24th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Earth Observation Missions (4)

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THE AUSTRALIAN INSPIRE-2 / AU03 CUBESAT FOR THE QB50 PROJECT

Abstract

The INSPIRE-2 / AU03 cubesat was accepted by the European Union's QB50 project on 19 August 2016, only 10 months after the project started on 30 September 2015, the last day of the 2015 Australian Space Research Conference. This 2-unit cubesat is the result of a very strong collaboration between the three participating universities, the University of Sydney, the Australian National University (ANU), and UNSW Australia. INSPIRE-2 carries 5 payloads: a multi-Needle Langmuir Probe (provided by QB50) to measure the electron number density of Earth's thermosphere and ionosphere as a result of daily variations and space weather events, including the so-called "plasma tubes in the sky"; Nanospec (U. Sydney), a photonic spectrograph that has a theoretical spectral resolution of 0.4 nm (for a mass below 50 grams), contains the first photonic lantern to fly in space, and is one path to a novel hyperspectral imager; a Radiation Counter (based on a Geiger-Muller tube) and a Microdosimeter, both from U. Sydney, to measure the counts of gamma rays and ionizing radiation along the orbit and so to study space weather; and the Kea GPS instrument (UNSW Australia) to provide locations, measure GPS signals scattered off the sea and land, and perform radio occultation experiments. In order to de-risk the project and to decrease the time required, the satellite's design and software are modified versions of those for UNSW Australia's ECO / AU02 cubesat and Commercial Off-The-Shelf (COTS) parts are used extensively. Boards for the instruments, the knife / burn circuits for releasing the communications and Langmuir probe antennas, and parts of the exterior structure were designed and built in Australia. INSPIRE-2 was primarily built and tested at U. Sydney and UNSW Australia, but underwent thermal vaccum and vibration testing at the AITC on Mt Stromlo. It is expected to be launched to the International Space Station (ISS) via an Atlas V rocket in late March 2017, with release into space about a month later. If all goes well, INSPIRE-2 and its fellow Australian QB50 cubesats will be the first Australian satellites to be launched from the ISS, the first Australian-built satellites in space in 15 years, only the 4th to 6th Australian-built spacecraft to fly in space, and demonstrable progress in building Australia a real, sustainable, space capability. This paper will describe the mission, spacecraft, instruments, technology, and (ideally) the first results in space.