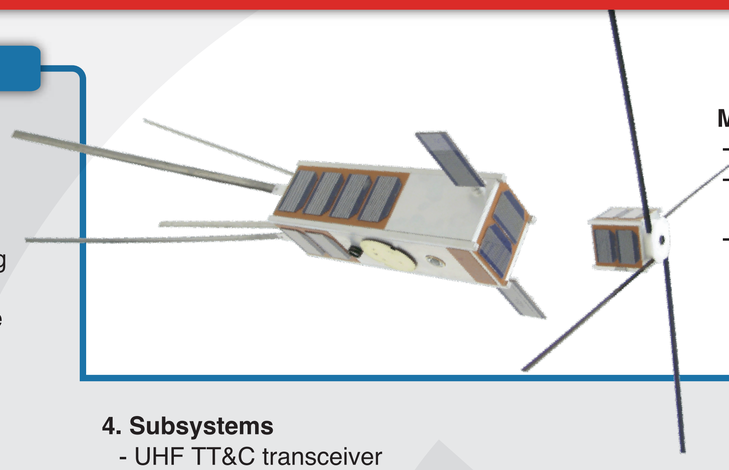
Cape Peninsula University of Technology

Faculty of Engineering

F'SATI French South African Institute of Technology

CubeSats: Development Outline

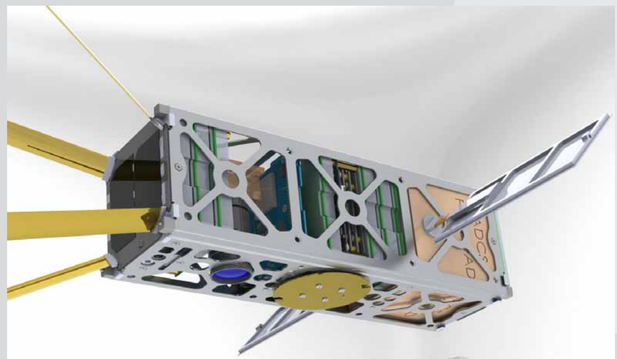
1ST MISSION



Major milestones for satellites:
- Integrated 3U prototype satellite by Oct 2011
- 1U Flight model expected Aug 2011 with possible launch opportunity early 2012
- Prototypes of both satellites to be showcased at IAC 2011

1. CubeSat
- 3U CubeSat: 10 x 10 x 30 cm
- Based on an international standard, making space more affordable.
- Subsystem use PC104 standard, stackable PCBs

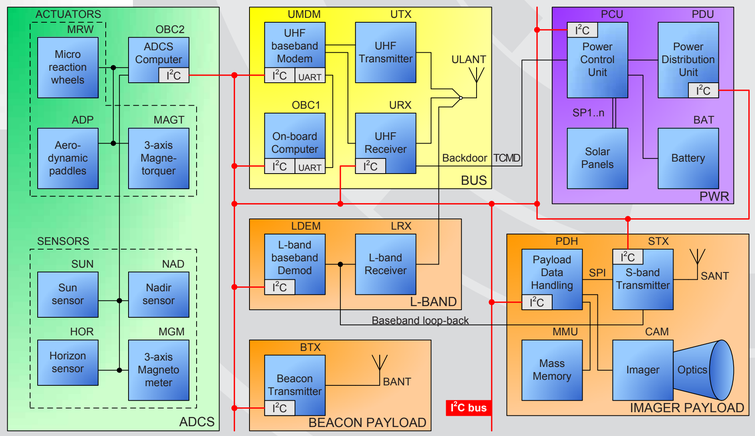
2. Concept design



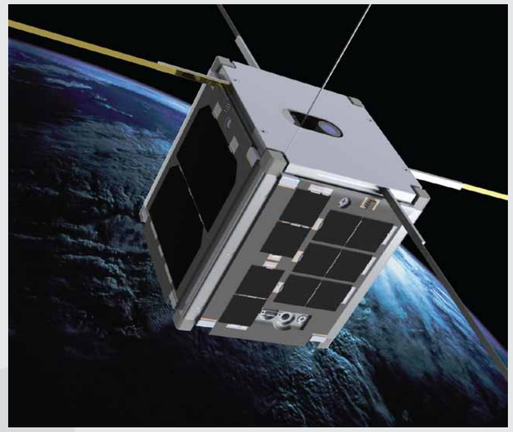
3. 3U CubeSat payloads
- Omnivision 5MP Colour Matrix Camera,
  Parameters: Aperture ≈ 20mm
  Focal length ≈ 50mm
  Ground resolution < 50m
  Swath width ≈ 130km
- L-band to S-band transponder
- Store & forward system on UHF, AX.25 protocol

4. Subsystems
- UHF TT&C transceiver
- S-band payload transmitter
- L-band receiver
- Full 3-axis stabilisation ADCS by University of Stellenbosch, deployed aerodynamic paddles and passively stabilised "tail feathers". Sensors: Nadir, sun, horizon and magnetometer Control: Actuators, magnetorquers, nano reaction wheels.
- OBC based on Pumpkin OBC featuring MSP430

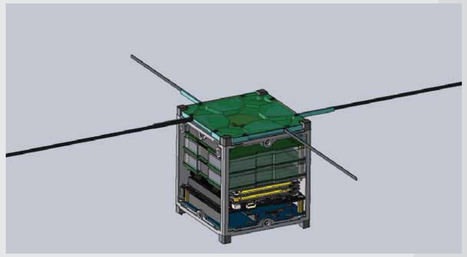
5. Block diagram



2nd MISSION (FAST-TRACKED)



1. CubeSat
- Fast track satellite
- 1U CubeSat: 10 x 10 x 10 cm
- Science payload in collaboration with SANSA Space Science



2. 1U CubeSat payloads & subsystems
- VGA Colour Matrix Camera with onboard EEPROM for image storage.
- 3-axis stabilised ADCS with torquer rods.
- HF beacon for calibration of space weather radar antennas at SANAE, featuring a novel HF antenna deployment mechanism
- VHF/UHF TT&C communication link
  - 9600 baud GMSK, 1200 baud AFSK modems
  - DTMF backdoor
- Power system: Clyde Space batteries
  Lithium-polymer 4.1V, 1.25Ah
  Clyde Space solar panels
  2.2V per cell at MPP, 1W max
  28% efficiency triple junction cells

FUNDING BY:
science & technology Department: Science and Technology REPUBLIC OF SOUTH AFRICA
NATIONAL RESEARCH FOUNDATION NRF