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THE UWE SATELLITE BUS, A MODULAR AND FLEXIBLE ARCHITECTURE FOR FUTURE PICOSATELLITE FORMATIONS

Abstract

Demonstration of a formation of cooperating distributed pico-satellites in orbit is the midterm objective of the UWE program (**U**niversity **W**ürzburg's **E**xperimental satellites). In technology preparation to meet this challenge, currently UWE-3 has been completed for a launch in the second quarter of 2013. It extends capabilities inherited from the first German pico-satellite UWE-1, launched 2005 to optimize parameters for internet in space, and UWE-2, launched 2009 with the technological aim of attitude determination. Besides the important milestone of demonstrating real-time attitude determination and control of the miniature satellite platform within the mass limits of 1 kg, a modular and flexible architecture has been qualified as a robust base for future UWE missions.

A standardized mechanical and electrical subsystem interface interconnected by a backplane allows for rapid and compact integration of the entire satellite bus without the need for any wired connections. Thus, the UWE-3 architecture supports easy maintenance, extension and replacement of subsystems in any configuration, even after final integration. The design particularly supports reusability and continuous design advancements of the individual subsystems for future missions.

Besides simple access to hardware in any phase of the development, the engineering approach further promotes robust satellite engineering by simplified access to embedded software components. A set of software tools allows the developer to define and perform automated test cases of the embedded software with minimal implementation effort. Any specific test routine implemented in each project phase remains accessible throughout the entire development and life cycle. In addition, a number of simple and portable test setups are available to support continuous automated testing of the satellite hardware throughout all project phases. Thus, unit testing of all soft- and hardware functionalities can ensure robustness and continuity despite typical challenges such as student team member fluctuations.

Advancements in robust and rapid satellite development, integration and testing in the context of the UWE project could recently be demonstrated when the complete UWE-3 flight model was assembled from its individual subsystems within a few hours only. Thermal Vacuum and Vibration Test campaigns could successfully be conducted with minimal procedural overhead as a large set of automated test cases was available already.

This contribution will describe technical details, hard- and software design, but will also address first in-orbit experiences and results, which are expected to be available at the date of IAC 2013.