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Small Launchers: Concepts and Operations (7)

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**HYPR SPACE: A NEW GENERATION OF MICROLAUNCHERS BASED ON INNOVATIVE HYBRID  
ROCKET ENGINES.**

**Abstract**

HyPrSpace (Hybrid Propulsion for Space), incorporated in 2019 in Bordeaux (France), is developing disruptive Hybrid Rocket Engine (HRE) technologies. HyPrSpace's goal is to unlock the full potential of HRE, which is a key technology to keep cutting cost of access to Space.

HREs have been known for several decades, but have failed to reach the maturity required to power orbital rockets. This is mainly due to a technological barrier that prevent HRE to have a high efficiency at high thrust. This barrier is unlocked thanks to the innovation patented by HyPrSpace. This innovation keeps the intrinsic advantages of HRE compared to conventional liquid and solid propulsion technologies, while ensuring that the regression rate and combustion efficiencies meet the requirements for orbital flight.

HyPrSpace's innovation is currently being tested as a demonstrator, while a first full-scale prototype is being designed. The first full-scale operational engine is expected to achieve 20-60 kN thrust range capability with a 14% dry mass to propellant mass ratio.

With the first generation of operational engine, it is possible to assemble a first version of a Two-Stage To Orbit (TSTO) launcher with a targeted payload of 250 kg to LEO. This first TSTO uses a seven engines cluster at the first stage and one (vacuum optimized) at the second stage. Later, HyPrSpace plans to develop bigger HRE, in particular, but not limited to, to replace the seven engines cluster by a single engine. This paper presents the development of the HyPrSpace technologies regarding HRE and the roadmap to reach to LEO and then... the stars.