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CONCEPTUAL DESIGN OF A N2O/PARAFFIN HYBRID SOUNDING ROCKET

Abstract

The exploitation of Hybrid Rocket Engines (HREs) to future space transportation systems is currently being investigated in the framework of the ASCenSIon project, where Université Libre de Bruxelles (ULB) provides expertise in the field of design and experimental investigation of HREs.

The Aero-Thermo-Mechanics (ATM) department of ULB provides unique capabilities which feature a 1kN test bench for ballistics and performance investigation and an optical access hybrid rocket slab burner to analyze the oxidizer-fuel interaction at the burning surface of the fuel grains. This know-how enables ATM to pursue and validate the sounding rocket development.

In this work, a scalability investigation of the N2O/Paraffin HRE technology to the propulsion system of an experimental sounding rocket for microgravity research has been carried out.

After the definition of the requirements by comparison with existing sounding rockets, a discussion of the design rationale is presented. Then, a deeper analysis with a focus on the propulsion systems properties and trade-offs on materials and operative conditions is carried out, in order to infer the weight of the system and estimate the final performance of the engine.

This scalability and feasibility study on conceptual level marks the first step towards the experimental investigation of the propulsive system and will help to pursue the goal of a ULB hybrid sounding rocket.