SMALL SATELLITE MISSIONS SYMPOSIUM (B4)
Small Space Science Missions (2)

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STATUS OF THE FAST MISSION: MICRO-SATELLITE FORMATION FLYING FOR TECHNOLOGY, SCIENCE AND EDUCATION

Abstract

FAST (Formation for Atmospheric Science and Technology demonstration) is a joint Dutch-Chinese formation flying mission cooperated through Delft University of Technology (TU Delft) in the Netherlands and Tsinghua University in China. During the 2.5 years period, the two satellites, FAST-D (being developed in Delft) and FAST-T (being developed in Beijing), will demonstrate various new technologies such as autonomous formation flying with distributed propulsion systems and MEMS technology to optimize propellant consumption. Meanwhile, using spectropolarimeter and altimeter payloads on both satellites, the formation flying architecture will provide more scientific return through the observation of atmospheric aerosols and seasonal variations of height profiles in the cryosphere. Furthermore, through the FAST mission, students in TU Delft and Tsinghua will be taught cutting-edge technologies, and the international view of students and staff members will be broadened. Therefore the FAST mission is expected to be the first international micro-satellite formation flying mission to achieve objectives in three distinct fields: technology, science and education.

The Phase A of the FAST mission has been completed. Currently the preliminary design is ongoing and scheduled to be finished at the end of 2009. In this paper the latest status of the FAST mission is presented. The first part of this paper describes the mission scenario and definition, highlighting different formation flying phases and operational modes. The second part details the system design of both the space and the ground segments, with emphasis on Dutch contributions. In this part, new results in the development of the science payloads SPEX (Spectropolarimeter for Planetary EXploration, on both FAST-D and FAST-T spacecraft), SILAT (Stereo Imaging Laser AlTimeter, on FAST-D) and the miniSAR (on FAST-T) are provided. The up-to-date system/subsystem design of FAST-D is specified along with an introduction of FAST-T. The architecture of the ground segment is also described with a focus on scientific data processing and distribution. The third, i.e. the last part deals with key technical issues related to autonomous formation flying. Design issues related to collaborative control, inter-satellite link, relative navigation and attitude control, and distributed on-board data processing are addressed. An agent-based framework is presented under the FAST system architecture, as a solution for these problems.