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SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Small Launchers: concepts and operations (7)

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FLETTNER BOOSTERS – A TECHNOLOGY TO UTILIZE THE MAGNUS EFFECT FOR SUBSONIC ROCKET PROPULSION

Abstract

This paper will introduce the so-called Flettner Boosters, an adaptation of the more commonly known Flettner Rotors, a technology employed to propel ships, now to be applied for rockets. Both utilize the Magnus Effect, which describes a perpendicular force on a rotating cylinder, when held in a streaming fluid. As indicated by the name, this technology can only act as aid for an existing main propulsion system. In contrast to their counterparts on ships, Flettner Boosters do not depend on naturally occurring winds but rather exploit the airflow generated through the accompanied, ascending rocket. While the utilization of a classical, chemical combustion based main propulsion system is possible, the present study concentrates on hot water propelled rockets as they feature an important characteristic: Hot water rockets usually function below Mach 1. Because the Magnus Effect can only be observed for subsonic velocities, Flettner Boosters can also only be applied in this area. Three cases will be discussed in the course of this paper: A baseline configuration of the hot water rocket with 100 kg of water at 50 bar pressure as well as two configurations with two respectively three Flettner Boosters. The three configurations will be compared regarding their achievable height without payload and the possible payload weight when configured for the same height. Values range from 6.8 km achievable height for the baseline configuration (131.7 kg overall mass, no payload) to 38 kg of payload delivered to the same height for the three booster configuration (177.2 kg overall mass).