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SYSTEM DESIGN OF MULTIPURPOSE REUSABLE ORBITER SUITABLE FOR SMALL LAUNCH VEHICLE

Abstract

Many small launch vehicles are being developed and operated to meet the explosively increasing demand for small satellites. Taking this opportunity, we are studying a multipurpose reusable orbiter to be launched by a small launch vehicle. Such orbiter will add further value to small missions and promote space utilization. In this paper, we report the results of the system investigation on a 1.5-ton class reusable orbiter to be launched by the Epsilon Launch Vehicle and then return to the sea after performing its mission in orbit.

Generally, mass design for a reusable orbiter is difficult because it needs a propulsion system for deceleration to reentry speed and a TPS (Thermal Protection System) required for reentry. Additionally, a conventional reusable TPS has a downside in operational performance as demonstrated by the Space Shuttle. In order to solve these problems, we conducted a trade-off study of propellant and evaluated the application of our innovative aeroshell system based on its sub-size flight test. These results are also included in this paper.