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IAF SPACE SYSTEMS SYMPOSIUM (D1)
Lessons Learned in Space Systems: Achievements, Challenges, Best Practices, Standards. (5)

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THE PROBA APPROACH: "VALUE FOR MONEY" SPACE PROJECTS

Abstract

Traditionally, high performance space projects have been subject to the "failure is not an option" cycle: launch costs are so expensive and launches are so rare that a mission failure after launch presents an enormous loss. This drives a need for reliability of the spacecraft, which becomes more expensive to develop, putting further reliability requirements on the launcher.

However, in recent years radical innovations such as launch vehicle reusability and standard satellite form factors have reduced launch costs and increased opportunities across the range of big and small space missions. This has created increasing pressure on the spacecraft to provide similar value for money improvements.

The European Space Agency's PROBA (PRoject for On-Board Autonomy) small satellite missions, with QinetiQ Space as prime contractor, are providing a remarkable performance and reliability despite their relatively low costs for design and operations. All PROBA satellites are still active and operational, including the hyperspectral Earth observation satellite PROBA-1, which at more than 17 years in orbit, is ESA's longest operated Earth observation mission of all time. The next PROBA missions are in various stages of development and construction, designed for similar high levels of reliability and performance.

This paper presents the lessons learned in systems engineering and project management from the PROBA missions, including:

- How to work with existing products and to build a highly reliable system out of them, through following established space standards but also through a smart use of failure detection, isolation and recovery algorithms.
- How to avoid unnecessary 'middle management' levels in systems engineering.
- How to set up a smart flow of integration, testing and operations, based on automation and autonomy on board of the satellite, in its ground station and during the testing activities.
- How to collaborate in an efficient way within the team, and with subcontractors and customers based on trust and verification where needed, including a good communication flow for decisions and changes.