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GROOVE – A NOVEL, COST EFFECTIVE ON ORBIT VERIFICATION POSSIBILITY FOR SPACE HARDWARE

Abstract

The new space industry rapidly develops. Many new, innovative technologies have been invented and brought to a high technology readiness level (TRL) in the last years. Miniaturized electric attitude control systems, 3D printed mechanical structures, and high data rate (HDR) transceivers for CubeSats are only some examples. A typical product is built upon hundreds of microchips, small components, special materials and more. These components must reach a high TRL, before being used as part of innovative space solutions. Flight heritage is the ultimate proof of space qualification – obtaining it is the final step before active commercialization. There is a large industry behind the satellite assembly factories of tomorrow which turned over USD $\sim$ 13,9 Billion in 2017 – and it needs more On Orbit Verification (OOV) possibilities. For this industry as well as for institutional and educational clients working at the forefront of the NewSpace revolution, German Orbital Systems (GOS) has developed a new On-Orbit Verification possibility. It allows small components to obtain flight heritage without building a dedicated satellite, maintaining a ground station network or negotiating a launch campaign.

The first model of the GROOVE (GOS Rapid On-Orbit Verification Experimental) satellite family is a 3U CubeSat, which provides 10 identical payload slots. Each slot hosts a PCB designed by the customer, according to an interface specification issued by German Orbital Systems, prior to the mission. To respect and maintain the customer's privacy the integrated PCB is handled as a black box during the entire mission. The GROOVE bus provides the customer with several voltages, numerous possible data interfaces as well as the opportunity to forward commands to the PCB. The slots share all resources of the satellite, such as power, downlink capacity, and duty cycle. Each slot can generate a specified amount of data, which the satellite forwards to the customer via GOS Ground Stations and the internet, without any processing. This "shared satellite" concept allows to reduce the price for each slot to USD 60.000.

The proof of concept (PoC) mission of GROOVE is scheduled for Q3 of 2019. A yearly minimum of two GROOVE satellites will be launched starting from 2020. A 6U and a 12U Version as well as advanced slot specifications, such as for biological experiments and material science, are planned. Bookings for the PoC mission are opened online, multiple customers have already signed in.