SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES (D6)
Commercial Point-to-Point Safety & Insurance Issues (2-D2.9)

Author: Mr. Rodrigo Haya Ramos
Deimos Space S.L., Spain

Mr. Hugo André Costa
Deimos Space SL, Spain
Mr. Davide Bonetti
Deimos Space S.L., Spain
Mr. Tobias Schwanekamp
German Aerospace Center (DLR), Bremen, Germany, Germany
Dr. Martin Sippel
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany
Mr. Giovanni Gambacciani
Aviospace S.R.L, Italy
Mr. F.A. Fossati
Aviospace S.R.L, Italy
Mr. Frederic Sourgen
ONERA, France
Mr. Emmanuel Laroche
Office National d'Etudes et de Recherches Aérospatiales (ONERA), France

HYPERSONIC MORPHING FOR A CABIN ESCAPE SYSTEM

Abstract

Passenger safety is one of the main drivers for the development of future trans-atmospheric transportation systems. The high levels of energy associated to this type of flight (hypersonics) as well as the level of reliability of the enabling technology leads to the need of a passenger escape system in case of flight abort.

The implementation of a cabin escape system for a hypersonic aircraft is challenged by the integration within a larger structure, the load factors for the passengers, the ejection propulsion concept, the capability to withstand extreme thermal environment (plasma flow) and the adaptability to a wide range of abort scenario conditions (low and high speed and altitude).

This multi-phase nature of the return flight makes morphing an attractive solution for a hypersonic escape system. The abort scenarios cover a wide range of flight conditions and the integration within the mother spacecraft requires compact solutions in terms of shape. Thus a single shape cannot provide adequate performances and consequently it can be challenging for the wellness of the ordinary passengers expected in the cabin.

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.

The following key technological areas to enable the use of morphing in hypersonic escape systems are addressed:

- Control and Reconfiguration during morphing.

- Structures, materials, actuators and mechanism of the deployed elements.
- System integration within the escape system and within the mother aircraft.
- Aerothermodynamics of the changing external shape.

All these technological investigations are appraised using a representative high-energy trans-atmospheric transportation scenario.

A Concurrent Engineering session has been successfully run as first step to identify the candidate Hypersonic Morphing concepts for further assessment. Two design loops have been planned to cope with the significant interaction among the four technological activities. The first loop aims to consolidate the system requirements and architecture while each technological research will be appraised during this loop. This initial design and analysis will be subject of detailed technological assessment during the second loop.

This paper will address the overall concept and organisation of HYPMOCES, a summary of the conclusions from the Concurrent Engineering session as well as the progress on the definition of the systems requirements and architecture.