SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems Technologies (5)

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ABORT RECOVERY STRATEGY FOR FUTURE VERTICAL LANDING SYSTEMS

Abstract

This paper summarizes the abort recovery strategy for future vertical landing space systems in case of one engine failure, by applying a state-of-art non-linear control law.

Mitsubishi Heavy Industries or MHI has been conducting R&D activities of Reusable Sounding Rocket and system architecture study of lunar lander for future space systems development. Reusable Sounding Rocket, equipped with four engines, is required to have abort capability on single engine failure to improve the vehicle or crew safety. MHI considers such a capability could also be applied to lunar lander.

MHI introduced the abort recovery strategy composed of two functions. First function will shut down the failed engine and that of the counter side in order to minimize the attitude perturbation caused by failed engine thrust. Second is the nonlinear optimized control law which have the robustness to variation in weight, moment of inertia and center of gravity. Since there are usually gimballing speed limits, classical control low, such as the PID feedback, does not work under the condition of large attitude perturbation. The control law applied has been developed under the collaboration with Nagoya University.

To evaluate the above mentioned strategy, MHI has conducted flight test by a subscale demonstrator "OEEX", which stands for "One Engine inoperative EXperimental vehicle". Verification results of the strategy are described in this paper.