

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Joint-Session Creating Safe Transportation Systems for Sustainable Commercial Human Spaceflight
(9-D6.2)

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COMPARISON OF SPACEPLANES WITH VERTICAL-LANDING REUSABLE ROCKETS

Abstract

The aim of this project is to develop an understanding of the relative economics of spaceplanes and vertical landing rockets for comparative purposes. As the space sector enters a new age of space transportation, exploration, and tourism, there is a growing demand for new vehicles to deliver such needs. To date, a completely reusable orbital launch system has yet to be fully realized. However, due to advancements in materials, engine, and aerospace technology, the concept of reusable launch systems are under steady development. This new age of space flight is defined by developing technology that supports the commercial development of launch vehicles that seek to lower space transportation costs and are generally characterized by two vehicle types of this nature that are striving for success in the industry; spaceplanes and vertical-landing reusable rockets.

Evidently, these developments are leading forces in the new age of reusable space vehicles. As a consequence, there is a growing need for the understanding of the comparative economics of spaceplanes and vertical landing rockets. This is also due to traditional space transportation system comparison typically focuses on flight parameters such as engine performance, payload availability and size. When considering long development schedules for such vehicles, the uncertain performance outcomes of current technological developments, and competitive business pressures, it is of interest to estimate the cash flow projections of these businesses from the perspectives of launch vehicle development, production and operation cost, and applicable considerations of refurbishment costs and the price of bringing a common unit to low-Earth orbit. Thus, a parametric cost estimation method will be utilized for the comparing of various designs under development through an analysis that will seek to be reliably referenced for the future of reusable vehicle development and research in the coming years. This will be done through the review of the relevant research concerning cost modelling and the sector's current research and development of reusable space vehicles, and the analysis of results yielded by cost estimation of applicable reusable launch vehicles and spaceplanes by effectively discussing such interpretations according to space sector's context.