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HYMOVE: ENABLING HYIMPULSE IN-ORBIT CAPABILITIES FOR SMALL SATELLITE MISSIONS

Abstract

HyImpulse is positioning itself as a commercial player in the NewSpace business developing launch services for the small satellite market in Low Earth Orbit (LEO), offering a proprietary, low-cost hybrid rocket propulsion technology as value proposition. The launch service will be offered by the orbital Small Launcher (SL1), currently under development. Within the spectrum of services provided by SL1, HyImpulse is aiming at extending the launcher's in-space capabilities to address missions involving the deployment of constellations and hosted payloads. In late 2022 HyImpulse and the Julius Maximilians University Würzburg (JMUW) started the development of a Modular Orbital Transportation Vehicle to extend the in-orbit capabilities of SL1 within the framework of project HyMOVE, funded by the Bavarian Collaborative Research Program (BayVFP). HyMOVE aims at developing a product to serve the growing market of small satellites for LEO, enabling downstream services associated to, for example, Earth Observation (EO) devices and satellite-based internet connectivity. The capabilities of HyMOVE can also support the strategy of responsive space, allowing to quickly replace satellites into orbit caused by a disruption of service. The first phase of the project shall include the testing of a ground demonstrator representative of the vehicle, while the mid-term benefit includes the commercialization of the flight proven product. Cost-optimization and flexibility are core requirements of the design phase. The system is designed to include modularity, to allow for more standardization and cost reduction, and enable the adoption of procedures from general industrial practices to practices specific to the space industry. The vehicle is designed to be compatible with standard interface adapters on SL1 and comparable small launchers, but it also complies with ridesharing requirements from existing launchers. One of the core technologies lies in the utilization of hybrid rocket propulsion to support kick-stage capabilities and orbital injection, and in the utilization of green chemical propellants for attitude and orbit control. The hybrid engine can be removed in specific configurations to enhance capabilities for constellation deployment.

High dependability and reliability are included into the modular development of the avionics system, as required by space applications spanning over two years of life. Fault tolerance control, radiation resistant hardware and real-time task control are accounted into the design phase. This paper summarizes the development status of main subsystems and planned activities of HyImpulse and provides and overview through the activities involved in the final year of the project.