eyesat

Interplanetary dust and galaxy

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CONTEXT AND OBJECTIVES

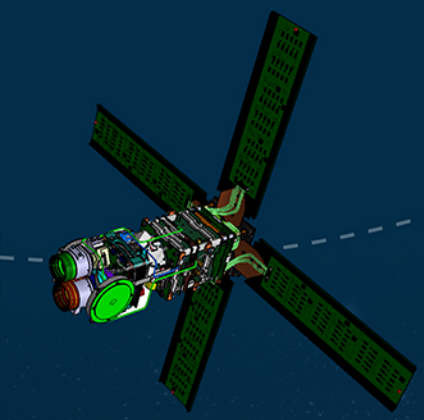
Since 2012, CNES has developed the JANUS program which helps students to make their own CubeSat. It currently gathers 14 projects in France: the leading project Eye-Sat is done at CNES with interns whereas the other 13 CubeSats are done within French universities. More than a hundred students from associate degree to PhD degree level have been working for 5 years on the Eye-Sat's system, from the mission analysis to the 3U CubeSat integration and the ground segment implementation. Various actors have been also contributing to Eye-Sat such as planetary scientists, engineers from CNES and private companies.

Eye-Sat will observe the night sky without the Earth's atmosphere contamination, in order to study the zodiacal light and image the Milky Way. The zodiacal light, a faint glow mostly visible to the naked eye near the Sun and the ecliptic plane, results from the solar light scattering on interplanetary dust particles present in all directions. Eye-sat will provide new space-based measurements of the intensity and polarization of the zodiacal light for the first time at the high spatial resolution of 1°.

IRIS: IMAGER REALIZED FOR INTERPLANETARY DUST STUDY

Eye-Sat's payload is a reflecting telescope with a 50 mm focal length, a 25 mm diameter for a +/- 6.5° field of view. It will operate in several polarization and spectral modes, thanks to polarization and wavelength filters assembled on two rotating wheels.

A 3U CUBESAT FULL OF CUTTING-EDGE TECHNOLOGIES



Design, realization and testing of the satellite have been done by students. Eye-Sat will produce more than 500 GB of data which makes necessary the use of the X band with a datarate of 15 Mb/s. Moreover, scientific objectives impose severe requirements on the attitude determination and control system such as a targeted 0.25° accuracy. Thus, Eye-Sat comprises a star tracker and four reaction wheels to have an accurate 3-axis CubeSat control. In addition to its scientific mission, Eye-Sat will help CNES demonstrate a set of advanced technologies developed within R&D programs.

Ninano: A C&DH module, developed by Steel electronics with CNES' support, which uses a Zynq 7030 from Xilinx

EWC27: An X-band transmitter developed by Syrlinks with CNES' support

EWC31: An S-band transceiver developed by Syrlinks with CNES' support

Self-blocking and self-deployable composite hinges to deploy the solar panels, developed by Clix with CNES' support

1 Star tracker (BST-200 from BST) and 4 reaction wheels (RW-210 from Hyperion technologies)

Flight sofware based on time and space partitioning concepts, developed at CNES by students

A MODERN AND SIMPLE CONTROL CENTER

Eye-Sat's control center is composed of both re-used technologies and new ones. All the low layers that deal with frames are CNES' modules. The above layers have been developed from scratch with students. They are CCSDS packet compatible, ECSS PUS compatible, use modern software technologies and still remain simple. Morevoer, dedicated web based GUIs have been designed, implemented and tested with operators in the loop.

JANUS

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