SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS (D2)
Launch Vehicles in Service or in Development (1)

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DEVELOPMENT OF JAPAN'S NEXT GENERATION SOLID ROCKET LAUNCHER- THE EPSILON ROCKET

Abstract

Japan's next generation solid rocket launcher has been officially put into a development phase after 3 years of intensive research study. The launcher was previously called the Advanced Solid Rocket (ASR) and is now newly nicknamed Epsilon rocket in accordance with the tradition of Japan's solid rockets: they are named using a Greek character. Japan's first artificial satellite "Ohsumi" was launched by the Lambda rocket in 1970 and the world's first asteroid sample-return spacecraft "Hayabusa" was put directly into an inter-planetary trajectory in 2003 by the M-V (Mu-five) rocket. The M-V, the world's biggest and best performance all solid propellant launch system, contributed to Japan's space science in almost all its fields but retired in 2006 mainly due to its relatively high operational cost.

Although the space science communities of Japan have obtained world-leading scientific achievements by use of the M-V rocket, they now suffer from relatively low frequency opportunities because of high cost and long development time. The space science will not survive unless they focus on more small satellites with lower cost and shorter development time. With this as background, the purpose of the Epsilon rocket, the successor of the M-V, is to provide small satellites with responsive and low cost launch. It is a three-staged launch vehicle having the launch capacity of two thirds of that of the M-V rocket: 0.6 ton into sun synchronous transfer orbit (SSTO). Its cost is projected to be only a third of that of the M-V, which means its cost performance is double that of the M-V rocket.

The most special aspect of the Epsilon rocket is to dramatically increase the operation performance to the highest standard of the next generation. The target is set to be less than 5 days to launch after the first stage motor stand-on. To do this, the onboard avionics are designed to be connected with each other and with the ground facilities by a high-speed network and made highly intelligent so that the vehicle can perform checkouts autonomously, thus reducing the associated time and labor needed for checkout of the rocket. In addition, it will be possible to check and control rockets anywhere in the world simply by using a single laptop computer. This is called a mobile launch control. In this way, the associated ground support system and facilities are made highly compact. Such innovative concepts are equally applicable to future space transportation systems.