SPACE SYSTEMS SYMPOSIUM (D1)
Innovative and Visionary Space Systems Concepts (1)

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THE CONCURRENT ENGINEERING APPROACH APPLIED ON THE SOLAR MAGNETISM EXPLORER (SOLMEX) CONCEPT

Abstract

In the Concurrent Engineering approach, design tasks are conducted parallely differentiating it from more classical, sequential design methods. In a working environment like the German Aerospace Center's (DLR) Concurrent Engineering Facility (CEF) in Bremen, this design method allows quick decision making, unhindered communication within the design team and efficient data sharing. Outfitted with modern visualisation equipment and interlinked computer working stations, the CEF by now has been used for about 20 design studies regarding aerospace systems and produced rigid engineering data in these studies lasting from one to two weeks.

Answering the 2010 Cosmic Vision call for a medium-sized mission opportunity in ESA's Science Programme for a launch in 2022 the Solar magnetism eXplorer (SolmeX) was proposed under the lead of the Max Planck Institute for Solar System Research. The overall objectives of the SolmeX mission are to map the magnetic field in the coronal and transitional regions of the solar atmosphere and to determine the origin and evolution of solar magnetism and its interaction with heliospheric plasma. In comparison to other solar observations with application of an occulter, improvement of the scientific results is achieved by the novel usage of a two spacecraft formation. The first one, the Coronagraph spacecraft (CS) will carry the science payload. The second one, the Occulter spacecraft (OS) will provide an eclipsed view of the Sun for the CS and fly in formation at a distance of approximately 200 m to mitigate diffraction effects and improve the on-limb observational resolution of the mission.

The satellite's consistent concept for this proposal was provided by the 18th CE-study of DLR, with consideration of i.a. mission analysis, formation flying, configuration, propulsion, subsystem dimensioning, payload accommodation, budgeting and cost. Besides the design of the two involved spacecraft this CE study was further used to allow observation and evaluation and consequent improvement of DLR's CE process by a team of outside scientists from the University of Luxembourg.

In this paper the Concurrent Engineering study regarding the observation of the process and the SolmeX spacecraft design (launch mass about 2100 kg) consisting of the OS and CS, are described. As the most critical aspect of the design is the accurate formation keeping of the two spacecraft, current open

design issues will be pointed out in this paper along with the results that underline the mission feasibility and initial cost estimates of under 460 Million Euro.