

## IAF SPACE SYSTEMS SYMPOSIUM (D1)

Lessons Learned in Space Systems: Achievements, Challenges, Best Practices, Standards. (5)

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ADDED VALUE OF EARLY ADOPTION OF THE CONCURRENT ENGINEERING APPROACH  
THROUGHOUT THE PROJECT LIFE CYCLE**Abstract**

As a lessons learned exercise, the European Space Agency's Concurrent Design Facility (CDF) is introducing assessments of the differences in design (configuration, mass, budgets, technologies, programatics, cost...) between the pre-phase A CDF models and the later mission phases. These studies include the evolution of the design, the analysis of the added value of the CDF activity and the results of the usage of multi-disciplinary concurrent engineering tools available at the facility (IDM/OCDT). It is a process to quantify the benefits of the concurrent engineering method and to evaluate the potential for insertion of the lessons learned into the CDF models for the benefit of future mission studies.

Different mission cases will be assessed to investigate the importance of adopting concurrent engineering from early phases. This will include missions such as Solar Orbiter, Sentinel 3 and Sentinel-5 Precursor. The latter is an example of a complete path from a CDF study to a flown mission. The initial pre-assessment of Sentinel-5 Precursor was carried out in 2008, following the request by the Earth Observation Programme Directorate under the funding of the Global Monitoring for Environment and Security programme, in the framework of the Sentinel family of spacecraft. The mission was then launched in October 2017.

During the nine years between the CDF activity and the launch, the mission design went through several iterations that enable a close investigation of the traceability of information and requirement consolidation, as well as, the evolution of the credibility of mission objectives, technology derivation and road mapping from concept to launch. For this examining purpose, all aspects of the different missions selected for the analysis have to be considered: requirements and design drivers, system characteristics, payload/platform evolution and resource budgets.

The paper will focus on the added value of early adoption of the concurrent engineering approach throughout the project life cycle, along with the identification of limitations, and ideas for improvement.