IAF SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES (D6)
Enabling safe commercial spaceflight: vehicles and spaceports (3)

Author: Dr. Gennaro Russo
Campania Aerospace District, DAC, Italy

Mr. Claudio Voto
Campania Aerospace District, DAC, Italy
Prof. Raffaele Savino
University of Naples "Federico II", Italy

SINGLE STAGE SUBORBITAL SPACEPLANE, S4

Abstract

The mid-to-long term perspectives of suborbital hypersonic spaceplanes require the availability of ultra-fast, winged vehicles, characterized by low wing loading, streamlined fuselages, sharp nose and wing leading edges, able to maneuver along flight trajectories at small angles of attack. From another point of view, the cost associated with sub-orbital space access flight is strongly conditioned by the still small dimension of its market and accessibility to critical technologies. Therefore, hypersonic technologies suitable for this market as well as for point-to-point fast transportation can facilitate the endeavor. A HTHL business-sized spaceplane with Mach¡5 is widely believed to be more affordable than larger hypersonic systems and would find presumably a larger market. It should be based on more readily state-of-art available technologies as titanium for its structure to manage the heat produced at higher speeds and turboramjet engines, instead of less proven scramjets required for faster aircrafts. The scientific and industrial background of the members of the Campania Aerospace District (DAC) includes leadership and participation in projects like USV, Phoebus, Hytam, IXV, Stratofly, Lapcat, Space Rider, Hexafly, Hyplane. Based on this heritage and coherently with the Smart Specialization Strategy of its Region, DAC is focusing on advanced technologies compliant with some reference target products: small supersonic/hypersonic business jet for passenger transport; suborbital aircraft for microgravity experimentation and training; dual use hypersonic aircraft (manned or unmanned). To flight validate the developed technologies a multi-mission Single Stage Suborbital Spaceplane (S4) demonstrator is proposed. The configuration is characterized by high lift-over-drag ratio and low wing loading to guarantee very low operational load factor along properly chosen flight paths. Sharp wing leading edges and combined rocket/turbo-ramjet are envisaged. The vehicle will not experience acceleration above 4.2g during the worst-case maneuvers. A dedicated working group has been set up by DAC, formed by representatives of industries, research organizations, and university. Large industries include MBDA and Blue Engineering, SMEs include Aerosoft, Caltec, Euro.Soft, LeadTech, Protom Group, Sòphia High Tech, TSD Space, research organizations are represented by the Italian Aerospace Research Center CIRA, CNR-ISASI, University involved are University Federico II and University Luigi Vanvitelli. DAC is parallelly supporting the development of Grazzanise airport to become a spaceport in the frame of a Suborbital Experimental Polygon to be established between Campania and Sardinia regions. It will make available the perfect operational scenario where to test and make use of the supersonic/hypersonic demonstrator.