

SPACE PROPULSION SYMPOSIUM (C4)

Propulsion System (2) (2)

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DEVELOPMENT OF SOLID PROPULSION SYSTEM FOR ENHANCED EPSILON LAUNCH
VEHICLE AND M-35 STATIC FIRING TEST

Abstract

The Epsilon launch vehicle, the newest version of Japan's solid propulsion rocket, made its maiden flight in September of 2013. The purpose of the Epsilon rocket is to provide small satellites with responsive launching with low-cost, user-friendly and efficient launch system. Now that the first flight was successfully finished, JAXA has been conducting intensive researches on a next generation Epsilon to launch a more powerful and lower cost version of Epsilon (Evolved Epsilon). In order to minimize technical risks and to keep up with demand of future payloads, JAXA plans to take a step-by-step approach toward Evolved Epsilon. As the first upgrade toward Evolved Epsilon, JAXA has started the development of Enhanced Epsilon. The Enhanced Epsilon is required to enhance launch capability by ERG satellite mission which have decided to change an orbit to be put into to farther and also to improve on-board capability in size and in weight by ASNARO2 satellite mission. The development of Enhanced Epsilon is mainly the renewal of the second stage, and also includes the each subsystem's improvement. The main change of the solid propulsion system is exposure of the second motor M-35. Currently, the design has been finished. The outside diameter of the motor case is expanded into approximately 2.5 m in order to increase the amount of the solid propellant and the outer shell of the motor case is used as the outer shell of the launch vehicle. Solid propellant which can the high-performance equal to a conventional upper-stage motor developed newly, reducing the cost. A general front ignition system is adopted instead of the rear ignition system of the throw-away type which was adopted for the previous motor. A new development material is applied to the case lining. An expansible nozzle is not adopted because compatibility of high-performance and cost reduction. In order to verify the design, the static firing test of the second motor M-35 on condition of vacuum has been conducted. This paper describes overview of development of the solid propulsion system for Enhanced Epsilon and the results of the M-35 static firing test.