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

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JAPAN'S NEXT GENERATION SOLID ROCKET LAUNCHER

Abstract

The paper describes the special concepts of Japan's next generation solid rocket launcher, which is under development to succeed recently retired M-V rocket. The M-V launch vehicle, the world's biggest and best performance all solid propellant launch system, contributed to Japan's space science in almost all its fields. The vehicle lifted its first payload, the world's first radio-astronomy satellite "HALCA" in 1997 and launched the world's first asteroid sample-return spacecraft "Hayabusa" in 2003 directly into its inter-planetary trajectory. Unfortunately, the operation of the M-V rocket was terminated in September 2006 mainly due to its relatively high operational cost after it launched Japan's second solar observation satellite "HINODE" into a solar synchronous transfer orbit.

The space science communities of Japan, which have obtained world-leading scientific data by use of the M-V rocket, suffer from relatively low frequency opportunities partly because of high cost and long duration required for pre-launch preparation of the rocket. Space Science will not survive unless they focus on the development of more small satellites with lower cost and shorter development time. With this as background, the next-generation solid propellant launch vehicle called *Advanced Solid Rocket* (ASR) has emerged to provide small satellites with responsive and low cost launch. The advanced solid rocket is a three-staged launch vehicle having the launch capacity of two thirds of that of the M-V rocket: 1.2 ton into low earth orbit (LEO); 0.6 ton into sun synchronous transfer orbit (SSTO). Its cost is projected to be only a third of that of the former M-V Launch Vehicle, which means its cost performance is double that of the M-V rocket. The first launch remains to be defined.

The most special research topic of the advanced solid rocket is to dramatically increase the availability of the rocket by improving the operation performance to the highest standard of the next generation. The purpose is to significantly reduce the time and labor needed for the operation involving assembly and checkout of the rocket and make the associated ground support system and facilities as compact as possible. 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 serial bus and made *highly intelligent* so that the vehicle can perform checks onboard and autonomously, thus reducing the associated time and labor required for operations on the ground. Ultimately, through the network, 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*. Such innovative concepts of the advanced solid rocket open doors for future launch systems.