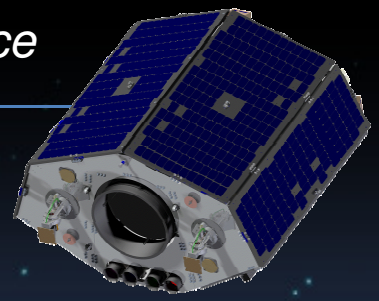
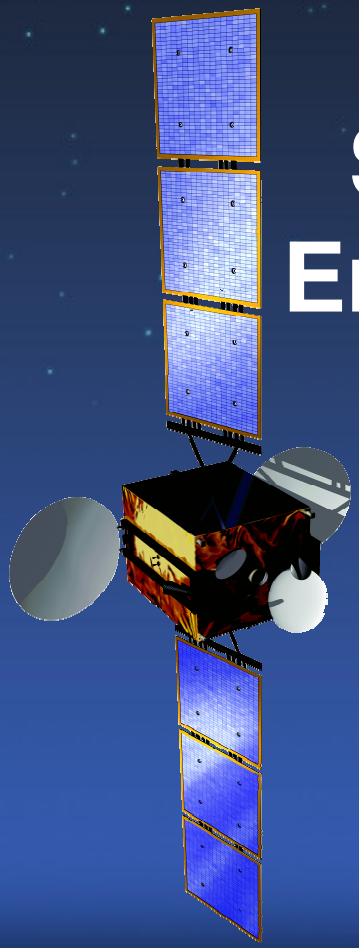
SURREY SATELLITE TECHNOLOGY LTD

*Changing the economics of space*





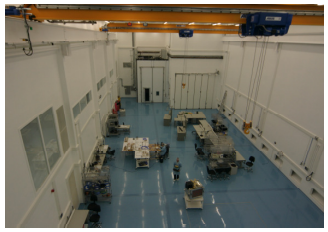
# Small Satellite Programmes to Enable National Space Capability

Andy Bradford, Director of Engineering, SSTL

ISU, Graz, July 2011

# Introduction to SSTL

**UK-based satellite manufacturing company owned by EADS Astrium NV (99%) and the University of Surrey (1%)**

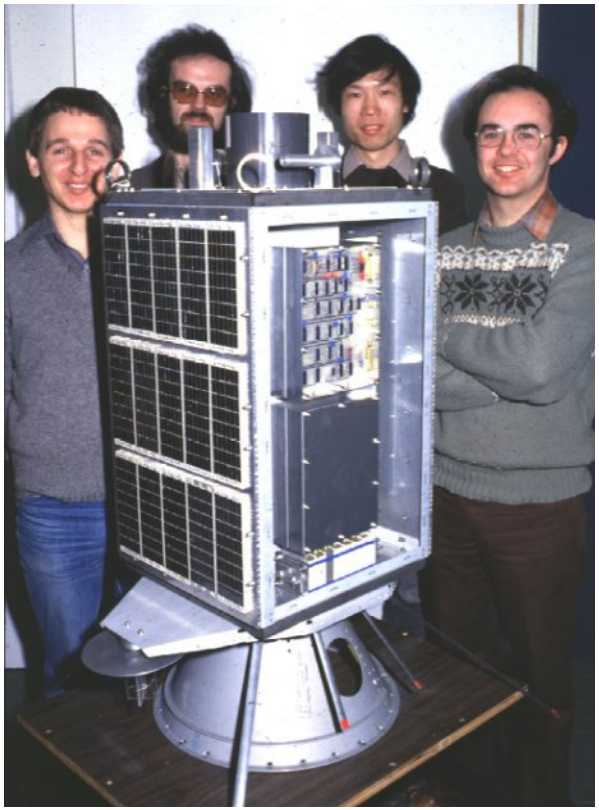
**34 Satellites completed – c.200 satellite years on-orbit experience**
**13 Further satellites (35-47) - currently being prepared for launch**
**22 payloads in progress (8 optical, 14 navigation)**
**5 satellites to be launched in 2011**

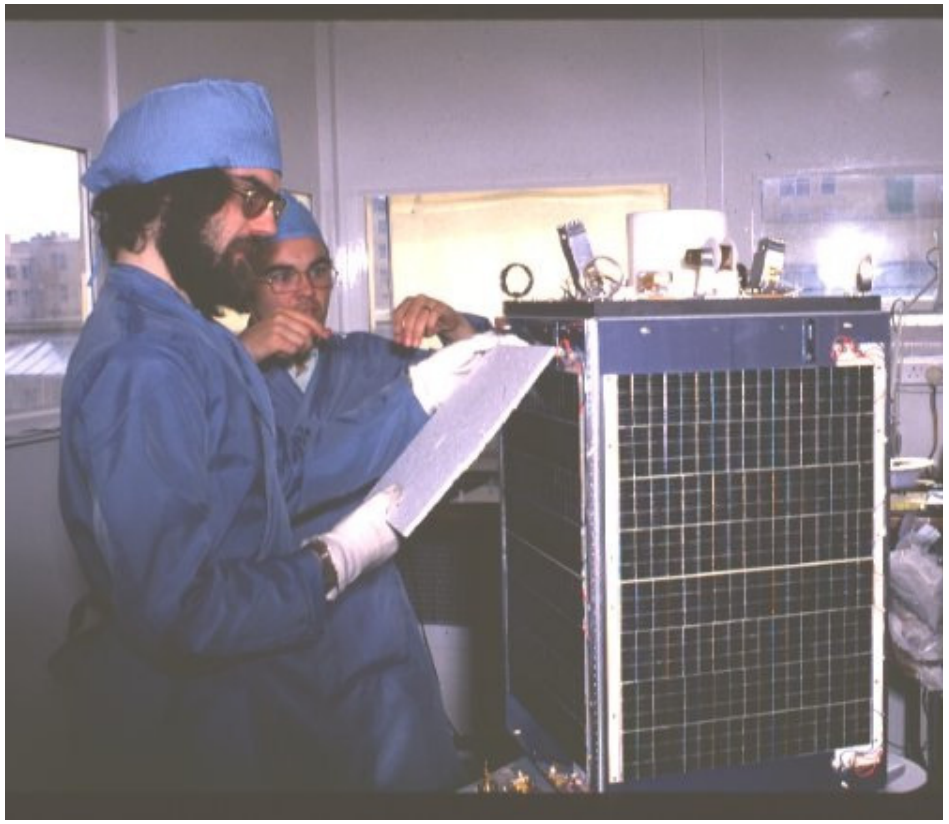
# SSTL Training Programmes

- SSTL has been training ‘Emerging Space Nations’ since the late 1980s
- Many Institutions & Nations have undertaken an SSTL ‘KHTT’ (Know How Training and Transfer) programme as their first steps in to the space arena
  - South Africa
  - South Korea
  - Malaysia
  - Portugal
  - Algeria
  - Nigeria
  - Plus many more….

# SSTL - In the Beginning….

- Martin Sweeting led the University of Surrey Electronic Engineering's Department First Satellite Project– UoSat-1 (1981).
- UoSAT-2 was built in in just six months and launched in 1984.



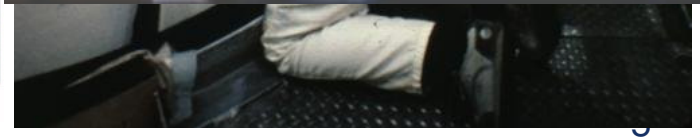


- In 1985, the University formed Surrey Satellite Technology Limited (SSTL) as a spin-out company to transfer the results of its research into a commercial enterprise able to remain at the forefront of satellite innovation.

# The Early Days

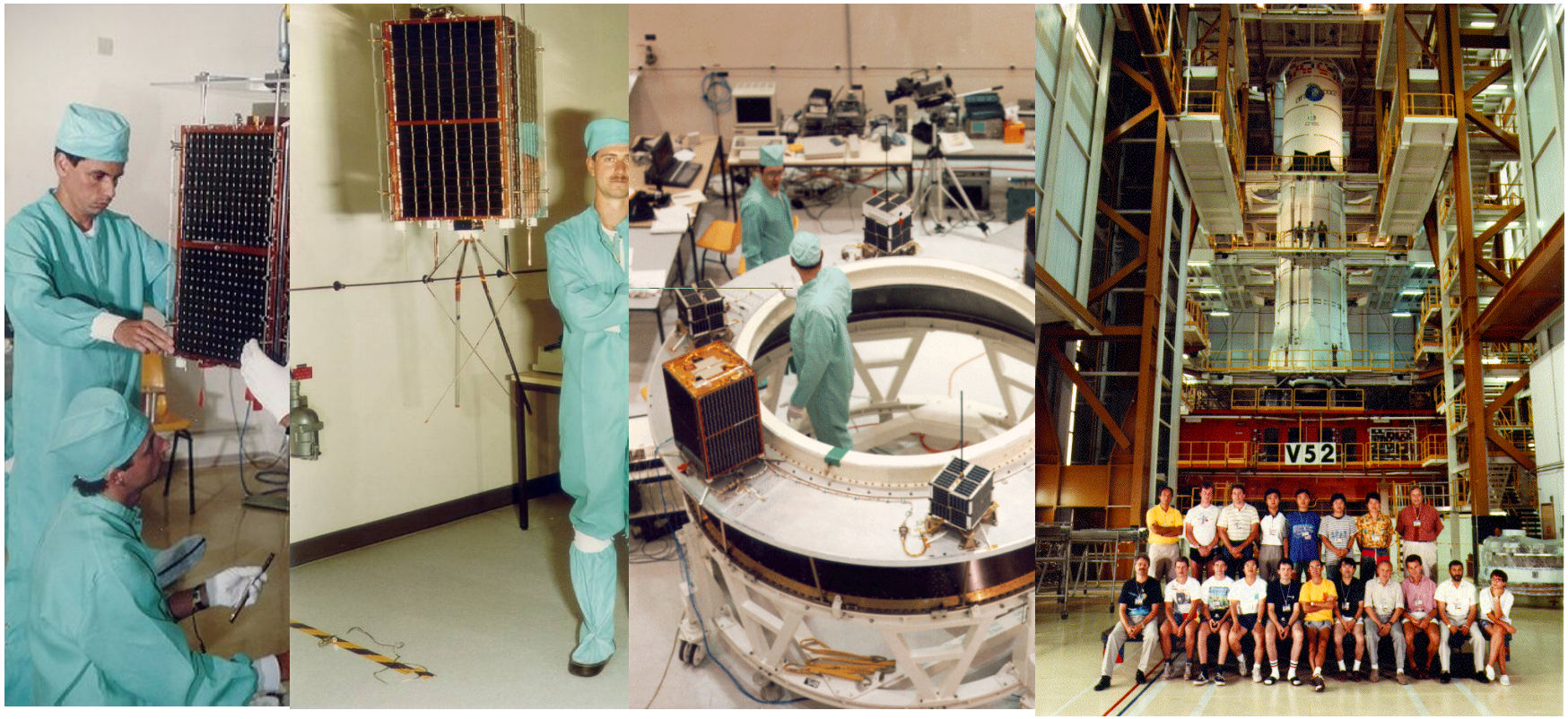
- Early Satellites were Designed and Built by a few enthusiastic Engineers, in very basic facilities!





# The Evolution and Growth of SSTL

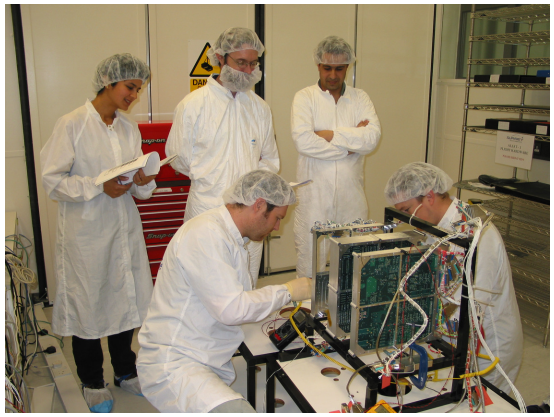
- SSTL evolved the MicroSatellite Design and Several Customers Decided they'd like to Buy one!

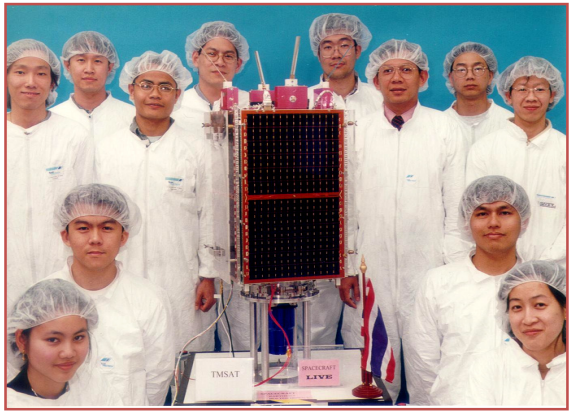



- SSTL also began training customers to build their own satellites through the KHTT (Know How Training and Transfer) Programme

# Principles of the KHTT Programme

- Typical Programme Content: Contract comprises
  - Development and Delivery of a Satellite and Ground Segment
  - Training programme for a small team of Engineers and Programme Managers
- Programme Delivery:
  - Trainees (literally) sit next to the SSTL team developing and building the satellite
  - Trainees 'shadow' their SSTL responsible engineers through all phases of the project
  - This is typically complemented by some academic training (MSc in a Space qualification from the University of Surrey), and also some more 'vocational', practical training (use of key tools, soldering to space standards, e.g.)
  - Trainees go through all phases – build, AIT and also the Launch Campaign



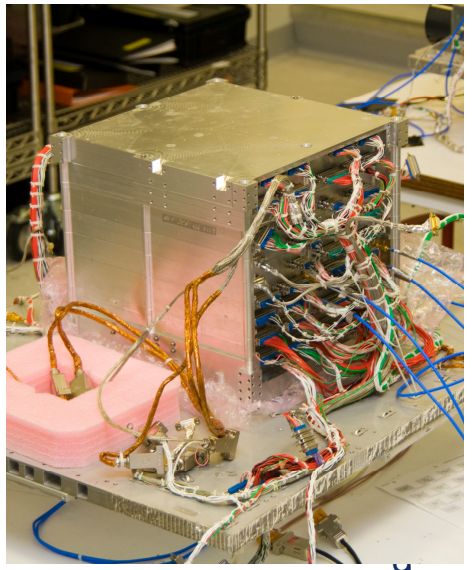


# Typical KHTT Programmes cont'd

- Typical Programme Objectives and Outputs:
  - Customer granted a licence to rebuild the SSTL satellite design, in country only (cannot exploit commercially)
- Ideal end result is the 'production' of a self sufficient team who can either (a) reproduce the programme (mission) in their own country, and/or (b) become an 'intelligent buyer' of future spacecraft (hopefully from SSTL!)
- Can't that Backfire, commercially?
  - Yes – we are potentially training up competitors and handing over our secrets….
  - In reality has only happened once (Korea – see later slide)
  - In fact this also serves to open up the market and awareness – so is still a positive outcome
  - Key is to keep commercial 'state of the art' offerings one step ahead of the KHTT programme material

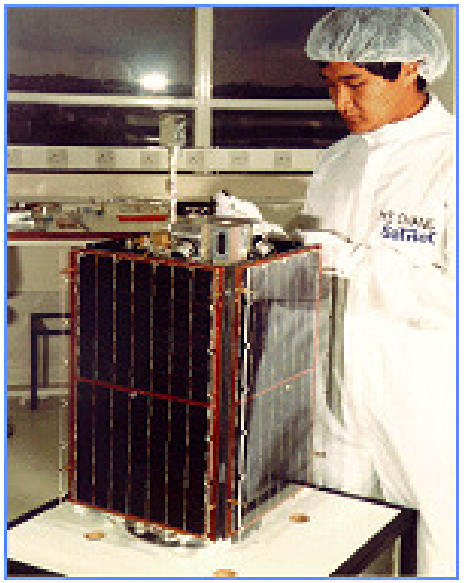
# KHTT Programme Variations

- Additional Satellite Models
  - Additional Flight Model, e.g. NigeriaSat X ('NX')
  - Standard SSTL-100 Spacecraft built by Nigerian Team during course of NigeriaSat-2 programme
  - Alternatively Engineering and/or Training models have also been built for on ground simulation & training (e.g. operations training)
- Customer Payloads
  - Payloads developed & built by KHTT team, with help/guidance of SSTL team, for inclusion on FM Satellite
  - Implemented on BILSAT-1 (Turkey) mission

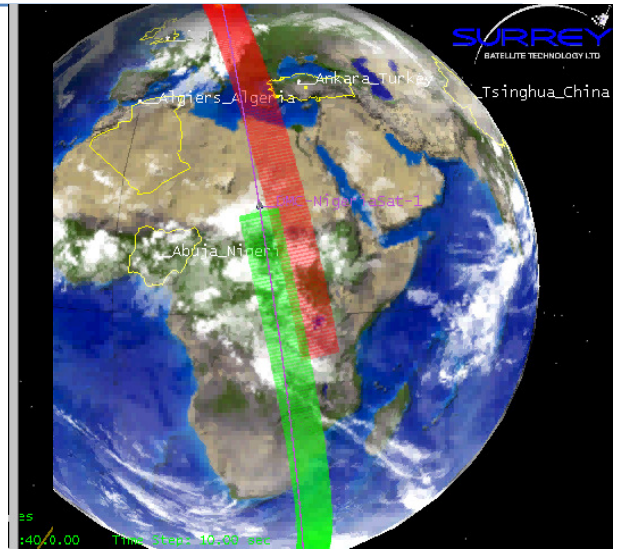


# KHTT Examples & Success Stories

- Portugal:
  - Portuguese Government had ambitions to become a ‘space nation’ and join ESA
  - First step to this was a Surrey KHTT mission & programme (‘PoSat-1)
  - Portuguese KHTT team completed their training at SSTL and went on to become the core of the new Portuguese Space Agency
  - Portugal accepted to join ESA only a few years later
- South Korea
  - KHTT Team Trained by SSTL
  - Team Formed Nucleus of Korean Satellite company, developed in to SATREC-I
  - SATREC-I now a credible player in Small Satellite Market – and in fact a competitor to SSTL

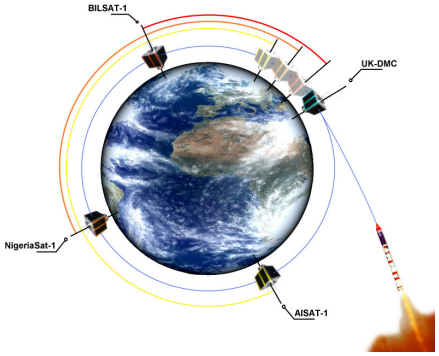


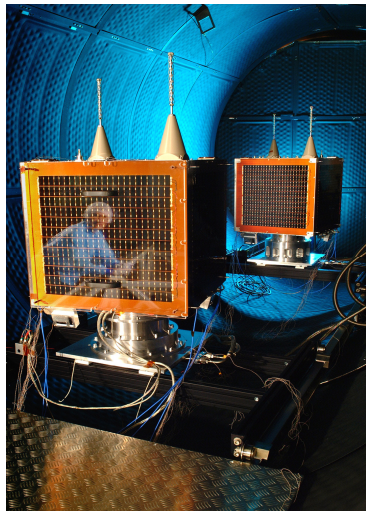
# Other Successes – Disaster Monitoring Constellation


**Novel International Collaboration – 6 countries**

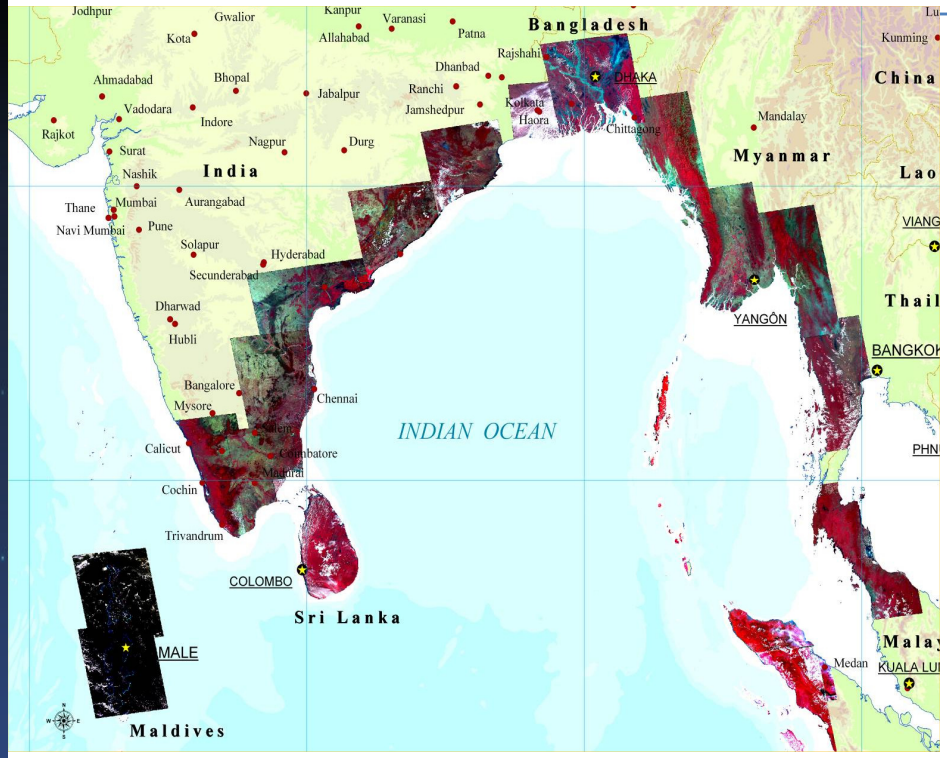
- ★3 Cosmos launches into the same orbit
- ★Individual satellite ownership
- ★Collaborative operation
- ★Data sharing and exchange
- ★Mutual data exploitation



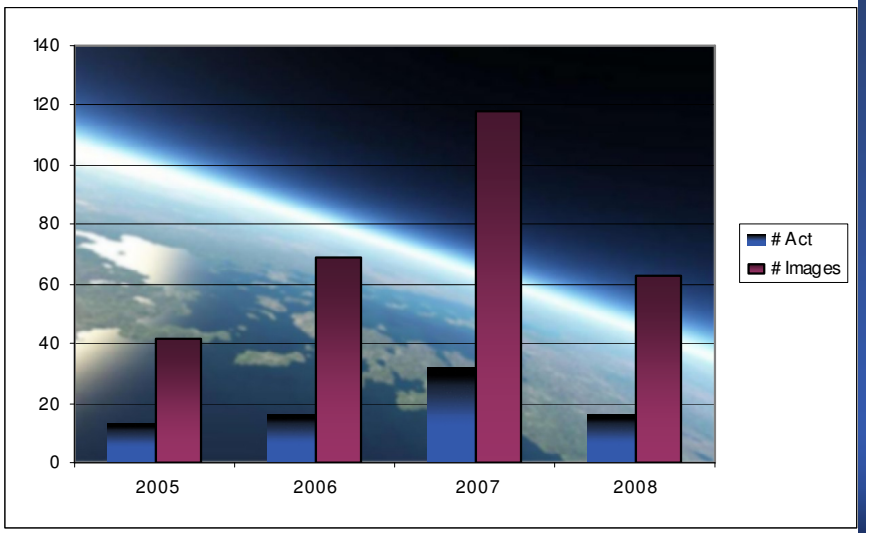



**The whole is greater than the sum of the parts – global daily imaging capability**

# DMC in the international charter

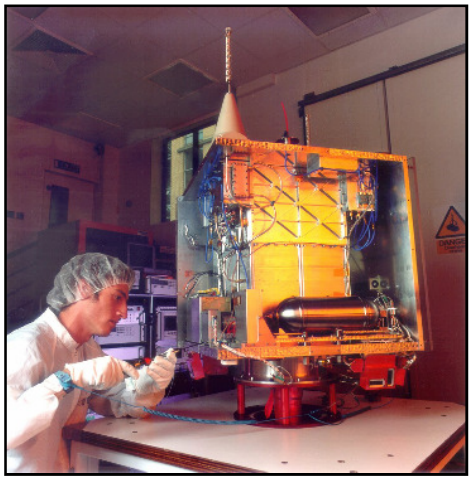


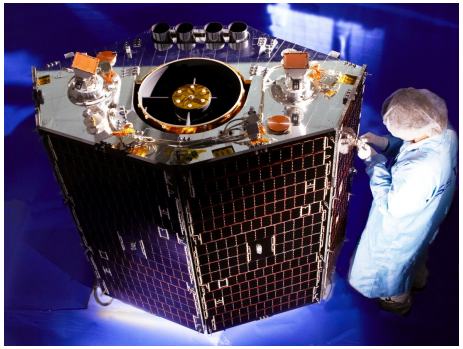

- **International charter space and major disasters**
- **Since 2005 DMC has:**
  - responded to 77 activations
  - with 292 wide-area images
- **Major campaigns in 2008:**
  - Floods in Southern Africa
  - Earthquake in China
  - Cyclone in Myanmar

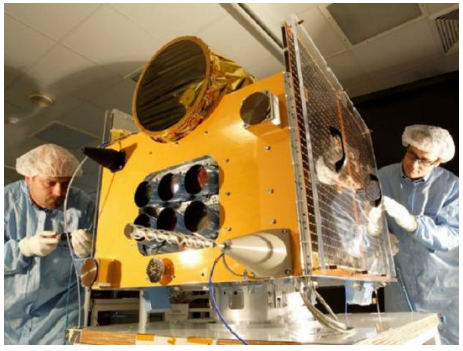


# Why Small Sats are Ideal for Training Programmes

- The price of the 'Entry Ticket' – can be less than $10m, rather than the more 'traditional' $100m - $1bn
- Small team size possible – less than 20 – can all work together, learn together, understand each other's specific issues, problems, challenges etc.
- Small team can see the whole project lifecycle – not easy to achieve if you're first project is a 6 tonne science mission with 15 payloads….
- Small Satellite can still give a small team a good grounding/introduction in all aspects of a mission
  - Short timescales – haven't forgetten how mission design was done (or have different team in place) by the time you get to AIT…







# Summary

- Small Satellites Missions are Ideal Vehicles for Training Programmes
- SSTL have successfully delivered over 15 KHTT programmes, to a variety of customers and nations, in a variety of ways
- Many of the Teams trained have gone on to form the Nucleus of Space Agencies in their Home Countries

SURREY SATELLITE TECHNOLOGY LTD

*Changing the economics of space*

# Thank you

*Questions?*