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DESIGN AND DEVELOPMENT APPROACH FOR A HIGHLY CAPABLE STANDARD NANO-SPACECRAFT

Abstract

The interest in nano-sized spacecraft (20kg, 20W) for scientific and technological missions is now very present and is expected to grow over the coming years. One of the most important advantages of nano-spacecraft is that their reduced cost provides the opportunity to revise the typical spacecraft design and development approach and to propose new concepts allowing to reduce the development time and cost, not necessarily at the expense of risk and quality.

This article reports on an exercise that was made by Systems Engineering and Assessment (SEA) and QinetiQ Space under an ESA contract to define a highly capable nano-platform that can be deployed in a multitude of different missions, without need for extensive redesign. The paper presents the trade-offs that were made between different types of architecture, ranging from common mission-specific designs to highly modular platforms, with attention for both the hardware and the software. It also discusses the implications for the ground segment and the operations that have been investigated during the project.

The exercise did not only focus on design aspects but also on the development approach. A suitable model philosophy is proposed and ways are presented to drastically improve the different verification and validation steps, while keeping the risk low.