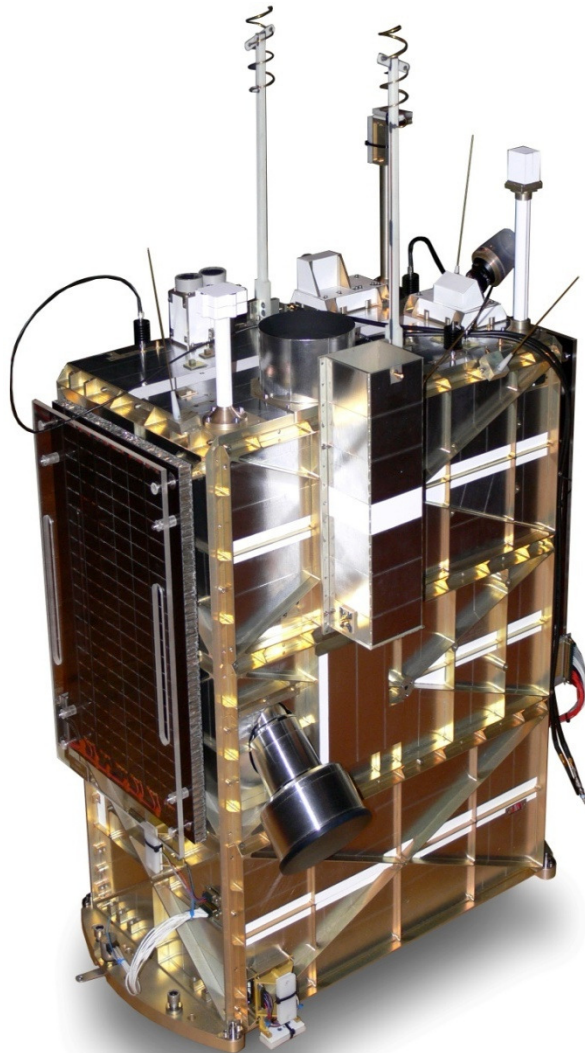




THE SOUTH AFRICAN COUNCIL FOR SPACE AFFAIRS
a member of the dti group



sunspace experience with sumbandilasat

"Our children may learn about the heroes of the past. Our task is to make ourselves the architects of the future."

Jomo Kenyatta,
first president of Kenya,
from an address given on Kenyatta Day, as quoted in Anita
King's *Quotations in Black*, Greenwood Press 1981.

ron olivier,
executive director (marketing & strategy)
ALC IV 2011, mombasa, kenya
rolivier@sunspace.co.za



sunspace origins

SUNSAT programme (SU)

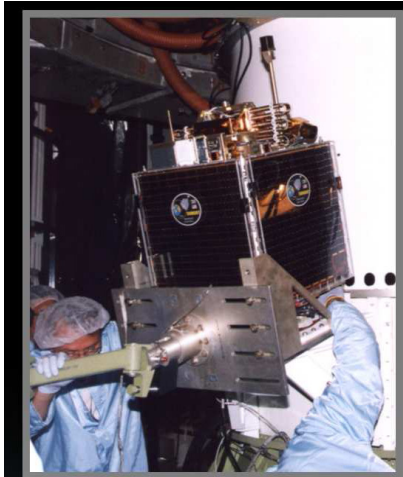
- ❑ First satellite developed in Africa
- ❑ Launched in February 1999 by NASA
- ❑ Demonstrated imaging capability not before considered possible with a small satellite

sun space and information systems (pty) ltd.

- ❑ Established in March 2000
- ❑ Only registered African private company with missions heritage
- ❑ Licensed to apply SUNSAT technology but we've moved significantly beyond that
 - Sumbandilasat established new landmark for cost-benefit for small satellites
 - Oryx 1 satellite is still imaging at nadir since 2007



completed missions



SunSat
Completed 1998
Launched 1999



SumbandilaSat
Completed 2006
Launched 2009



SunSpace Medium Resolution Satellite
Completed 2003
Launched 2007

image
embargoed

SUNSAT
64 kg
15m MS GSD
\$1 million

SUMBANDILA
84 kg
6.5 m MS
\$3.5 million

Oryx 1
230 kg
3.4 m PAN
5.6 m MS
\$10 million

VHR
450 kg
>1 GSD PAN
\$ 50 million



capacity development

Know-how transfer in support of client missions

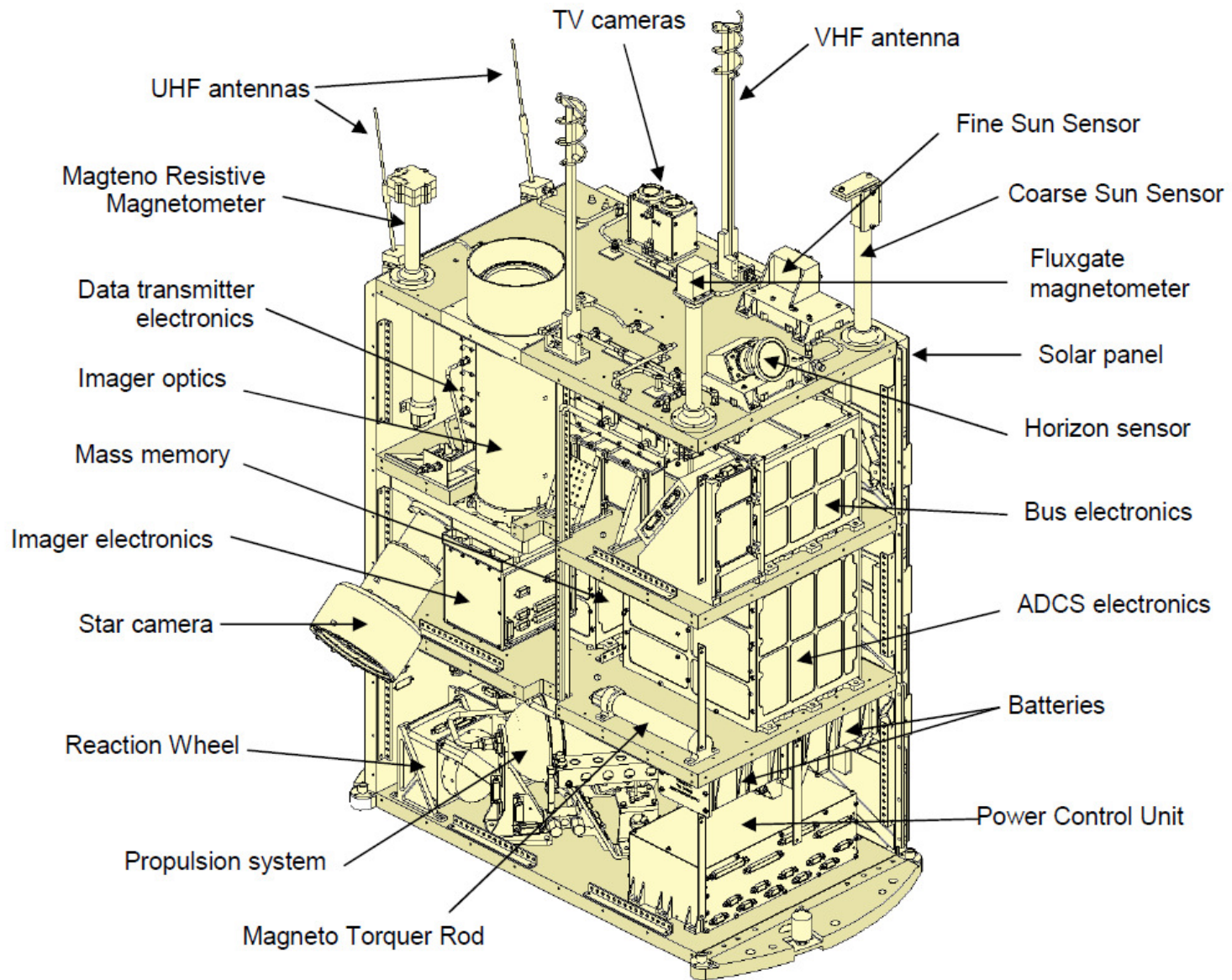
2006-7
9 satellite
engineers
DST, et al

2005-6
5 satellite
engineers
Malaysia

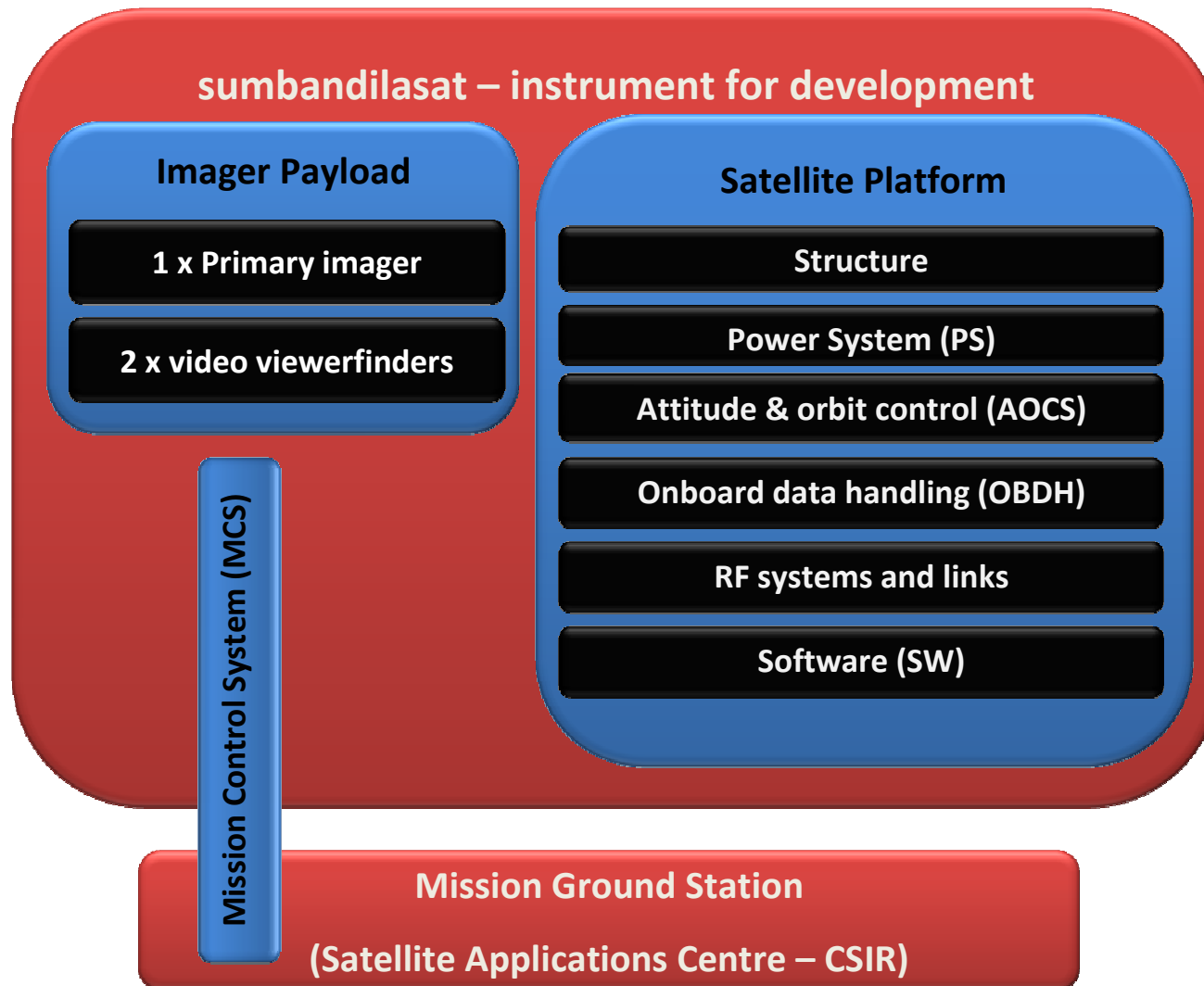
2001-4
31 satellite
engineers
Saudi Arabia



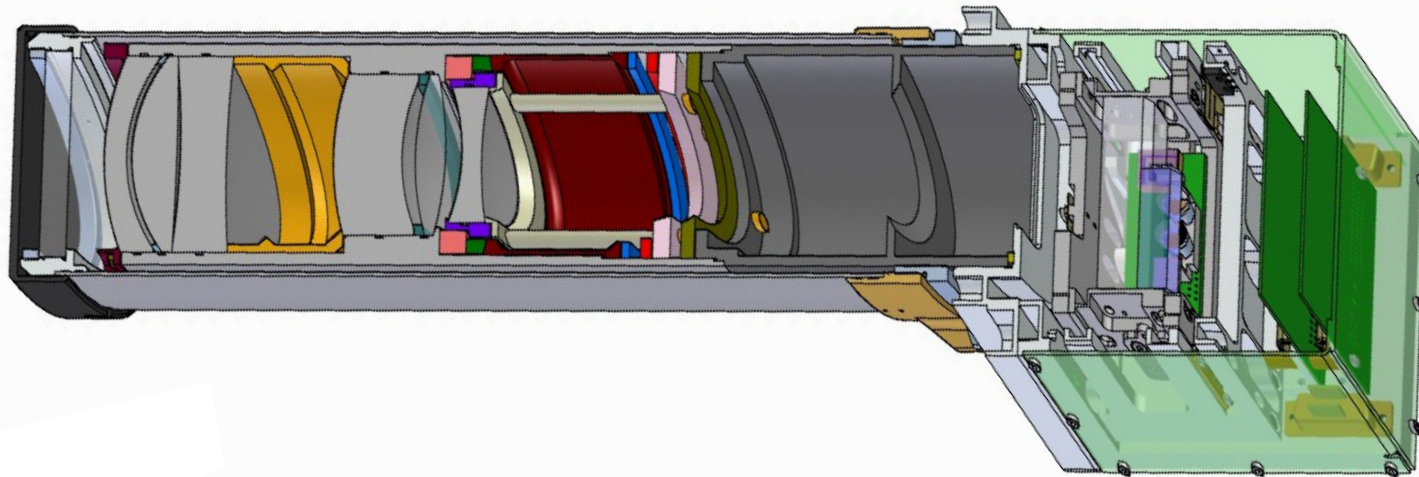
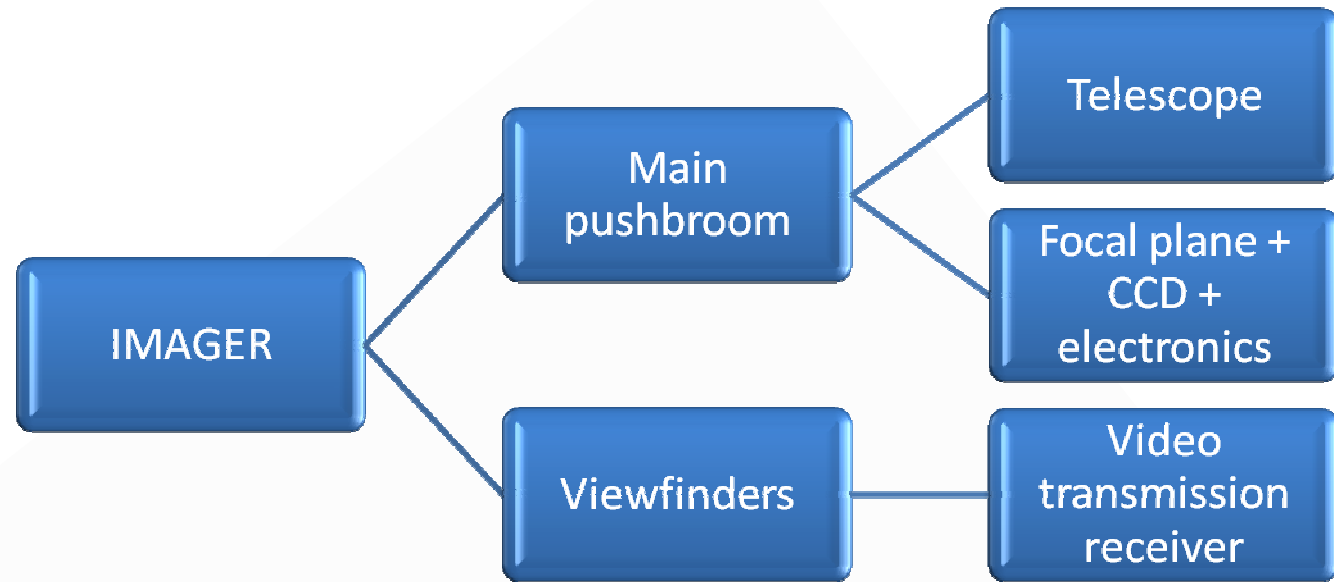
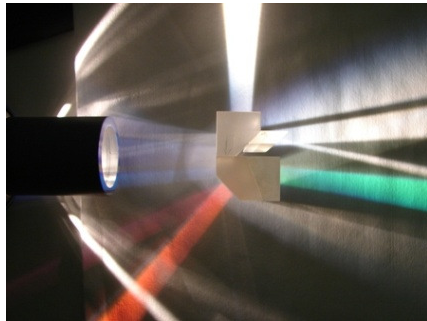
satellite cad model



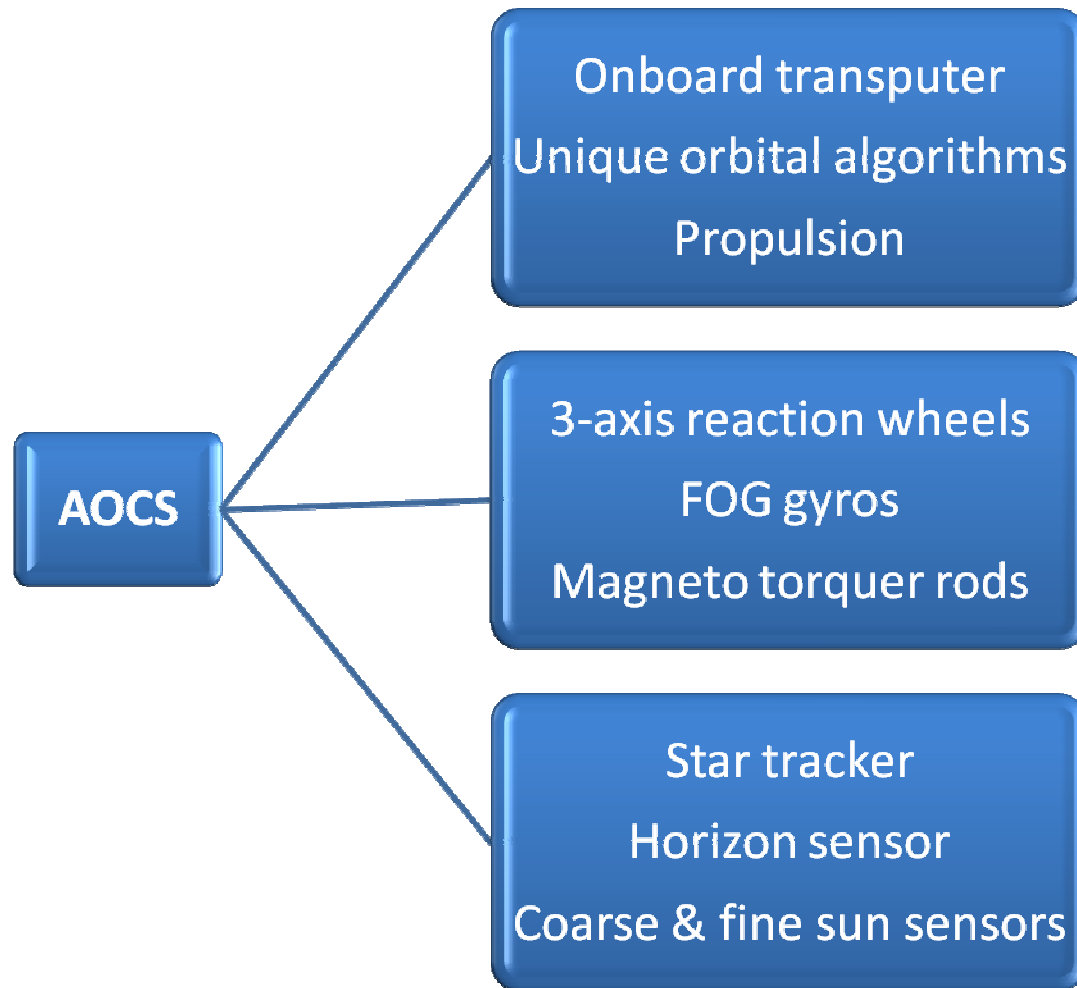
satellite overview



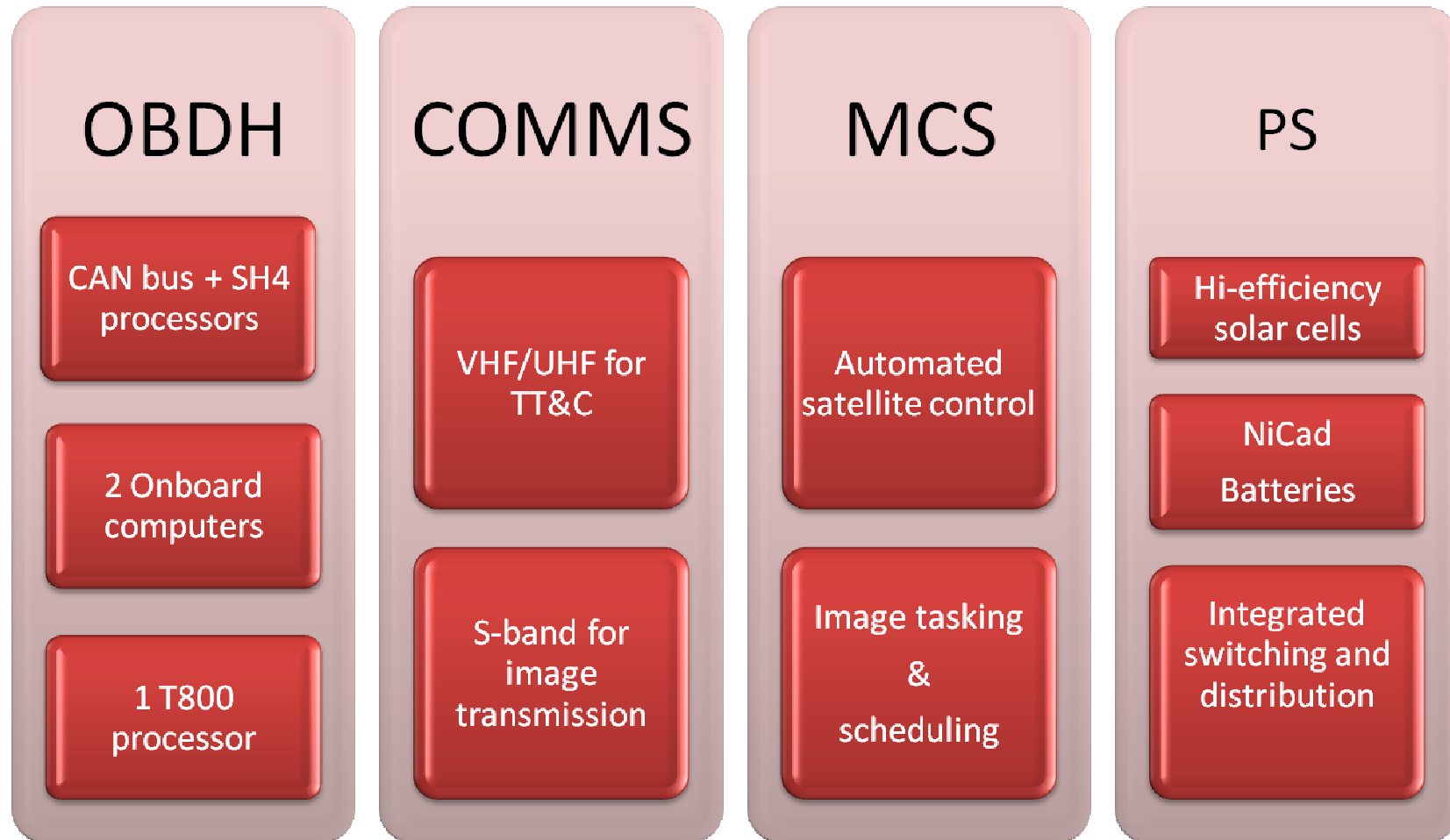
raison d'être



pointing the imager



other critical parts



holding it all together!

SATELLITE STRUCTURE

PLATFORM & LAUNCH ADAPTOR

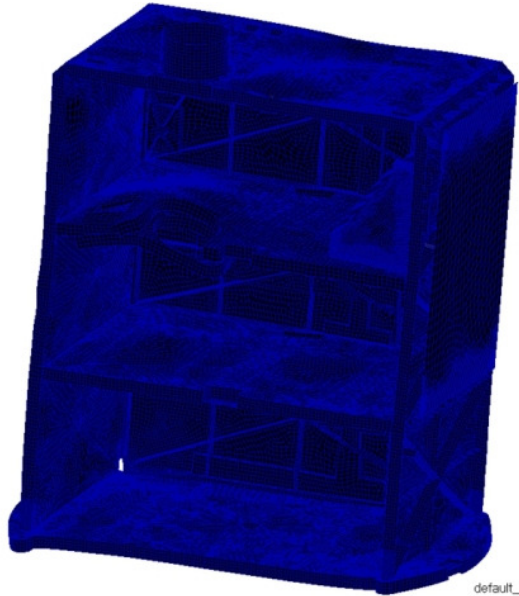
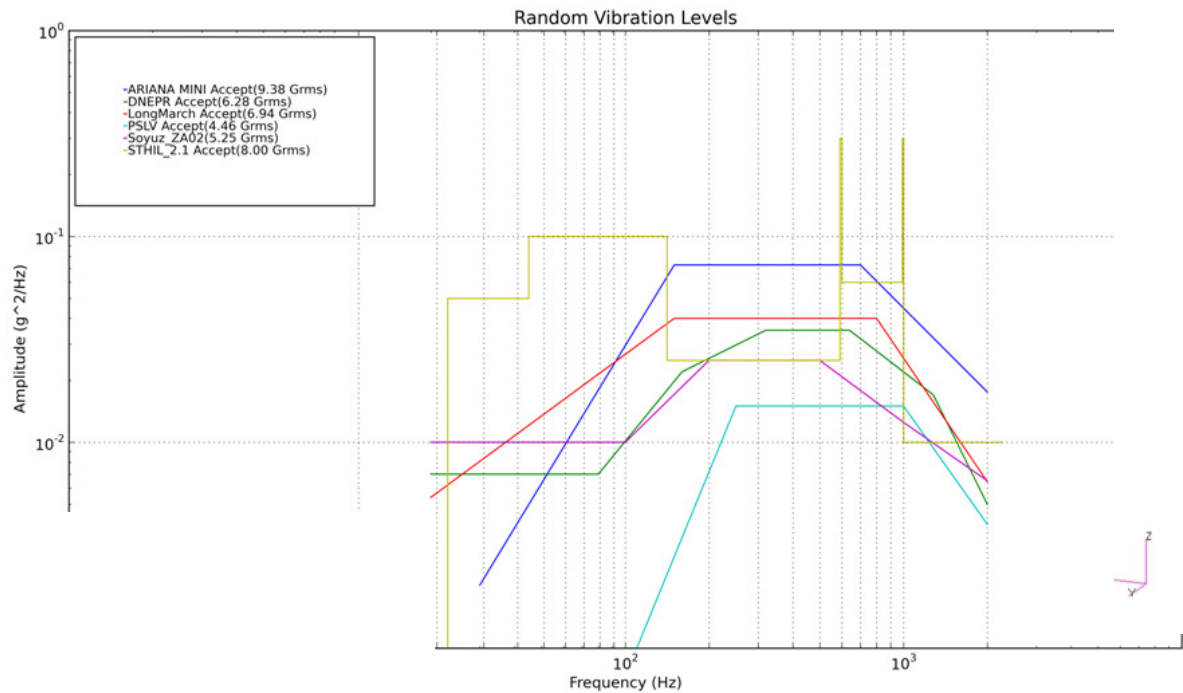
IMAGER

SUB- AND FULL SYSTEM ENCLOSURES

Structural integrity

Thermal analysis

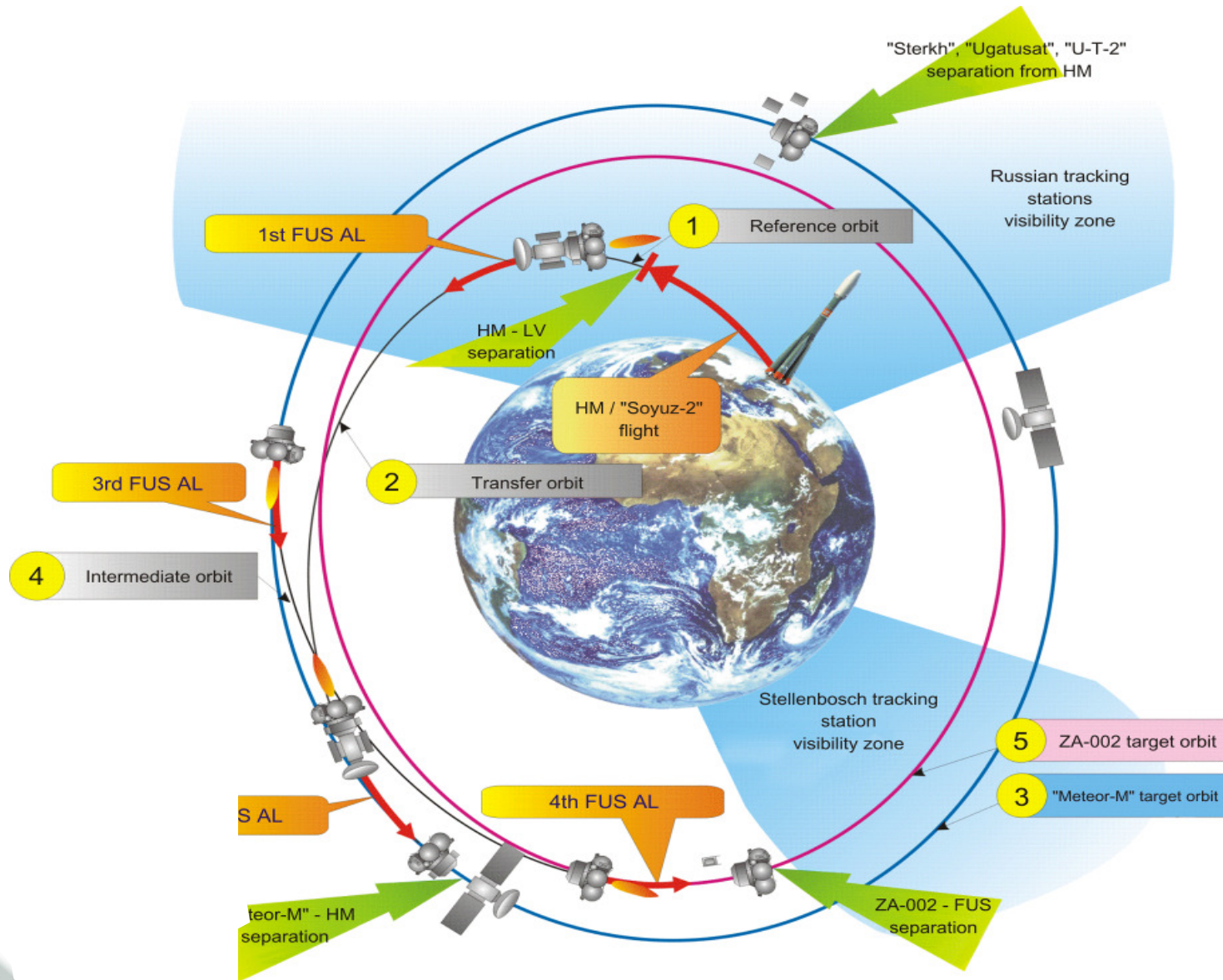
Mass reduction



default_Deformation :
Max 4.30-001 @Nd 15:



sumbandilasat launch



sumbandilasat objectives

1. Re-establish South Africa as a space-faring nation with an in-orbit small technology demonstrator
2. Build and utilise space engineering and science human capacity development academically and in industry
3. Provide a vehicle for further research and development throughout the complete EO satellite system value chain
4. Provide imagery for utilization in sustainable development



meeting sumbandilasat objectives (1)

Re-establish South Africa as a space-faring nation with an in-orbit small technology demonstrator?

- Delivered in 15 months
- Launched on 17/09/2009
- TTC contact within 15 minutes of launch
- Commissioning completed within 6 months
- Operations handover to SAC (now SANSA Satellite Operations)
- Mission tasking and scheduling carried out by client
- Health monitoring and anomaly handling carried out by SunSpace
- Operational for 24 months



meeting sumbandilasad objectives (2)

Provide a vehicle for further research and development throughout the complete satellite imaging value chain

- Image processing chain development at SSO
- MCS product developments
- Level 1B image data
- In-orbit re-focussing mechanism
- Refractive vs reflective OFE
- FMC utility
- Operating software evolution
- RF systems
- Mass reduction methods



meeting sumbandilasad objectives (3)

Build and utilise space engineering and science human capacity development academically and in industry

- 9 trainee engineers
- Experience for 78 other engineers
- Value addition to Cubesat program
- Spinoff companies in space and
- biomedical engineering
- Specialist manpower to technical software developer
- 18 M and 2 PhD engineering students
- Knowledgeable technical staff for SSO
- Local industry 240 other small manufacturers
- Improved design life



meeting sumbandilasad objectives (4)

Provide imagery for utilization in sustainable development

- ❑ 1900 useful image scenes
- ❑ 52 x 60 km av. scene size
- ❑ Image processing automation improvement

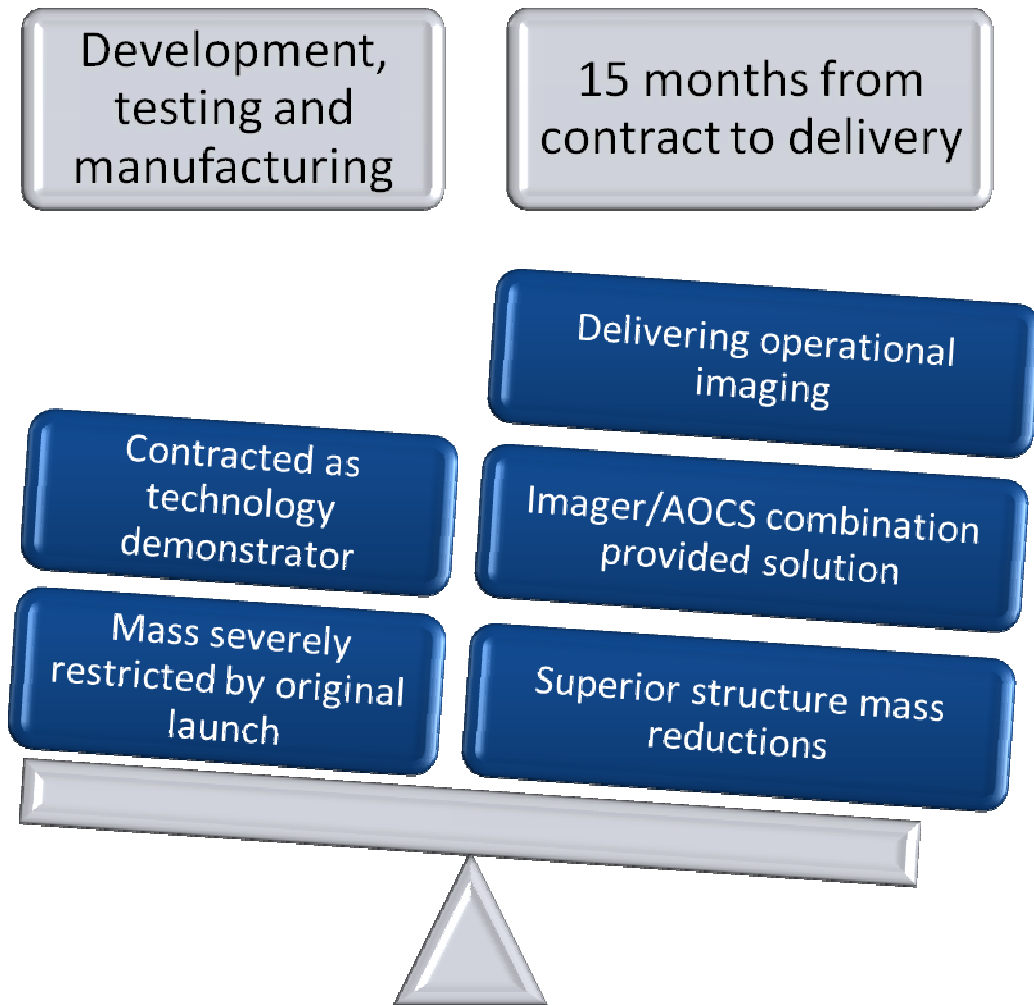


faultless design ... then reality

Some incidents	Immediate effect	solutions	comment
Comms connection bad at beginning of commissioning	Dropped data packets, complicated fault analysis during early operations	Replaced and repositioned YAGI antenna	Improved fault tracking and analysis.
T800 AOCS transputer link lost	Uncontrolled tumbling	Reprogrammed OBC to take over main functions	Design versatility prevented catastrophic loss and helped improve original algorithms .
X- reaction wheel lost	Lost tilting capability	Reprogrammed star-tracker/horizon sensor combination to achieve performance close to original HW	Not possible with hardwired satellite systems. Because of local design engineers our sorted out the problem during commissioning



some achievements - sumbandilasad



sharing beyond the vision (1)

Can a limited sumbandila be turned into super-sharing beyond hot air and patient paper?

- engineering and management contribution to an ARM(E)C know-how transfer sharing hub together with South African and other African universities
- developing engineering capacity to adroitly convert unique African earth observation user requirements into technical sensor systems to ensure utility for development

What will it cost a national fiscus to keep a serious small spacecraft manufacturing capability going?

- National focus on the utility of the deliverables – time, strategic planning, timeous implementation, administration (Euro 2 million)
- Useful projects of around Eur 6-8 million p.a. (include materials, know-how transfer, nano/cubesats, academic training)
- Strong interaction with regional, continental and international partners to bring down cost of certain programmatics (additional Euro 0.5)



sharing beyond the vision (2)

Now what are some of the opportunity costs of **NOT** investing in a serious national small spacecraft manufacturing capability?

- Repatriate the largest percentage of national taxes to rich foreign companies as a consumer
- Refuse the opportunity to save foreign exchange and therefore helping the volatility of your national currency
- Deprive the country of high-level development engineers and scientists
- Retard future sustainable economic through failure to invest in base high-level technical people



thanks/questions/contact

**Thanks to the South African Council for Space Affairs
for sponsoring my trip and the arrangements by the
ALC secretariat.**

**“you must first say I am, before others will affirm that thou art”
an ancient Nigerian saying conveyed by a young Prof Abiodun**

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