

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

Author: Mr. Ryuichiro KANAI
Interstellar Technologies Inc., Japan, ryuichiro.kanai@istellartech.com

Mr. Takahiro INAGAWA
Interstellar Technologies Inc., Japan, takahiro.inagawa@istellartech.com

DEVELOPMENT AND LAUNCH OPERATION OF A HYDROCARBON/LIQUID OXYGEN
ORBITAL/SUB-ORBITAL LAUNCHER FOR SMALL SATELLITES**Abstract**

The authors have conducted a project of development and operation of low-cost small liquid rocket system. Resources for development has reduced by using public knowledge and COTS parts. A purpose of the project is "Make the space within reach of every humans". A near-term goal of the project is a micro launcher for Micro/Nano-satellites. We have started a conceptual design of the orbital launcher, code-named "ZERO", can carry up to 100 kg of Micro/Nano-satellites into 561 km Sun-synchronous orbit. ZERO launcher has two stages for a minimum configuration and it uses kerosene/liquid oxygen propellant, a gas generator cycle engine system. We are conducting some series of tests of a gas generator, pumps and a main combustion chamber. As a preliminary step of the orbital launch, we have developed and launched sub-orbital rocket named "MOMO". MOMO sub-orbital launcher has 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 and a roll control system with hot gas-jet provided by a small gas generator. After the first launch, in 2017 summer, to improve roll control, hot gas-jet system was developed and mounted into a second vehicle. Second vehicle was launched in 2018 summer and newly mounted hot gas-jet system caused shutdown of a main engine just after lift-off. Design and test process was improved for third launch and already full duration captive firing tests finished twice. In the conference, concept design and results of some tests of ZERO orbital launcher and some new launches of a MOMO sub-orbital launcher will be reported.