

ASTRODYNAMICS SYMPOSIUM (C1)  
Attitude Dynamics (2) (4)

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DEVELOPMENT OF TOTAL ORBITAL REAL-TIME ATTITUDE CONTROL SIMULATOR FOR  
SMALL SATELLITES**Abstract**

The higher the mission requirements of small satellites become, the more sophisticated onboard attitude control subsystems are required in order to achieve highly complicated mission. QSAT-EOS (Kyushu Satellite for Earth Observation System Demonstration) currently under development by Kyushu University is an example of which attitude control subsystem has to steer the satellite body in order to enable onboard cameras and antennas to point and track the desired direction. Observation targets are not only surface of the earth but also the moon and the stars. Therefore, we need to develop the attitude control simulator which enables us to study and verify feasibility of missions in the initial design phase and to tune the attitude control parameters in the flight hardware design phase. This paper presents the overview of the attitude control simulator TORA-Sim (Total Orbital Real-time Attitude control Simulator) and simulation results applied to QSAT-EOS. TORA-Sim enables design and analysis of the following modes

- Sun Acquisition control,
- Geocentric Pointing control,

- Ground Point Tracking control,
- Star Tracking control.

Since TORA-Sim has a simple model and an exact model for each mode, it can be used not only for the conceptual design or initial mission study but the detailed design using actual hardware information such as reaction wheels, gyroscopes, etc. This simulator is used for the development of onboard software for the attitude control subsystem of QSAT-EOS planned to be launched in 2013. The simulation results of ground point tracking control mode have verified the simple quaternion control used for QSAT-EOS is satisfactory for required tolerance of pointing accuracy. The simulator will be improved using the actual in-orbit data to be acquired from the flight data of QSAT-EOS.