Education and Nano-Satellites
A South African Perspective

Arno Barnard
Stellenbosch University, Stellenbosch, South Africa

UN/Japan Nano-Satellite Symposium
Stellenbosch University - SUNSAT

- 63kg – EO Satellite
- Graduate student project
- Launched 1999 – 2 years operation

UN/Japan Nano-Satellite Symposium
SUNSAT Education

Good
• Over 100 graduate students 1992-2001
• Product development
• Spin-off company created
• Experienced engineers trained

Bad
• Long development time: 8 years
• Student graduation delayed

UN/Japan Nano-Satellite Symposium
Stellenbosch University - SumbandilaSat

• SU Research, development and training mandate
• Operational for 2 years – using new generation technology
• Separation of research and production

UN/Japan Nano-Satellite Symposium
SumbandilaSat - Education

Good
• 32 MSc graduate students, 2 Doctoral graduates delivered in satellite engineering from 2006-2010
• Students with experience of interfacing with industry

Bad
• Once-off project – continuation of research difficult

UN/Japan Nano-Satellite Symposium
Stellenbosch University - CubeSats

De-OrbitSail (FP7 Project)
• With Surrey Space Centre
• 5 Student projects

ZACUBE-2 & ZA-AeroSat
• Cooperation with CPUT
• 8+ Student Projects

UN/Japan Nano-Satellite Symposium
Cape Peninsula University of Technology

- Started satellite (CubeSats) work in 2009
- French South African Institute of Technology (F’SATI)
- 35 graduates delivered
- 40 current postgraduate students
- ZACUBE-1 delivered for launch

UN/Japan Nano-Satellite Symposium
Cape Peninsula University of Technology

Satellite Program Structure
Main aim: Human Capacity Development

• Academic – 1 year
  • Coursework
• Research – 18 months
  • Satellite engineering topics
• Professional development
  • Graduates develop and integrate complete satellite systems in industrial environment

UN/Japan Nano-Satellite Symposium
Requirements for success: Cooperation with
• Academia
  • Stellenbosch University
  • University of Florida
  • ESIEE (Paris)
• Research institutions
  • SA National Space Agency (SANSA)
  • iThemba Labs
• Satellite Industries
  • EADS Astrium
  • Clyde Space
• Government!

UN/Japan Nano-Satellite Symposium
Ongoing Projects

• ZACUBE-2 &
• ZA-AeroSat (QB50)
Does current Nano-Satellite educational approach work???
YES!

MIC 1 – 2011
SU&CPUT Team – Semi-finalists

IAC2011
SU – 2\textsuperscript{nd} place Best Student Paper Award

MIC 2 – 2012
CPUT – Category 2 winner
SU – Best Student Team Award

Both teams with original ideas – not current SU / CPUT projects

UN/Japan Nano-Satellite Symposium
This leads to Innovative Products!

CubeSat Systems

CPUT:
- STX – S-Band Transmitter system
- S-Band Antenna

SU:
- CubeSense
- CubeComputer
- CubeTorquers

UN/Japan Nano-Satellite Symposium
Joining Forces in South Africa?

• SU & CPUT – Stable cooperation
• WITS University – first students
• University Pretoria – keen interest

Is UNISEC-type organisation the next step?