

SPACE PROPULSION SYMPOSIUM (C4)
Propulsion Systems I (1)

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REGENERATIVE COOLING CYCLE LOX/METHANE ENGINE AND SOME OTHER
HYDROCARBON FUELED ROCKET ENGINE STUDIES

Abstract

Recently, small satellites are focused because of its short term development, low cost production. They are often launched as secondary payloads, launch opportunities are restricted. In order to increase them, orbit injection by a responsive launch system is preferable. Tradeoff study of launch propellant (solid or liquid) was carried out in terms of performance, injection accuracy and operation. As a result, it is found that liquid upper stage is required because of its flexibility and controllability. Especially, jet fuel is most suitable liquid propellant because of its familiarity. Hydrogen is high performance, but very difficult to handle. In the future, methane will be potential candidate due to similarity of boiling point with LOX. Target engine thrust level is ranging 1 to 50 kN. This range covers upper stage, boost stage for 50kg payload launcher to LEO. Engine cycle for LOX/Kerosene system is studied and selected to pressurized tank system or gas generator (GG) cycle, counting engine thrust level and component sizing. For smaller range, pressurized tank system will have more advantages. This paper also reports on the progress of hydrocarbon fueled engine development. MHI is planning the following in-house research and development for future; combustion tests, turbopump tests and power head tests (combining gas generator and turbopump). Furthermore, MHI is joining to the regeneratively cooled methane engine development program in Japan.