

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
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CONCEPT FOR A COMPACT AND FAST SPACEPLANE DELIVERY SYSTEM

Abstract

Deliveries with rocket-based systems have gripped the public imagination since the earliest days of the space race. The thought of extremely fast transportation of goods and people have however remained part of sci-fi until the very last few years, as large space companies like SpaceX have started developing their own systems for Earth-to-Earth transportation.

This student project explores the possibility of using and adapting technologies already present in the market to achieve the transportation of compact time-critical cargo at extremely large distances, while maintaining accelerations constraints typical of manned missions and ensuring safety by using non-toxic propellants.

The developed solution is a combination of two stages of the Vega-C launcher and a spaceplane derived from ISRO'S RLV-TD and ESA's Space Rider project. The presence of a space plane allows a controlled trajectory during the reentry, alleviates acceleration loads and permits landing on any conventional runway, allowing for further flexibility in the deliveries.

The group has completed a preliminary design of the launcher demonstrating its capability of containing thermal and acceleration loads, achieve accuracy at landing in multiple locations and conditions, while performing only minor modifications of the stages of the Vega and the reference geometry of the spaceplane.

The results were a delivery time of about one hour for a 100 kg payload at a range of 7000 km, allowing for even transoceanic deliveries.

Making use of already proven technologies, this concept allows for rapid development and short time to market, opening the possibility for a new way of transporting crucial payloads.