24th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Generic Technologies for Small/Micro Platforms (6A)

Author: Mr. Michael Jetzschmann
German Aerospace Center (DLR), Germany

Dr. Frank Dannemann
German Aerospace Center (DLR), Germany
Mr. Thomas Gärtner
German Aerospace Center (DLR), Germany
Mrs. Caroline Lange
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany

SCALABILITY AND MODULARITY AS DIMENSIONS OF FLEXIBILITY OF A MICROSATELLITE PLATFORM

Abstract

The Small Satellite Technology Experiment Platform (S2TEP) is a microsatellite platform built for technology experiments and small scientific payloads. The platform is designed, integrated and operated by the German Aerospace Center (DLR). S2TEP is a supplement to the DLR CompSat minisatellite program (followed by the first mission Eu:CROPIS), and a part of the DLR satellite roadmap. Both satellite platforms have a close technology exchange: avionic technologies developed for and matured within the frame of a S2TEP-mission are designed in a way that they can be used for the CompSat platform as well.

The S2TEP platform is strongly cost-driven. It shall provide fast and frequent access to space and more science for less money. In order to achieve this goal, it is indispensable that the platform is adaptable to different missions, adding only minor costs.

Flexibility is a major attribute of such a satellite platform. It determines to what extend a spacecraft bus can be adapted to satisfy the requirements of various missions. But flexibility can increase complexity and –by implication– risks and costs too. To keep the system complexity manageable it is important to evaluate which degree of flexibility is reasonable. The degree of flexibility can be defined in terms of scalability and modularity. Considering this, the classical mission-driven requirements engineering approach has to be slightly extended.

Within this paper, general flexibility requirements for cost-effective microsatellite platforms are derived. It is elaborated what flexibility, scalability, and modularity of a spacecraft, at system level, means. Beyond this, flexibility drivers are identified and parameters of the flexibility derived. The impact that the flexibility has on the system design is investigated and evaluated. All findings are illustrated using S2TEP as an example. Finally, general recommendations for the flexibility of a microsatellite platform design are proposed.