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BLACKBOX: LOCATABLE CRASH SAFETY DATA STORAGE DEVICE FOR SOUNDING ROCKETS

Abstract

Within the scope of the AQUASONIC project, a student developed sounding rocket in the frame of the DLR STERN program, the development of crash-save data storage device for future sounding rockets was initiated. At the beginning, this was published as an interdisciplinary project module in the master study program "Aerospace Technologies" at the university of applied sciences HS Bremen. During the research the chance to apply for the REXUS/BEXUS program for prototype test emerged. Therefore, the idea to develop the project as a stand-alone system that could be used for any sounding rockets came up. After presentation of the project concept at the Selection Workshop at DLR Bonn from 28th to 29th November 2016, the selection committee chose the project as an experiment for the tenth cycle of the campaign with launch on the REXUS 24 in March 2018. The BlackBox experiment is intended to test a redundant, independent and crash-save data storage system for sounding rocket missions. The system is designed to measure and withstand the prevailing environmental and flight conditions occurring during rocket launch, free flight and crash. The measured data include acceleration as well as temperatures at different locations within the rocket. In addition, the system shall have a reliable localization system ensuring a recovery of the data memory. On the REXUS 24 test flight, the BlackBox will be mounted inside the rocket's nose cone, which will be separated from the main rocket at an altitude of 60 km. As the nose cone does not offer any kind of parachutes, it is necessary that all the saved data within the BlackBox is able to survive an undamped fall from the lower mesosphere, which is both challenging for the design and construction of the mechanical system, as well as the impact resistance of the electrical system. Simultaneously to the inevitable way back to earth, the BlackBox will collect data from different pressure-, temperature- and acceleration-sensors, in order to examine the free fall characteristics of a separated nose cone, which has never been done before. The paper will give an overview of the design and construction of the BlackBox. Furthermore, results from the REXUS 24 test flight will be presented and discussed.