

IAF SPACE PROPULSION SYMPOSIUM (C4)
Propulsion System (1) (1)

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DEVELOPMENT STATUS OF BOOSTER STAGE LIQUID ROCKET ENGINE OF KSLV-II
PROGRAM

Abstract

South Korea's indigenous three-staged liquid propellant rocket Korea Space Launch Vehicle-II (KSLV-II) also known as Nuri is now developing by Korea Aerospace Research Institute (KARI). KSLV-II planned to launch into space in 2021 at the NARO Space Center located the southern coast of Korea peninsular. Both the booster stage and the second stage of KSLV-II are propelled by the newly developing 75-tonf thrust level liquid-propellant rocket engines (KRE-075) and the third stage is powered by a 7-tonf thrust level rocket engine (KRE-007). KRE-075 fueled by kerosene and liquid oxygen which have some heritage of predecessor LV (KSR-III and KSLV-I). For the simplicity of its design and the parallel development logic to reduce the development schedule of the key components such as combustion chamber and turbopump, we adopted the reliable gas-generator cycle. Also, the extended altitude version of this engine will be used for the second stage main engine of KSLV-II. To accommodate the thrust vector control of the launch vehicle, KRE-075 can be gimballed in two axes. Furthermore, only for the second stage engine, the turbine exhaust thrust is also gimballed in single axis to generate the roll control moment. Vacuum thrust level of this engine is about 75.8 tonf and 81.1 tonf for the sea-level version and second stage version, respectively. From 2010, the system design of KRE-075 and the construction of test-facilities had been started simultaneously. While conducting the component level development hot-firing test of combustion chamber(CC), we faced the combustion instability(CI) problem. After several design change of the injector and the baffle arrangement in CC, we were able to overcome this problem. In 2015, the first integrated system model of KRE-075 was built and conducted hot-firing test in 3 sec. After this threshold, total 11 engines have been fabricated and tested. The accumulated total test number is 104 and the test time is about 8800 sec. In Nov. 28th 2018, a flight test of the second stage of KSLV-II was successfully conducted, and the performance and operability of KRE-075 were proved in flight test. Until 2020, upcoming altitude environment tests for the vacuum level engine and the additional qualification tests will make it more reliable and be ready to commit the launch of three-staged KSLV-II.