SPACE SYSTEMS SYMPOSIUM (D1)
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CONCURRENT ENGINEERING APPROACH FOR THE PRELIMINARY STUDY OF HYPERSONIC MORPHING FOR A CABIN ESCAPE SYSTEM

Abstract

HYPMOCES is a EU FP7 funded project which aims to investigate and develop the technologies in the area of control, structures, aerothermodynamics, mission and system required to enable the use of morphing in escape systems for hypersonic transport aircrafts. To investigate, define and evaluate the reference concepts of HYPMOCES, a Concurrent Engineering (CE) Approach at DLR Bremen has been conducted. The applied CE process is based on the optimization of the conventional established design process characterized by centralized and sequential engineering. Simultaneous presence of all relevant discipline specialists within one location and the utilization of a common data handling tool enable efficient communication among the set of integrated subsystems. The study comprised the multidisciplinary

analysis and the development of all relevant subsystems for the space mission and system, e.g. with respect to system engineering, configuration, geometry, aero-/thermodynamics, trajectory and mission analysis, structure, thermal protection system and actuators. Candidate morphing schemes are proposed at the beginning of the CE study and traded-off to identify one reference candidate architecture and one backup concept that is compatible with the constraints imposed by the integration within the reference mother aircraft, not only in terms of the direct impact in mass, volume, power and complexity but also considering the overall operation of the cabin escape system and the mother aircraft. System requirements for morphing schemes and operational aspects are formulated and evaluated during the CE study. As far as possible the capsule shall be an integral part of the orbiter structure. This imposes the necessity to find the best compromise between the requirements of the capsule and the orbiter. Candidate architectures include the use of folding of wings, sliding surfaces, telescopic wings, deformable shape and tilting wings. During the CE study the architecture approaches are investigated on a preliminary but multidisciplinary level. The proposed paper focuses on the general attributes of the CE approach as well as the initial input data for HYPMOCES, the multidisciplinary CE study process itself, the results and the lessons learned for the next steps of the project.