

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

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FIRING TESTS FOR ADVANCED FEATURES AND LONG-LIFE DURABILITY OF THE MAIN
ENGINE OF THE REUSABLE SOUNDING ROCKET

Abstract

A fully reusable sounding rocket has been developed in JAXA to realize low-cost and frequent scientific observations and experiments at altitude over 100km. This rocket has a vertical take-off and vertical landing style and flies back to the launch site. Hence, the system requires the main engine to have very advanced features such as a wide and continuous throttling, a re-ignition in an atmospheric condition, and a safe and sure abort capability. The engine is also demanded to have a lifetime over 100 flights and a high maintainability. To show that these advanced features and long-life durability of this engine will be feasible, the engine firing tests have been conducted in Kakuda Space Center of JAXA since June in 2014. The first series of the firing tests was performed from June to August in 2014, in which the basic features such as steady-state conditions at several thrust levels, transient behaviours (start-up and shutdown), and characteristics of valves were tested. These results were presented at the 65th IAC conference last year. In the second series in October and November in 2014, the advanced features of this engine such as a continuous throttling, a feed-forward and feed-back control, engine responses to control valves, an

idling combustion mode, a re-ignition, and a health monitoring system were tested. Through the first and the second series of the firing tests, we confirmed that the engine worked stably at any thrust levels and could be throttled continuously between 100In December of 2014 and January of 2015, long-life durable tests for this engine were performed to prove that this engine would be reusable for over 100 flights. In this series of the firing tests, we made sequential multiple firing tests, in which 100