

ASTRODYNAMICS SYMPOSIUM (C1)
Attitude Dynamics and Control (9)

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SINGLE SENSOR SPACECRAFT CAN NOW BECOME REALITY WITH HYDRA QUALIFICATION

Abstract

A new generation of multiple heads Star Sensors called HYDRA has been developed in the past years by Sodern to offer to the market a high potential for attitude control loop simplification and cost optimization for future missions. A complete EQM of this new product has been realized and will be qualified on ground during the summer 2009.

The SODERN approach for this new product was to propose a single attitude sensor for the AOCS which allows a large simplification of the system. This goal is achieved thanks to a centralized star tracker Electronic Unit (EU) managing multiple Optical Heads (OH) and taking care of almost all Sensor related FDIR and data processing functions. Individual optical heads also offer an increased availability, robustness and performances making unnecessary the addition of other attitude sensors onboard.

The baseline of the HYDRA concept is an assembly of three OH's and one redounded EU, but other configurations are possible since the EU can drive only one or up to three different OH's plus a fourth one in cold redundancy. Fused multiple head concept extends star tracker field of view providing robustness to occultation of one or two Optical Heads from external bodies like Sun and Earth. The high sampling rate (30 Hz) ensures robustness to rapid accelerations, and also acceleration changes that could be experienced in a highly agile mission or during thrusters firing for spacecraft de-spin.

Besides the description of the HYDRA final design and various possible configurations, the full paper will assess its performances in details through a presentation of HYDRA EQM test results. These tests include the performances and environmental testing of individual components of the system (OH and EU), as well as complete system tests involving the multiple components operating altogether. Multi-heads performances will include night sky testing, robustness testing with digital image sequences as well as thermal vacuum tests.

The ground qualification of HYDRA in 2009 will be followed by the flight demonstration in MEO in 2010, onboard a Glonass satellite built by JSC-ISS from Russia. Taking advantage of the potential offered by this product, several primes such as IAI, ThalesAleniaSpace or Astrium have already selected the HYDRA for their new LEO platforms. The first deliveries of flight models for these customers will start in 2010 with at least three HYDRA flight sets with three heads and two electronic units to be delivered by Sodern next year.