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THE EU:CROPIS ASSEMBLY, INTEGRATION AND VERIFICATION CAMPAIGNS: BUILDING THE FIRST DLR COMPACT SATELLITE

Abstract

Eu:CROPIS (Euglena Combined Regenerative Organic Food Production In Space) is the first mission of DLR's Compact Satellite program. The Compact Satellite is a small, highly customizable and high performance satellite bus, providing a platform for scientific research as well as for demonstration of innovative concepts in space technology. The launch of Eu:CROPIS onboard a Falcon 9 is scheduled in Q3 2018 within Spaceflight Industries SSO-A mission. The name-giving primary payload features a biological experiment in the context of closed loop coupled life support systems. The feasibility of such kind of a system shall be proven under different gravity levels with a focus on long term operations. In this context the rotation of the spacecraft will be used to utilize simulated gravity for the first time. A further biological experiment dealing with synthetic biology comprising genetically modified organisms (GMOs) was provided by NASA Ames Research Center as secondary payload.

The integration and acceptance of a satellite flight model containing biological experiments faces constraints regarding schedule, facility certification and process definition. The driving parameters for the Eu:CROPIS AIV campaign are the degradation time of chemicals stored inside the primary payload, the GMOs used in the secondary payload, which cause handling and transport restrictions due to biosafety regulations, as well as schedule constraints due to the chosen dedicated rideshare mission. Furthermore the development of a spin stabilized system for gravity simulation had impact on the overall verification approach, especially towards the attitude control subsystem.

This paper describes the model and verification strategies to design and build the spacecraft under said constraints. The applied verification processes comprise the hardware, the software and the third party payloads while focusing on the utilization of a flexible tabletop engineering model approach. To achieve a smooth transition to project phase E, this concept enables co-alignment of the ground segment development and verification with spacecraft AIV as of early phase C. Furthermore scientific projects like Eu:CROPIS, with small project teams and financial budgets, encounter few personnel redundancy. The existing structural organization gets confronted with challenges where dependability, testability and safety of the processes and the product are expected to be achieved with minimal effort. The paper presents how the technical management adapts work flows, cooperation and tools in project phases C and D to achieve a reliable system realization.