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SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Small Launchers: Concepts and Operations (7)

Author: Mr. Ali Butt
University of Alabama in Huntsville, United States, ali_tariq_butt@hotmail.com

LEAN AND RELIABLE SMALL LAUNCHER - DESIGN OF SOLID ROCKET BOOSTER AND LOX/LNG BASED AIR LAUNCHED SYSTEM

Abstract

An increase in nano-class satellites in the past decade, and a resulting multiple deployments on a single launch to reduce launch cost, have raised an opportunity for a low cost, reliable, and responsive launch system. Studies and research have already been done on various options available for such a system and private companies and government agencies are still trying to come up with a definite solution.

Several studies have recommended using manned carrier platform, others have recommended to use an unmanned version for various reasons as cited in this paper. Another recent approach calls for a rather hybrid approach of using a classical unmanned carrier as a first stage to avoid complexity and regulatory issues associated with manned/unmanned vehicle systems.

This paper will present a design on this hybrid approach, where solid rocket boosters are used as a first stage and LOX/LNG as the second stage.

Although liquid hydrogen takes advantage of the high performance, liquid natural gas (LNG) has merit for the less evaporation in space and higher density. Previous results have shown high pressure combustion and high characteristic exhaust velocity efficiency for such a system. A 50kN high performance engine with pomp-feed system is designed in this study. Analytical results will be presented in the paper as a way to categorize usefulness of such a system.