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IMAGES FROM NSIGHT - A 2U EARTH OBSERVATION AND ATMOSPHERIC SCIENCE CUBESAT

Abstract

South Africa contributed two 2U CubeSats to the international EU-funded QB50 project: ZA-AeroSat (QB50 AZ01) and nSight 1 (QB50 AZ02). nSight 1 carries two significant payloads: the "Gecko" camera for Earth observation and the "FIPEX" atmospheric science instrument.

Our Gecko RGB matrix camera was developed in-house. The camera features a unique modular design that includes integrated high-speed flash memory and an FPGA processor. These features enable the camera to achieve high frame and data transfer rates. This technology has since been applied to larger satellites that support multiple spectral bands and more powerful optics.

Image compression and imaging modes were optimized to work with the available UHF/VHF data downlink. Attitude determination and control system is handled by a ADCS stack developed by CubeSpace in South Africa. A dedicated ground station was set up on South African soil to service nSight 1's daily data downlink needs.

The FIPEX (Flux-Φ-Probe Experiment) instrument was developed by the TU Dresden and measures the time-resolved behaviour of atomic and molecular oxygen in the lower thermosphere.

Mission-specific challenges included integrating our imaging hardware into the severely space-and-power constrained 2U form factor enforced by the QB50 mission. Additionally, a minimum daily amount of scientific data needs to be downloaded from the FIPEX instrument over a UHF link while still leaving enough bandwidth for imaging missions. nSight 1's short completion time of only 6 months, whilst achieving full compliance with the QB50 project and launch requirements, serves as a useful example to the field.

nSight 1 is currently complete, delivered and awaiting launch. According to the current timeline the QB50-ISS launch to the International Space Station will occur by mid March 2017. During the 68th IAC in September 2017, nSight 1 will have been operational in space for several months.

We will present how nSight 1 was turned from concept to flight model in less than 6 months by combining commercial off-the-shelf technology with home-grown IP, paying specific attention to nSight 1's role as Earth Observation technology demonstrator. We conclude by reporting on commissioning and our first images taken of Earth.