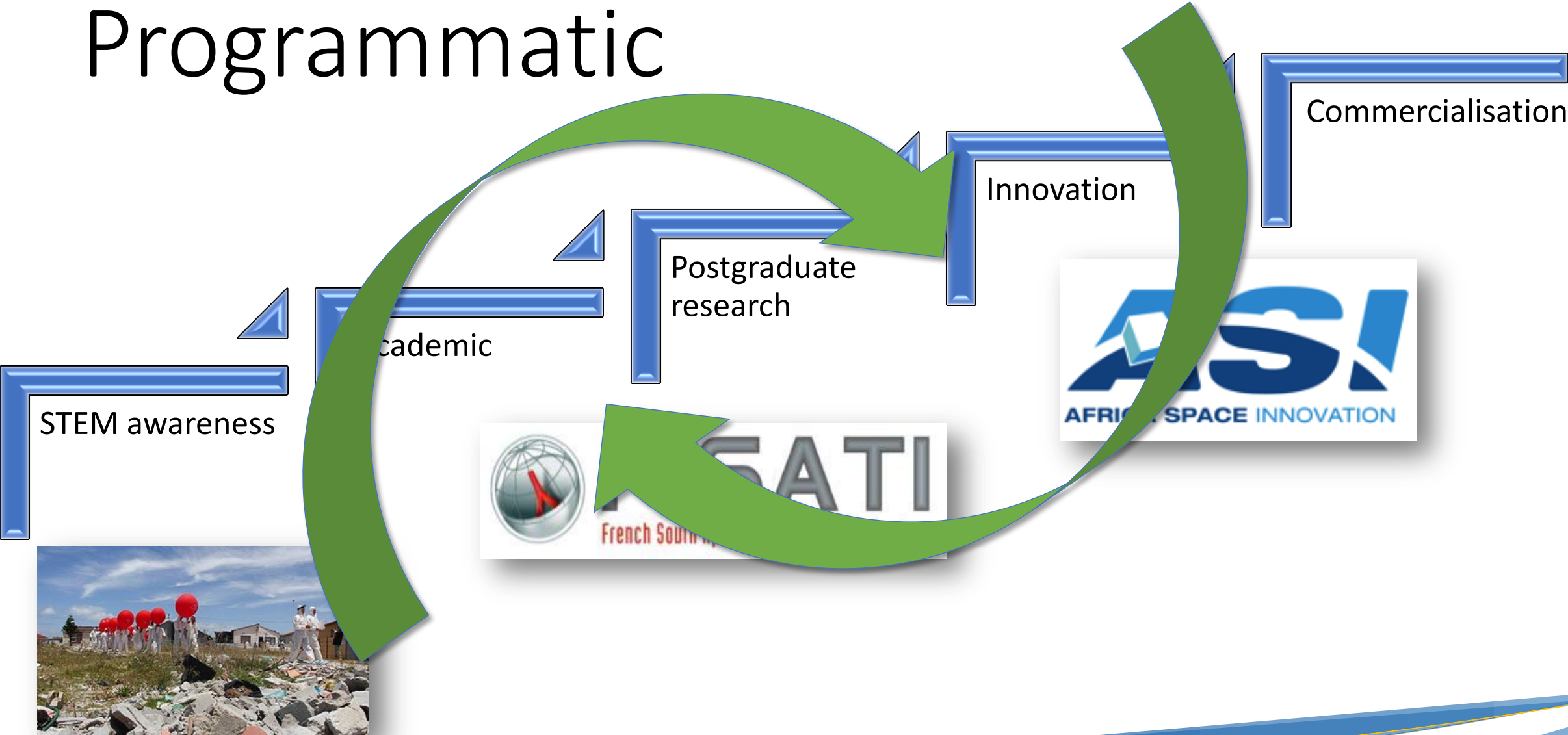


- The only University of Technology in the Western Cape
- The largest university in the Western Cape, 32 000 students
- Merger of two technikons in 2005 – we are only 12 years young!
- Diverse students population: 87% black
- Satellite programme established in 2009

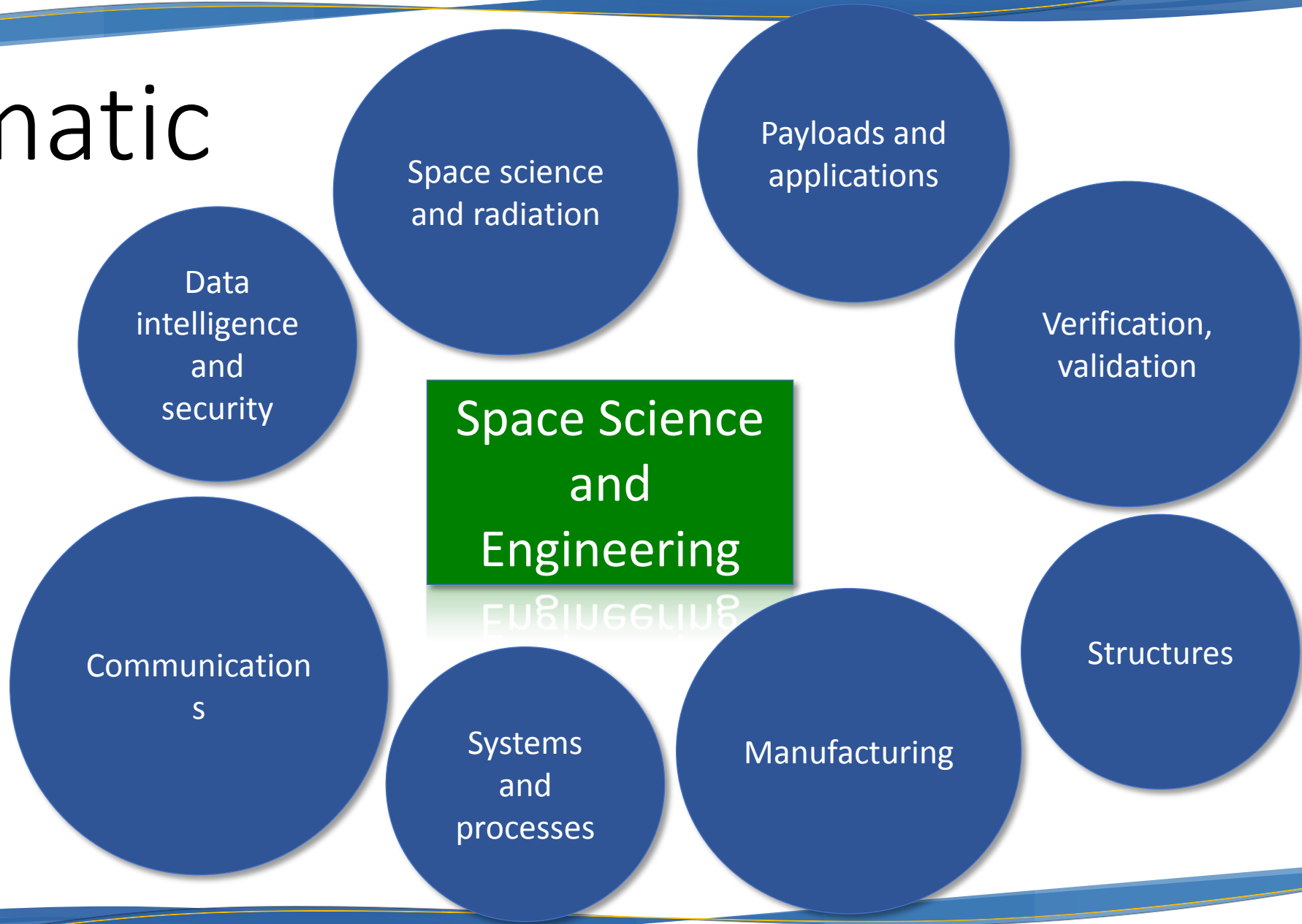
# Programmatic



# Programmatic

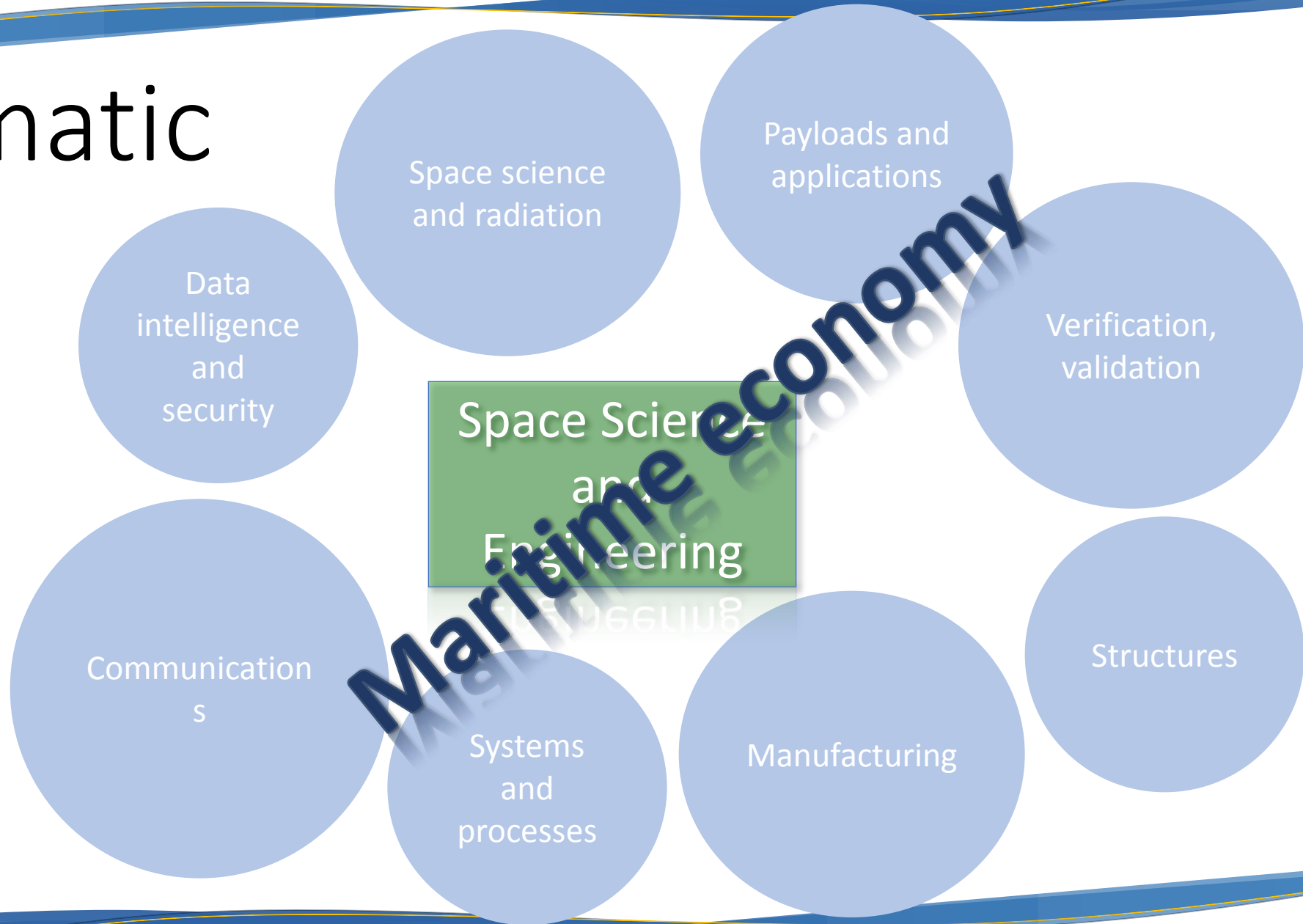


# Thematic





# Thematic



# What has been achieved

## Human capacity development

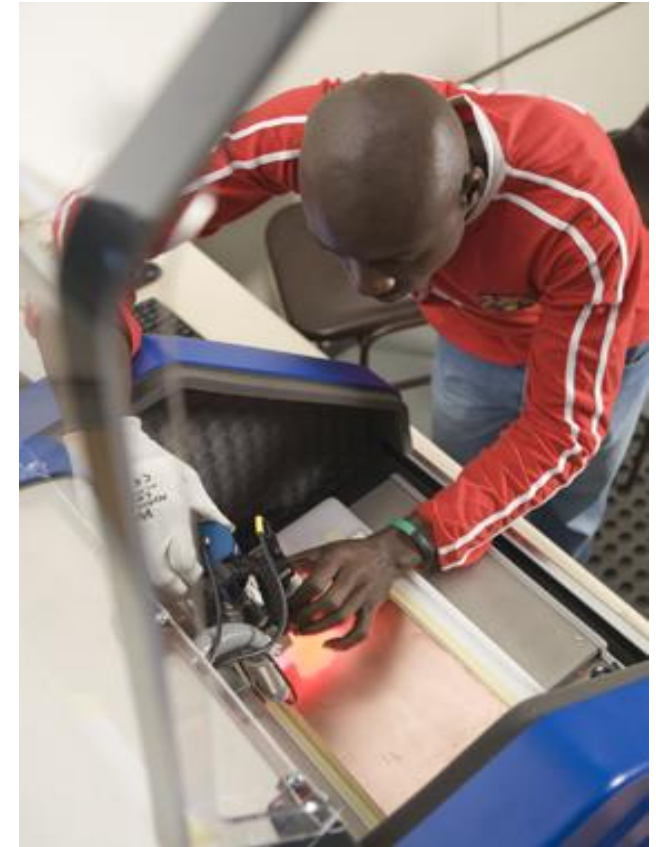
- Postgraduate studies
  - 55 students registered
  - > 60 M and D students graduated
- Research and innovation output
  - 104 conference papers
  - 49 journal papers
  - 11 artifacts
- Professional development
  - 16 engineers-in-training
- STEM outreach
  - > 30 000 students engaged



# What has been achieved

## Transformation scorecard

| Level                                  | Then | Now | % Increase |
|--|------|-----|------------|
| Bachelor enrolment: Black, SA students | 0    | 9   | INF        |
| Bachelor enrolment: Female students    | 0    | 4   | INF        |
| Master's enrolment: Black, SA students | 1    | 9   | 800%       |
| Master's enrolment: Female students    | 2    | 5   | 150%       |
| Doctorate enrolment: Black SA          | 0    | 1   | INF        |
| Professional development: Black SA EiT | 1    | 7   | 600%       |
| Professional development: Female EiT   | 0    | 1   | INF        |



# What has been achieved

Industry catalyst



F'SATI  
**Industry Seminar**  
Series 2012



Thematic areas:

- Value proposition and business opportunities
- Emerging technologies
- Applications
- Quality assurance
- STEM education and awareness

Abstract deadline:  
**17 October**

**Cape Peninsula University of Technology**

Bellville Campus

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CUBES  
FOR AFRICA

First Call

24-26 FEB 2016  
Cape Town

- Emerging & Disruptive Technologies
- Value Proposition & Business Opportunities
- Human Capacity Development
- Applications for Sustainability and Prosperity
- STEM Education & Awareness
- Space Governance & Policies

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[#IACW2016](https://twitter.com/IACW2016)

3RD INTERNATIONAL AFRICAN CUBESAT WORKSHOP 2016



# What has been achieved

## Facilities



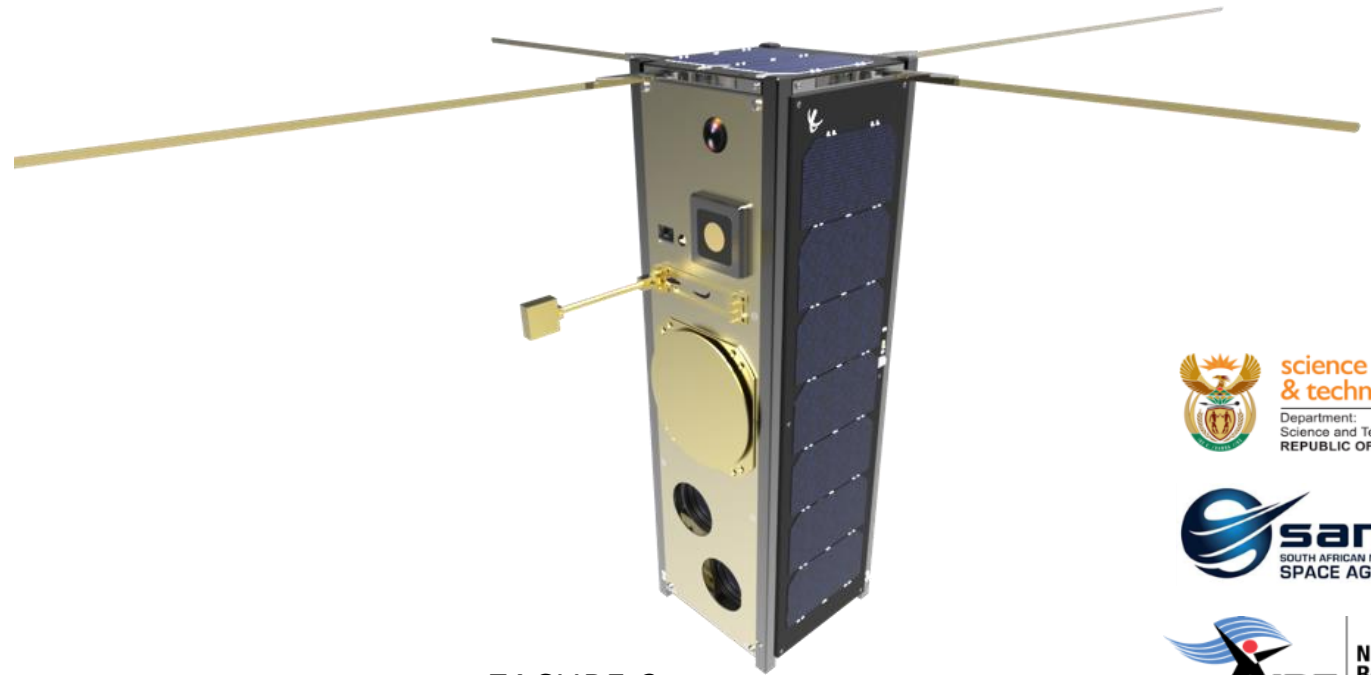
From 2018 we will be hosting 3 ground stations, and double our clean room areas

# What has been achieved

Technology innovation | Missions Subsystems Payloads



ZACUBE-1 / "TshepisoSAT"  
Launched 21 November 2013

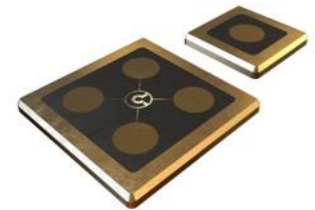


ZACUBE-2  
Launch mid-2018



# What has been achieved

Technology innovation | Missions Subsystems Payloads



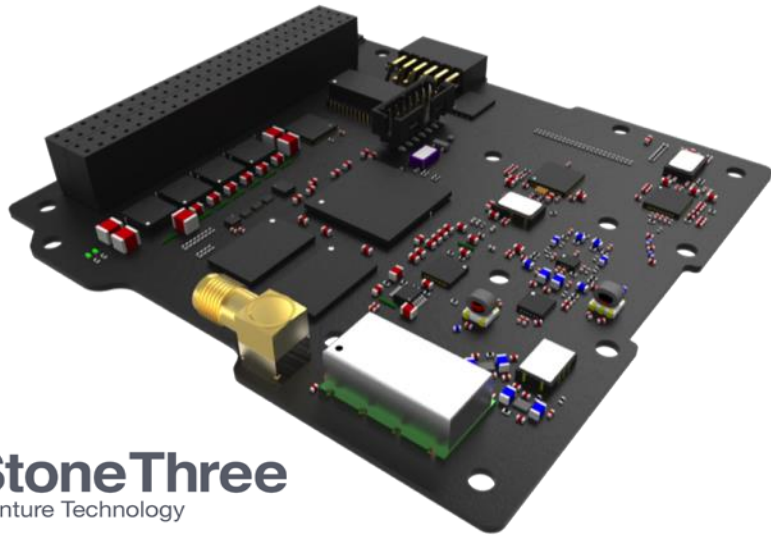
UHF/VHF UHF/UHF Transceivers  
(Amateur and commercial)

S-band Transmitter and Antenna  
(Amateur and commercial)

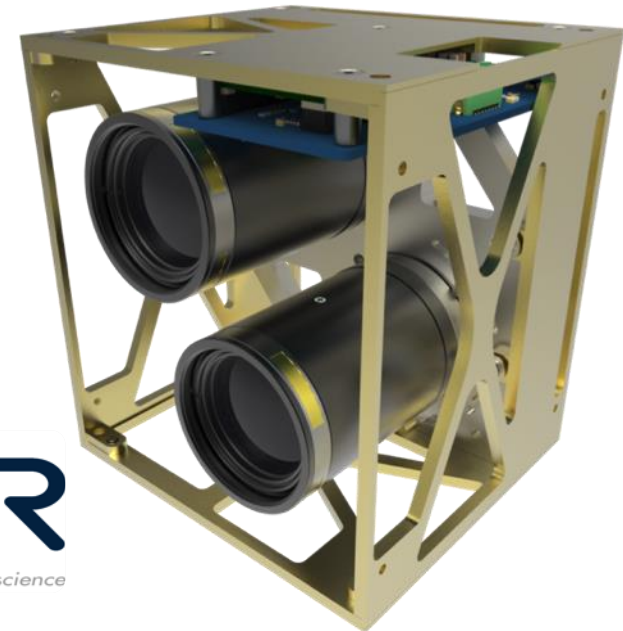
X-band Transmitter and Antenna  
(Commercial)

# What has been achieved

Technology innovation | Missions Subsystems Payloads



SDR for ship tracking AIS/VDES receiver (Phakisa)



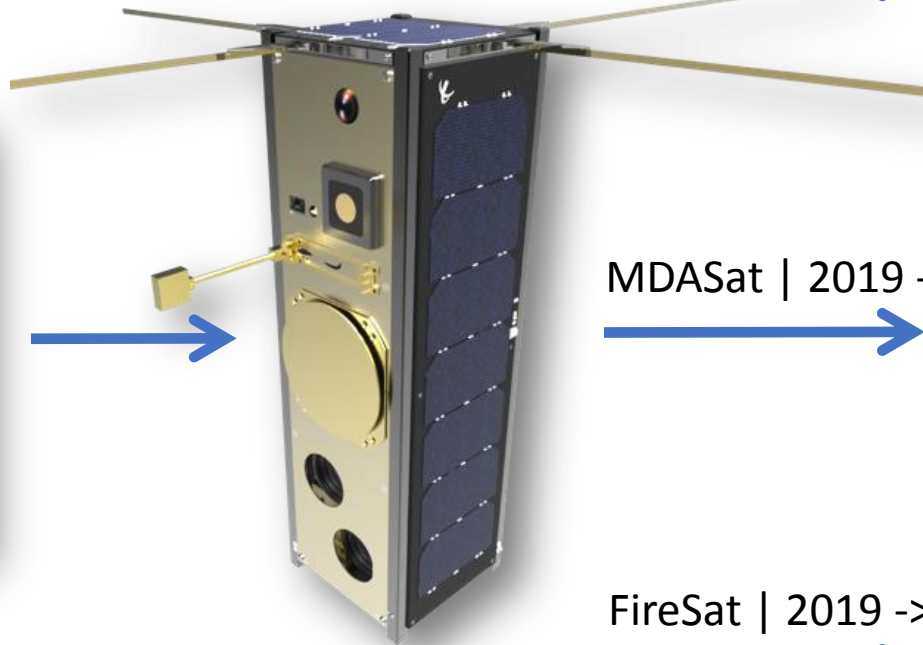
Fire detection camera (ZACUBE-2)



# Technology roadmap



ZACUBE-1 | 2013



ZACUBE-2 | 2018

SDR 2018 ->



MDASat | 2019 ->



FireSat | 2019 ->



# Phakisa Phase 1 | ZACUBE-2



## Mission Objectives

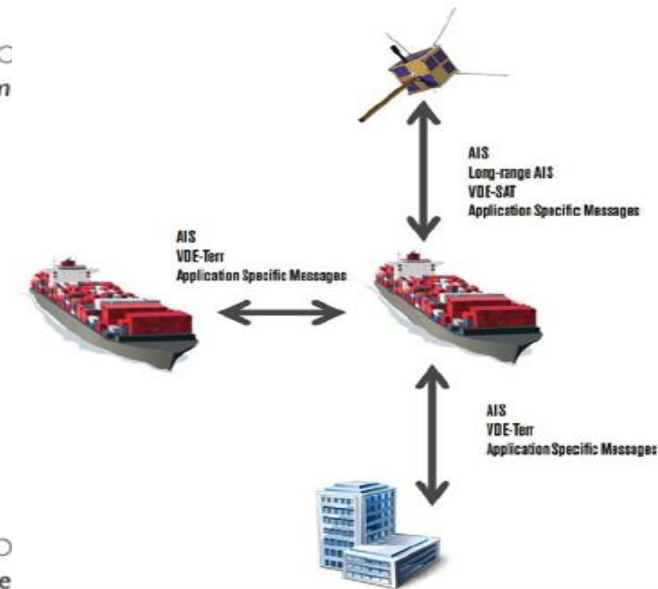
- Precursor to MDASat constellation
- Technology demonstration of AIS/VDE message reception using the primary payload
- Technology demonstration of a medium resolution imager payload



# Phakisa Phase 2 | MDASat



A constellation of nano-satellites enables fresh data on a global scale.



# Phakisa Phase 2 | MDASat



- Maritime Domain Awareness
- Collection of statistical data in the South African maritime zone, with a special focus on vessel detection.
- The primary geographic focus is the coastal waters of South Africa but also offers MDA expansion to a global scale.



# Phakisa Phase 2 | MDASat



- Leverage ZACUBE-2 project to create an engineering model of the Phakisa constellation nanosatellite unit
- Develop initial production capabilities
- Establish constellation production
- First launch and commissioning

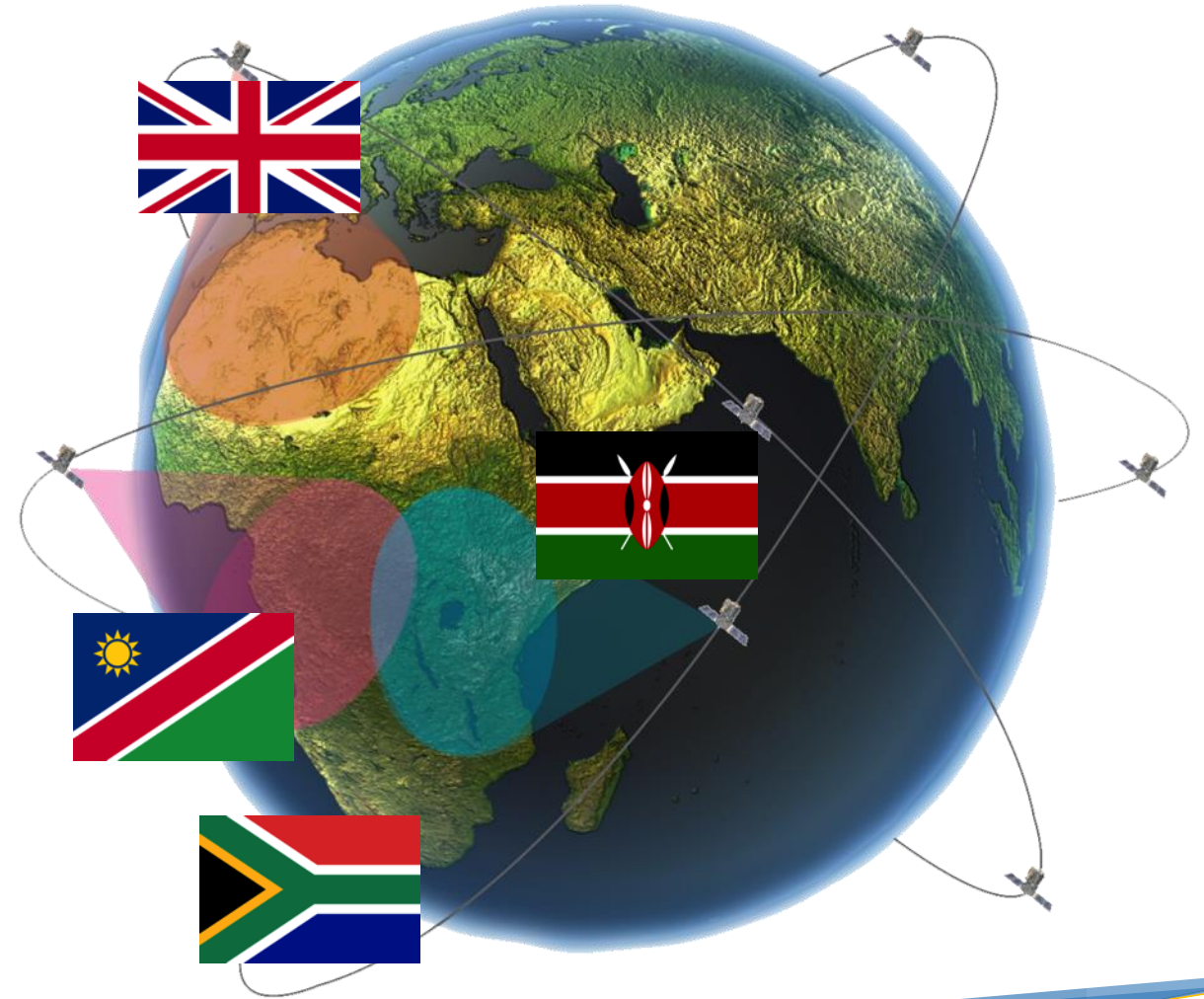
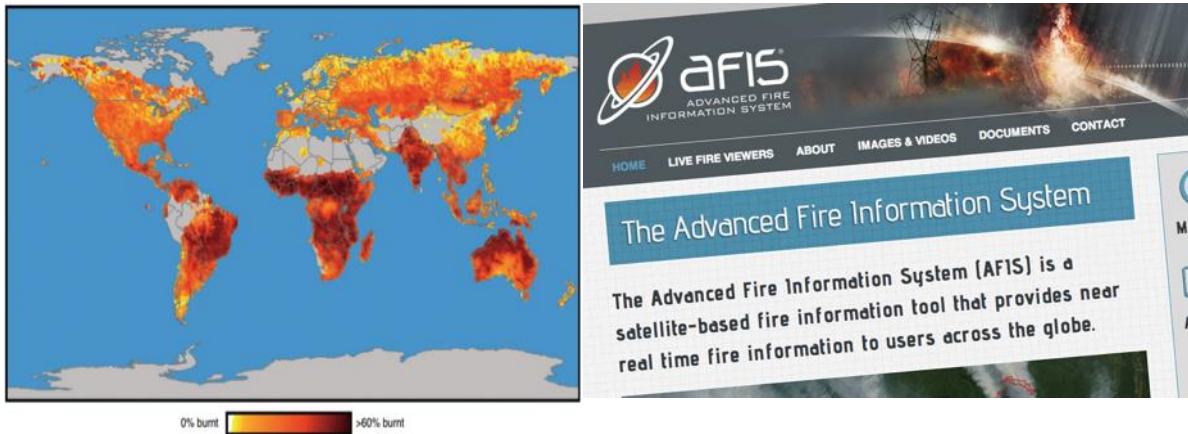


# Phakisa Phase 2 | Partners



# FireSat

- UKSA IPP
- Global fire detection services



Thank You

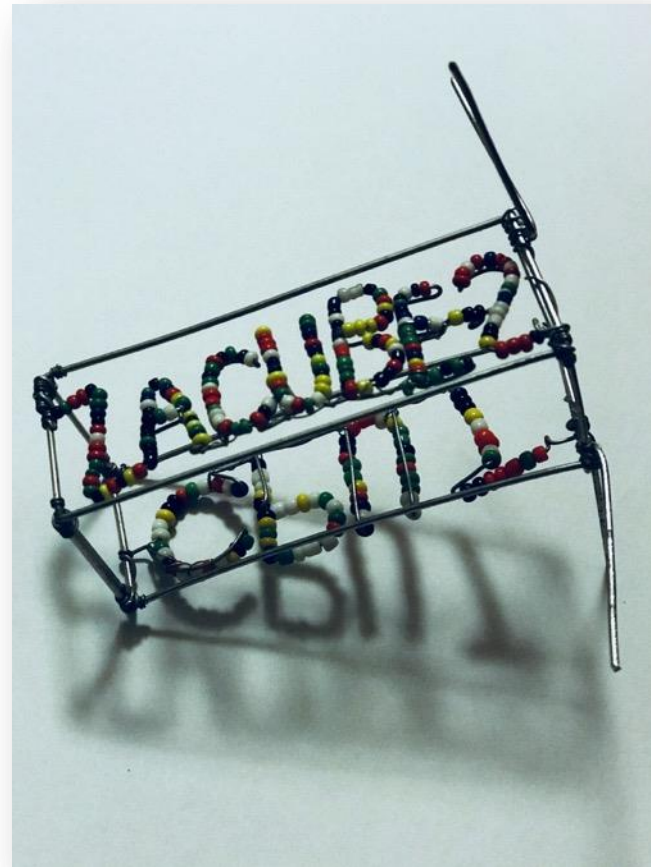
Dankie

Ngiyathokoza

Enkosi

Ngiyabonga

Ke A Leboga



Ke A Leboha

Ke A Leboga

Ngiyabonga

Ndi A Livhuha

Ndza Khensa

French South African Institute of Technology

<http://www.cput.ac.za/fsati>

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