

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

Author: Prof. Yasuhiro Morita  
Japan Aerospace Exploration Agency (JAXA), Japan, morita.yasuhiro@jaxa.jp

## A YEAR TO LAUNCH: JAPAN'S EPSILON LAUNCHER AND ITS EVOLUTION

**Abstract**

The development of the *Epsilon* launch vehicle, Japan's next generation solid rocket launcher has just moved on to the final stretch for its first launch scheduled in summer of 2013 carrying the planetary telescope satellite SPRINT-A. It should be emphasized that Japanese government strongly appreciates the advantages of combined power of the standardized small satellites and the *Epsilon*'s highly efficient launch system, both developed by JAXA. The launch site of the *Epsilon* rocket will be the Uchinoura Space Center(USC), the home of Japan's solid rockets, which is well known as a highly compact launch complex. The efficient *Epsilon* launch vehicle and the compact USC will become one of the most powerful tools that contribute to small missions (maximum 1.2 ton into LEO and 450kg into SSO).

The purpose of the *Epsilon* rocket is to provide small satellites with a responsive launching, a low cost, user friendly and ultimately efficient launch system. To realize this, the design concept of *Epsilon* involves the next generation technologies such as *the highly intelligent autonomous checkout system and the mobile launch control*. Owing to this, the lift-off will be executed in less than 6 days after putting the first stage on the launch pad. The prototype model of the intelligent mobile launch control was already established and verified its effectiveness. Another aspect that small satellites will most welcome is more user-friendly characteristics involving an improvement in the level of acoustic vibration, which will be reduced to those of the liquid launchers. This can be achieved by a modification of the current launch facilities and the effectiveness was validated using a numerical analysis as well as a series of static firing tests using a scale model of the launch facilities. The construction has been started at USC.

Now that the full-scale development is about to be finished, the most important is what the next step should be beyond *Epsilon*. JAXA has already announced the post *Epsilon* development to launch the low cost version of *Epsilon* in 2017 with the targeted operational cost set at below US\$30 million to be competitive in the world market. It will be based on the radically low cost technologies, primarily in avionics and structural systems, and the associated research has been already started. This paper provides the details of the final phase of the *Epsilon* development and reveals its evolution plan.