

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Interactive Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS
SYMPOSIUM (IP)

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MOON ROAD - THE STUDENT ROCKET APPROACH TO AUTONOMOUS VERTICAL LANDING

Abstract

Autonomous landing on the Moon, Mars and other celestial bodies is a technological challenge. Gathering practical flight data to train Artificial Intelligence Systems suffers a high financial risk for common liquid-propelled landers. Also, educational experience with landers for students is sparsely available.

At the Centre of Applied Space Technology and Micro Gravity (ZARM), a sub-scale demonstrator based on recent achievements in amateur rocketry is developed. The student rocket uses commercially available D-Class solid rocket motors. The thrust vectoring is achieved via electric motors and gimbal for RC helicopters. The throttling utilises an over-expansion mechanism, the Krushnik effect. These methods are realisable on the tiny scale of unregulated model rockets. This leads to a cost-effective demonstrator where the financial risk of total vehicle loss is minimal.

Our student rocket design for the sub-scale lander demonstrator is presented in detail. The guidance and control for the first data acquisition flights are presented. The experimental and numerical throttling mechanism development are discussed, closing with the results of our flight campaigns.