UKube-1: technology, mission and operations

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Summary

• How did I do that?

• What is UKube-1?

• UKube-1 status

• What is a Ground Station?
  What is it not?
  What do I do?

• UKube-1 – after one year

• What next?
IRAS

Infrared Astronomical Satellite - launched 1983

A joint American, Dutch, British project

IRAS was the first infrared satellite and it made a survey of the whole sky
IRAS Ground Station

12 metre S-band antenna plus Apollo 16 (flight spare) control rack
Satellites I have known

IRAS 1983

ISO

Mars Express

JWST 2018

Cluster
MIRI Flight Model Testing
UKube-1 satellite

- Ukube-1 is a 3-unit cubesat
- It orbits around 630km above Earth at a velocity of 7.5 km/s
- It has 6 payloads on it:
  - a camera from OU
  - ionospheric experiment from Bath University
  - 2 computer-related experiments from industry
  - FUNCube-2 from AMSAT
  - S-band transmitter

Image from AMSAT
UKube-1 teams

Engineer
Ground Station
Payload Providers
Support
Software
UKube-1 preparations

Operations rehearsals
at Clyde Space

Deploying the solar panels

- Build the satellite (and test)
- Build the payloads (and test)
- Build the software
- Fit the payloads into the satellite
- Test the satellite
  - Operations
  - Thermal
  - Vibration
Status of satellite

- In correct orbit
- Solar panels and antenna deployed
- Batteries in good shape
- Slow spin rate
- Still working, after one year of operations

- Uplink and downlink capability checked
- Large Data Transfer checked (up and down)
- Downlink at 1k2, 2k4, 9k6 successfully tested
- Redundant comms checked
- Platform systems checked
- Payloads commissioned (not STX), and checked
- All payloads (except STX) operated and delivered data

Two issues: UVTRX deafening and resets
UKube-1 Ground Station

SO....

What is a ground station?

UKube-1 Mission Manager
UKube-1 uses amateur radio frequencies for communication (VHF downlink and UHF uplink)
Ground Station system

This is not just a Ground Station
This is a Mission Operations Centre
What do I do, and how?

- The Mission Planning Software package creates the commands to send to the satellite
- The Ground Station computer (and me) keep track of when the satellite passes over the antennae
- I send up the commands and get data downloaded
- I decide what to command and which data to download next
- I process the data and send it out
- I handle updates to the on-board software, and cope with (or solve) problems
UKube-1 – after one year

- It has 6 payloads on it:
  - a camera from OU
    Images taken
  - Housekeeping
  - RDM
  - ionospheric experiment
    from Bath University
    Data taken
  - 2 computer-related
    experiments from
    industry
    JANUS LP data
    MIC data
  - FUNCube-2 from AMSAT
  - S-band transmitter
• UKube-1 will continue until 8 July 2015, one year after launch.
• Then AMSAT has it for 2 more years.
• Hopefully there will be more cubesats funded by UKSA after that.
• Centres at Harwell, Edinburgh and Glasgow, to allow payload providers to test payloads and interfaces.
• When the nominal mission complete UKube-1 gets its OSCAR.