22nd IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Space Systems and Architectures Featuring Cross-Platform Compatibility (7)

Author: Mr. Merlin F. Barschke
Technische Universität Berlin, Germany

Mr. Karsten Gordon
Technische Universität Berlin, Germany

ENABLING FLEXIBLE PAYLOAD MANAGEMENT THROUGH MODULARITY

Abstract

Nanosatellites recently gained a lot of momentum and are nowadays considered for a variety of mission scenarios. Among others, these include science and technology demonstration missions that often carry more than one payload in order to effectively exploit the satellite's resources. It is common that payloads are developed alongside the satellite on a similarly tight schedule. Therefore, specific payloads might not be completed in time and need to be removed from the mission. This in turn leads to excessive resources, such as power, mass or volume. However, replacing a payload with another of sufficient maturity might require extensive adaptions of the satellite bus and therefore lead to unacceptable delays. A modular platform design can significantly reduce the required modifications for exchanging payloads and can therefore increase the flexibility in payload management.

Technische Universität Berlin is currently developing TUBiX20, a nanosatellite platform for 20 kg missions. The platform offers a standardised payload interface and hard- or software modules are used to translate from payload to platform. To reduce the overhead introduced by these modules, the payload interface allows for several levels of conformity. These levels range from fully complying with the mechanical, power, data and software interface, to a mere compliance with the platform's data and power interface.

TechnoSat is a technology demonstration satellite that is based on TUBiX20 and carries several different payloads. While three payloads had to be removed from the mission in different stages of the development, four other payloads could be included as a replacement, due to the standardised payload interface of the TUBiX20 platform. A second mission that is based on TUBiX20 is TUBIN, which carries two uncooled infrared imagers and a camera with sensitivity in the visible spectrum.

This paper introduces the TUBiX20 platform design, as well as its standardised payload interface. As a next step, the TechnoSat mission and it's scheduled as well as the finally implemented payloads is presented as an real-life example. By classifying the TechnoSat payloads regarding their impact on the satellites power management, structure and software, their influence on the platform is analysed. Here, the paper describes how the TUBiX20 payload interface responds to payloads' needs without requiring major adaptions of the satellite platform. Furthermore, the TUBIN mission will be used to illustrate, how the very same interface serves a demanding Earth observation payload.