

SPACE PROPULSION SYMPOSIUM (C4)
Propulsion Technology (1) (3)

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ENGINE CONTROL SYSTEM FOR THE MAIN ENGINE OF THE REUSABLE SOUNDING ROCKET

Abstract

A Reusable Sounding Rocket (RSR) is being developed in JAXA and MHI to provide more frequent opportunities for atmospheric observations at lower cost and with short turnaround time. RSR will take off vertically, reach to the altitude higher than 100 km, and land vertically on the launch site. RSR adopts a clustered propulsion system for redundancy which is composed of four LOX / LH2 engines to achieve full time abort capability in case of one engine failure, and the reusability target is over 100 flights. Therefore, RSR requires the main engine to have very advanced features such as continuous throttling for vertical landing and health monitoring for abort operation. In order to show these advanced features will be feasible, a technological demonstration engine with three electrical valves was developed, and engine firing tests have been conducted in Kakuda Space Center of JAXA since June in 2014. First, the simple feed-forward control was used to control three valves, and engine characteristics were obtained, such as the engine response to each valve operation and the operational trends at each thrust level. Based on

these results, two-degree-of-freedom control by combination of feed-forward and feed-back control was applied to the engine, and the engine showed the capability of robust continuous throttling between 100