

SPACE PROPULSION SYMPOSIUM (C4)  
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RESEARCH PROGRESS OF REUSABLE LIQUID ROCKET ENGINE IN JAXA

**Abstract**

A research on future reusable transportation systems has been conducted in JAXA for the sake of drastic reduction of space transportation cost and expansion of space market. Reuse technologies of liquid rocket engines are key subjects of future reusable transportation systems. System and subsystem study of reusable liquid rocket engine has been conducted in Kakuda Space Center in JAXA, and one of the preceding project is a Pilot Engine for a reusable sounding rocket project in ISAS, JAXA. A 40kN rocket engine, Pilot Engine, is being developed in Japan. Pilot Engine development has been initiated relating to the reusable sounding rocket, which is also developed in Japan. This rocket vertically takes off, reaches to 100km altitude, lands vertically on the launch site and is launched again within several days. This rocket will provide observation mission chances with low cost and with quickness utilizing the advantages of reusability. This program has been authorized as a technology demonstration phase, and most of the technologies required for the vehicle are to be demonstrated in a few years. In order to realize this rocket concept, the engines installed on the rocket should have features of reusability, long life, deep throttling and health monitoring. Those have not yet been established in Japanese rocket engines. To solve the engineering subjects about those features, a new design methodology, advanced engine simulations and engineering testing are focused in the Pilot Engine development. Especially in engineering testing, limit condition data is acquired and new diagnostic techniques. Those can be applied utilizing mobility of small size hardware. In this paper, development status of Pilot Engine is mentioned, including fundamental design and engineering tests of turbopump bearing and seal, turbine rig, injector and combustion chamber.