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SONATE - A NANOSATELLITE FOR AUTONOMY

Abstract

The need for more autonomy in spacecraft operations for nanosatellites will increase in the future. Nanosatellites are becoming more and more mature and the fields of applications are growing daily, including exploration.

The SONATE mission will demonstrate higher level of autonomy in spacecraft operations for nanosatellites by two means. First, it will be able to detect transient lightning phenomena's in the atmosphere by the optical instrument ASAP (Autonomous Sensor and Planning System, FKZ 50RM1208), which cannot be predicted and previously planned on ground. Furthermore ASAP-L will autonomously generate a new plan, including a new command list on board, dependent on the type of phenomena, which has been detected. Second, the autonomous diagnosis system ADIA/ADIA++ (Autonomous Diagnosis System, FKZ 50RM1524) will make a diagnosis on board in case of a failure and give ground controllers information not only about the failure but also the root cause of a failure. Furthermore ADIA-L will propagate possible future failures onboard. Thus, a more intelligent reaction in the absence of communication will be possible in future nanosatellite missions, which would be especially meaningful in interplanetary missions.

The SONATE nanosatellite will be a triple-cubesat for technology demonstration and testing, carrying the above mentioned two main payloads and a number of other secondary payloads. The project started in February 2016. Launch is planned for early 2019. The satellite will be operated from the mission control center and the ground station of the University of Würzburg. One of the secondary goals is the education of students by involving them in the development and operations of the satellite and incorporating the relevant topics in the academic courses.

The paper will describe the status of the satellite development and the main payloads ASAP-L and

ADIA-L, which are smaller, for a triple-cubesat adopted versions of ASAP and ADIA/ADIA++, as well as the ground segment.