

## Small satellites for scientific - technical development and capacity building

IISL/ECSL Symposium  
24 March 2014

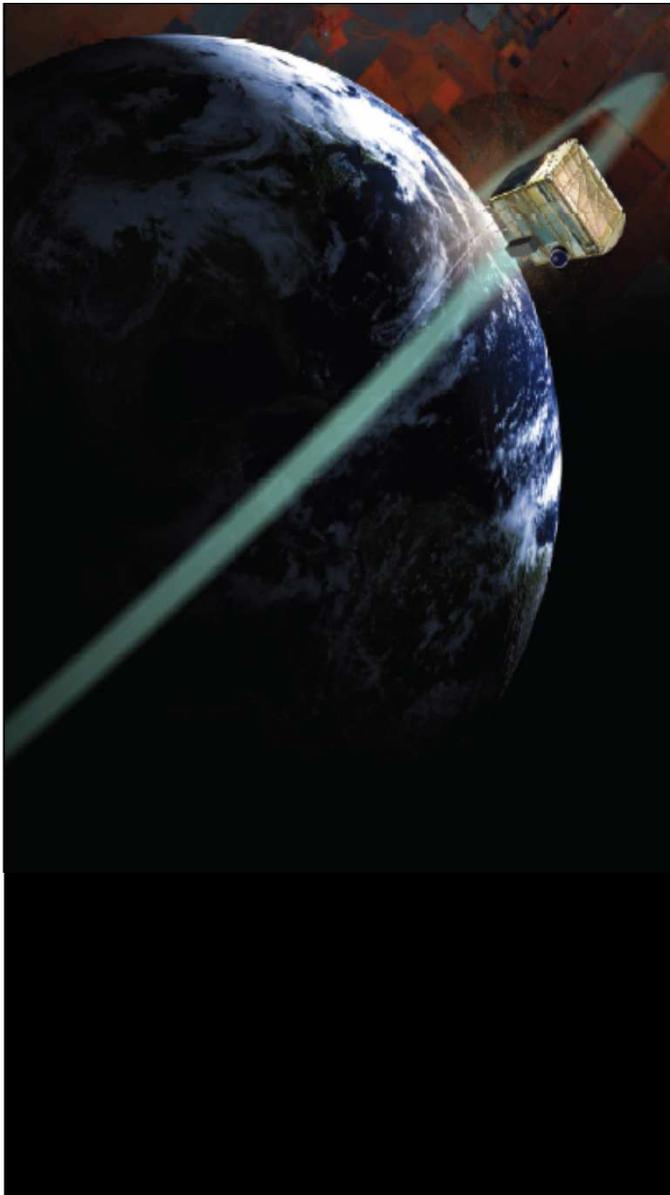
Lulu Makapela  
Council for Scientific and Industrial Research , South Africa

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## Overview



Significance of small satellites

As a driver for scientific and technical development

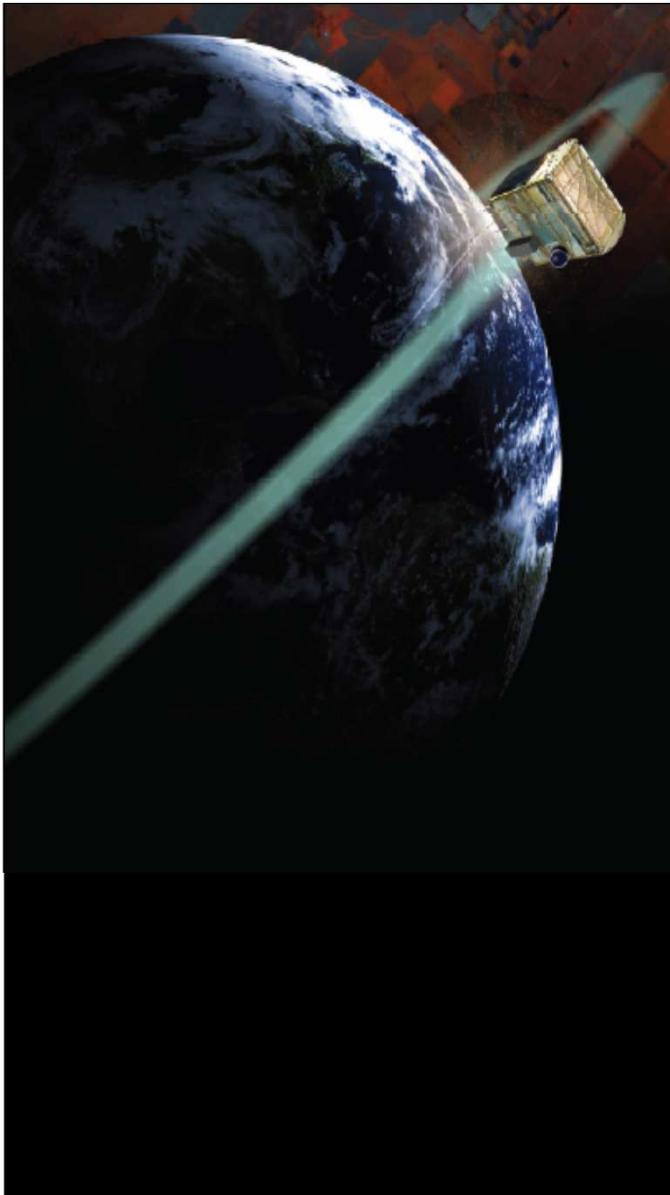
As a driver for capacity building

South Africa's Achievements in satellite development

Opportunities and challenges in the developments of small satellites

Need to observe and conform to the necessary international and national legal rules.

## The value for small satellites

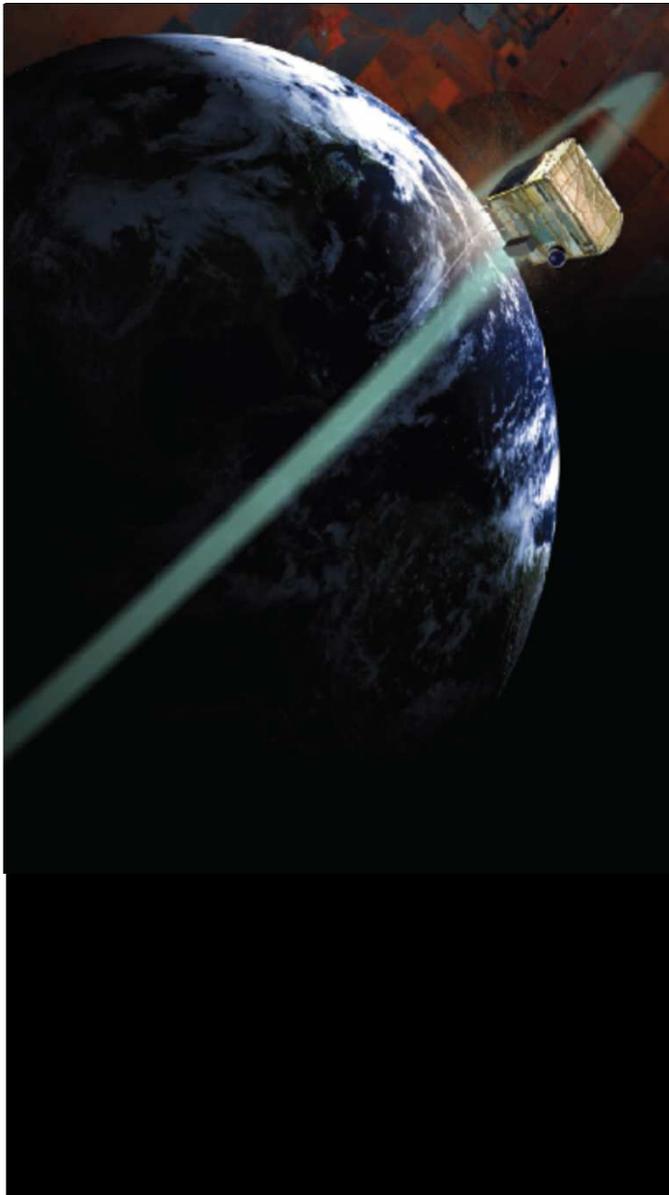


### Factors motivating the use of small satellites

- Low development cost
- Shorter duration for spacecraft development
- Low-cost launch options (as secondary payloads)
- Risk mitigation in case of a constellation
- Fulfilment of specific needs – e.g socio-economic

**Reduce the barrier to entry for space missions for emerging space actors in both developed and developing countries**

## A driver for scientific and technical development



Scientific Research and development

Same engineering principles are used in the development of big satellites

Demonstration and proof of concept

Transfer of knowledge

International co-operation

Useful to both developed and developing countries

➤ **Potential to**

➤ **endanger the safety of other space activities**

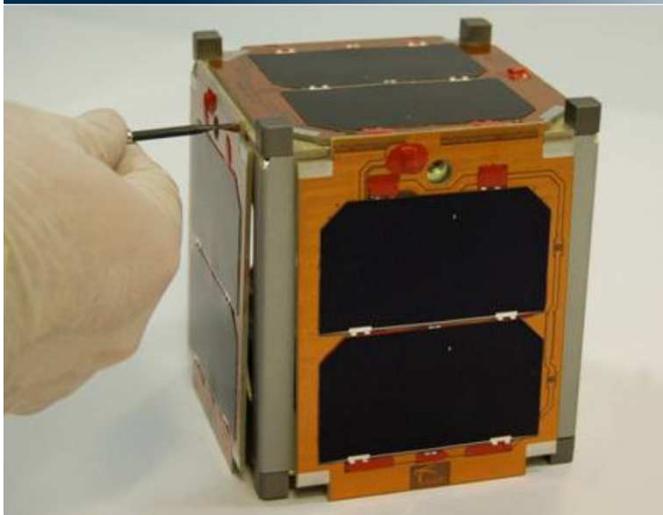
➤ **impact adversely on the long-term sustainability of outer space**

➤ **Requires observance of international rules**

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## A driver for capacity building



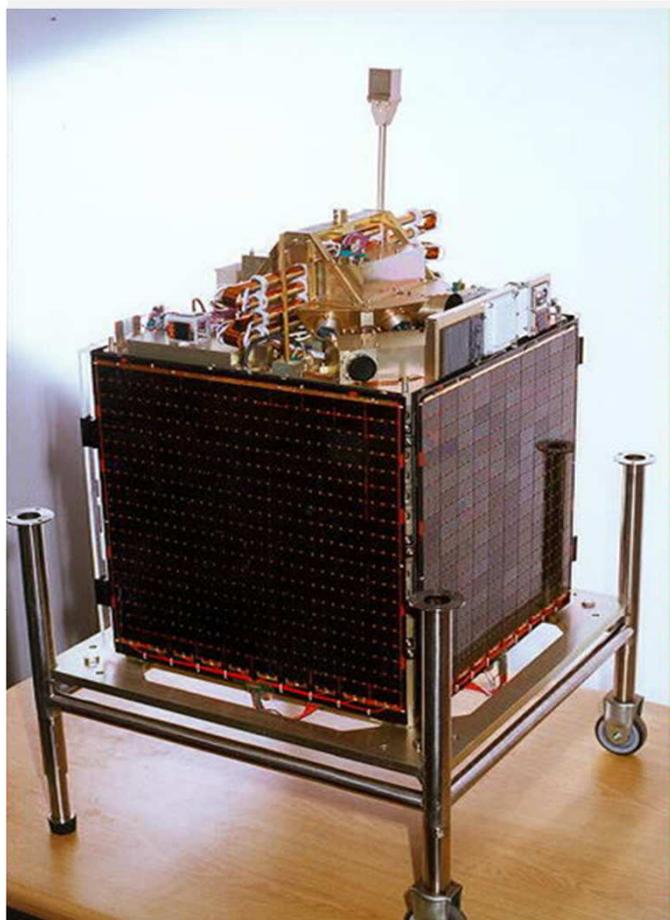
### In space technology

- Accessibility to academic and research institutions for training: (students of engineering and scientists)
- Opportunity for skills and knowledge transfer among institutions

### In space law

- Opportunity to implement international obligations under the space treaties
  - Registration , liability, responsibility under international laws
- To evaluate and assess national space regulations.

## South Africa's achievements in small satellite development



### SUNSAT

- Completed in 1998
- Launched in 1999
- Weighed 64 kg's
- \$1 million

University of Stellenbosch under its programme introduced a honour's degree in Engineering. Students are taught engineering principles using micro-satellites as a training tool.

## South Africa's achievements in small satellite development cont.



### SumbandilaSat

- Completed in 2006
- Launched In in 2009
- Weight - 84kg
- \$3.5 million
- Licence issued by South African Council for Space Affairs (SACSA)
- In terms of the Space Affairs Act , 1993
- Registered in the National Space Register

**First government satellite**

**17 Masters graduates in engineering and remote sensing as well as two PhDs**

**Involvement of academia, space industry, research institutions**

**Involvement of students from previous satellite demonstrated that South Africa could build and operate its own satellite**

# South Africa's achievements in small satellite development cont.



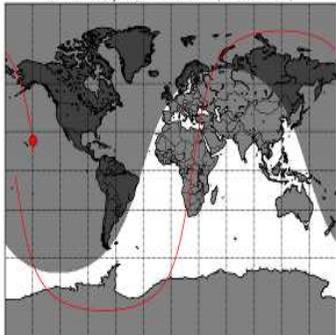
Ground Track



## ZACUBE

DATE : 2014-01-06 10:12:30  
LONGITUDE : -149.80915824  
LATITUDE : 23.2888337810  
HEIGHT : 595 km  
ECLIPSED : True

ZACUBE 06 Jan 2014 10:12:30 (SAST/UTC+2)



## 48 Hour Pass Information

- The default location is set for Hermanus
- All dates and times are SAST (UTC +2)
- All passes for the current and the next day are calculated
- Transit data is calculated in 60 second increments

Enter your location information

Longitude

19.2500

Latitude

-34.4167

Submit

## TshepisoSat

Launched in 2013

Weight - 1.3 kg's

In response to the need to the South African National Space Agency Act, 2008

- Advance scientific engineering
- Space science research
- Human capacity development

Licensed by SACSA ,

In terms of the Space Affairs Act , 1993

**CPUT under its F'SATI programme introduced a Master's Degree in Engineering students are taught engineering principles using CubeSat as a training tool.**

# South Africa's National Register of space objects

SA Space Council

www.sacsa.gov.za/registry/index.php

## South African Council for Space Affairs

SACSA THE SOUTH AFRICAN COUNCIL FOR SPACE AFFAIRS

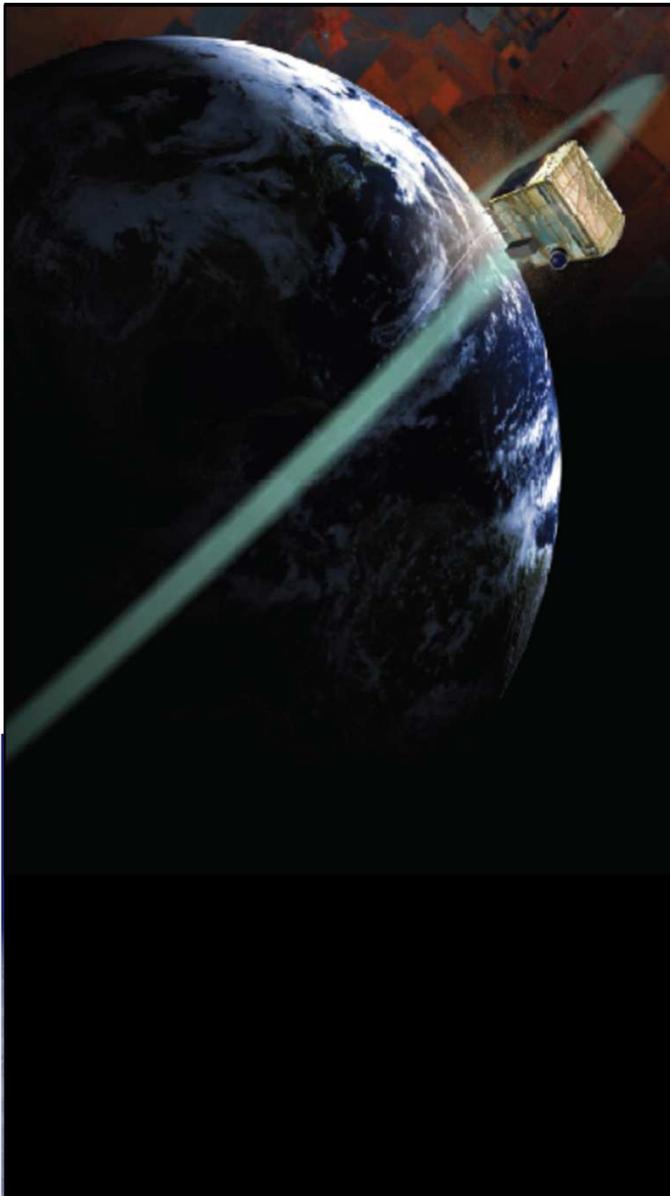
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**National Registry of Objects Launched into Outer Space**

SA designator	Intl. designator	Name	Launch Date	Apogee (km)	Perigee (km)	Inclination (deg)	Period (min)	Function
ZA-002	2009-049F	SUMBANDILA	17/09/2009	504	503	97.28	94.68	Earth observation with additional experimental payloads.
ZA-001	1999-008C	SUNSAT	23/02/1999	852	642	96.45	99.75	Earth Observation with additional experimental payloads.

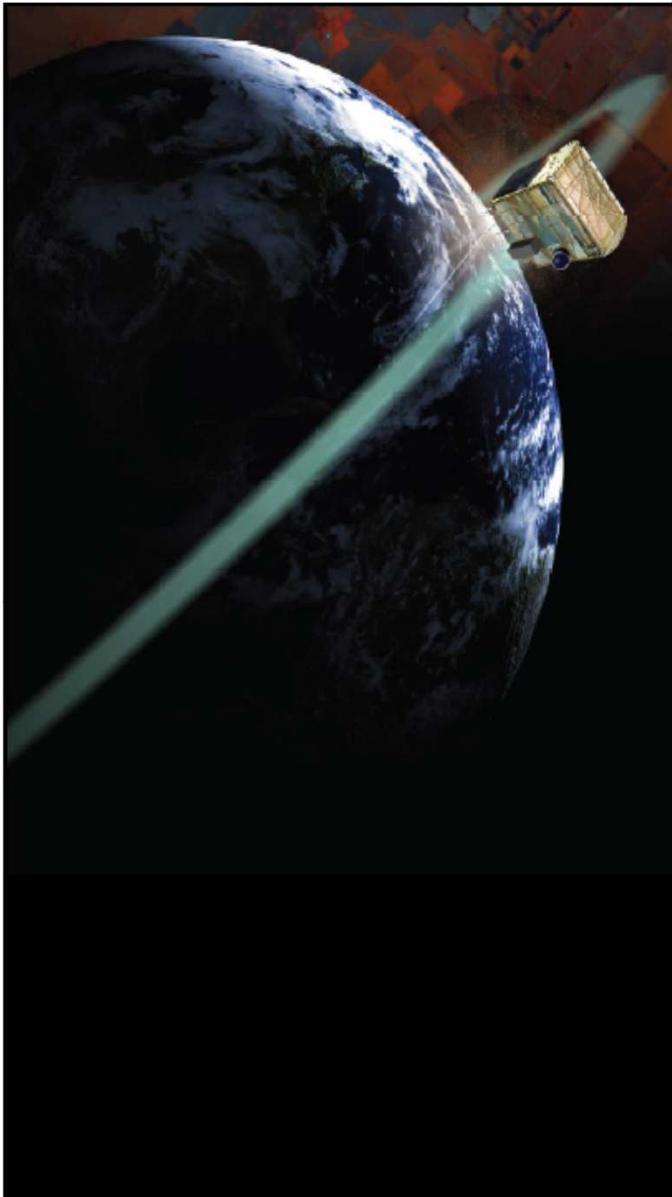
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# Opportunities and challenges impacting on small satellites development



- **Risk Management :**
  - Low levels of oversight lead to technical risk, and regulatory risk –
    - Quality and reliability
    - Inadequate time to follow proper legal procedures
- **Launching opportunities :**
  - Have to look for opportunities for launch- secondary payloads or piggy backs, allowing for co-operation opportunities
- **Regulation:**
  - “Outer space objects” irrespective of the size, weight and scope.
  - Necessitates compliance with space treaties/ UN res, guidelines, principles (registration , liability and responsibility)
  - Share the same scarce resource as big satellites - radio frequencies which necessitates compliance with WRC resolutions e.g. (Res 757)
  - Indicates requirements for national legislation

# Conclusion



- Small satellites are an important tool for acquiring and developing space capability/technology for emerging space actors.
- Small satellites are also an important tool for proof of concept demonstrations for the development of big satellites
- Small satellite developments are an important tool for achieving the OST Objectives, of bridging the wide technology gap between the developed and developing countries.
- There is a great need to regulate the launching and operation of small satellites.

### Contacts

Council for Scientific and Industrial Research (CSIR)

Meiring Naude Road

Brumeria, Pretoria

South Africa

Tell: +27 2 8412644

Cell: +27 84 9809941

Email: [lmakapela@csir.co.za](mailto:lmakapela@csir.co.za)

Website/s: [sageo.saeoss.org](http://sageo.saeoss.org) / [www.csir.co.za](http://www.csir.co.za)

Website/s: [sageo.saeoss.org](http://sageo.saeoss.org) / [www.csir.co.za](http://www.csir.co.za)

Email: [lmakapela@csir.co.za](mailto:lmakapela@csir.co.za)

Cell: +27 84 9809941

Tell: +27 2 8412644

South Africa

Brumeria, Pretoria

Meiring Naude Road

Council for Scientific and Industrial Research (CSIR)

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