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Small Launchers: Concepts and Operations (7)

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A GAME-CHANGING, EUROPEAN SMALL LAUNCH VEHICLE FOR SUSTAINABLE ACCESS TO SPACE

Abstract

A steadily growing demand for smallsat launch capabilities drives on the search for low-cost launch vehicles. Hybrid rocket technology has been pushed forward in the recent years and is now ready to meet the demand of this low-cost rocket development. Thanks to inherent safety and reliability the development and production cost of hybrid rocket engines can be a small fraction of bi-liquid propulsion systems. The New Space start-up HyImpulse Technologies GmbH was founded in 2018 from 5 employees from the German Aerospace Center (DLR) which are experienced with flight-proven hybrid sounding rockets and excellent hands-on experience. HyImpulse has successfully completed its first funding round in 2018 and partnered with a German Aerospace company. A concept for a mini-launcher has been started by HyImpulse and the development of the 75 kN (SL) main hybrid rocket engine is on-going with a first test campaign in 2019. The propellants are Liquid Oxygen/Paraffin and deliver the same performance as a Liquid Oxygen/Kerosene liquid rocket engine while having a much simpler design and lower cost. Testing and development is done in collaboration with the DLR Institute of Space Propulsion in Lampoldshausen. This engine will be the largest hybrid rocket engine ever tested in Europe. The concept of the HyImpulse minilauncher includes eleven engines of this type, which will result in large scale serial production for the foreseen launch rate of twelve launches per year. This further reduces production costs of the hybrid rocket engine. The advantage of paraffin-based fuel lies in the simple geometry of the grain caused by the high regression rate. This paper describes first details of the mini-launcher design and test results of the hybrid rocket engine demonstrator at TRL 5.