SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Small Launchers: Concepts and Operations (7)

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DEVELOPMENT AND OPERATION OF A HYDROCARBON LIQUID PROPELLANT ORBITAL/SUB-ORBITAL LAUNCHER

Abstract

The authors have handled a project of development and operation of low-cost small liquid rocket system with well-known technologies and easily available parts. A purpose of the project is "Easy Access to the Space." A near-term goal of the project is a launch system for Micro/Nano-satellites into orbit. We have started a preliminary design of the orbital launcher has minimum components for carrying up to 100 kg of Micro/Nano-satellites into low earth orbit. As a result of developing low-cost launch system, we watch for a chance of fast transfer from experimental to a commercial launch. The orbital launcher has two stages for a minimum configuration and it uses kerosene/liquid oxygen propellant, a gas generator cycle engine system. For design and optimization of an orbit depending on each customer, we developed open-source software and keep updating. Already we have started some series of tests of a gas generator, pumps and a main combustion chamber. As a preliminary step of the orbital launch, we plan to conduct first sub-orbital flight test above 100 km altitude in 2017. The rocket has 20 kg payload capacity, a 12 kN thrust ethanol/liquid oxygen engine, a Helium pressure feeding system for the propellant, a thrust vector control system with servomotors for a pitch and a yaw angle control, a cold gas jet system for a roll angle control and a reentry system for a recovery of an avionics and payloads. Because of its less impact for environment of the near sea and ease of treatment, ethanol was chosen for a fuel of the sub-orbital launcher. In the conference, concept design and status of components of the orbital launcher and details and flight operation of the sub-orbital launcher will be reported.