

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems (4)

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PROGRESS OF SPACELINER ROCKET-POWERED HIGH-SPEED CONCEPT

Abstract

DLR's launcher systems analysis division is investigating since a couple of years a visionary, extremely fast passenger transportation concept based on rocket propulsion which will seamlessly span the boundaries between aviation and spaceflight in the future [1]. The SpaceLiner ultimately has the potential to enable sustainable low-cost space transportation to orbit and while at the same time revolutionizing ultra-long distance travel between different points on earth. The fully reusable concept consists of two vertically launched winged stages in parallel arrangement. Work on the SpaceLiner is supported by the EU-funded studies FAST20XX (Future high-Altitude high-Speed Transport 20XX) [2] and CHATT (Cryogenic Hypersonic Advanced Tank Technologies), internal DLR funding, and contributions of several European partners.

Thanks to the multi-national collaboration, the technical lay-out of the SpaceLiner has now matured to Phase A conceptual design level. Iterative sizing of all major subcomponents in nominal and off-nominal flight conditions has been performed. An aerodynamic database is established by numerical calculations of the four different flyable configurations (both stages, launch configuration, emergency passenger capsule) in the complete, broad Mach-number range. The SpaceLiner's environmental impact has been assessed [3] and the operational and business concept is under definition.

The paper describes the technical progress achieved for the most recent SpaceLiner 7 configuration:

- system aspects of the reference vehicle's preliminary design including its nominal trajectory,
- main propulsion system definition,
- pre-development of a passenger cabin and rescue capsule,
- establishment of a preliminary structural concept,
- preliminary sizing of the thermal protection and active cooling systems,
- evolution of the passenger stage for different missions allowing for increased passenger numbers on shorter flight distances,

- operational scenario and business case analyses

1. Sippel, M., Klevanski, J., Steelant, J.: Comparative Study on Options for High-Speed Intercontinental Passenger Transports: Air-Breathing- vs. Rocket-Propelled, IAC-05-D2.4.09, October 2005
2. Sippel, M., van Foreest, A.: SpaceLiner Rocket-Powered High-Speed Passenger Transportation Concept Evolving in FAST20XX, IAC-10-D2.4.06, September 2010
3. Sippel, M.; Schwanekamp, T.; Bauer, C.; Garbers, N.; van Foreest, A.; Tengzelius, U.; Lentsch, A.: Technical Maturation of the SpaceLiner Concept, AIAA-2012-5850, 18th AIAA International Space Planes and Hypersonic Systems and Technologies Conference, Tours, September 2012