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LAUNCH RESULTS AND DEVELOPMENTS OF SMALLEST-CLASS LAUNCH SYSTEM 'SS-520
NO.5' ROCKET FOR MICRO-SATELLITE IN JAPAN

Abstract

JAXA has launched successfully the SS-520 No.5 to inject the micro-satellite 'TASUKI' into the elliptical orbit on February 3rd, 2018 at Kagoshima Space Center at Uchinoura in Japan. The base-line of SS-520 sounding rocket is a two-stage rocket which has a capability for launching 140kg payload to an maximum altitude of about 800 km and spun by 4 tail fins for attitude stability. Enhanced SS-520 No.5 is a three-stage rocket for smallest-class launch system in the world which has the orbit injection capability of the micro-satellite of a few kilograms by adding the high-performance third solid motor and the advanced Rhumb-line control system. Total length of the rocket is about 9.6 meters, the gross weight is 2.6 metric tons, reference diameter is 0.524 meters. The 'TASUKI' has some purposes of the experiments of 'store forward' communication on orbit and earth observation by some commercial cameras, and so on. The key points of this launch success are newly developed Rhumb-line control system, compact and high performance avionics, some light weight structures and high performance third solid propellant motor made of CFRP. Rhumb-line control system has established attitude maneuver of about 70 degrees to inject the 'TASUKI' into the orbit of perigee altitude 180km and apogee altitude 2000km. This Rhumb-line control system has many high performance functions of precise angular momentum control function, high

attitude maneuver rate capability, the suppression function of nutation angle generated by the disturbance of RCS thruster injection, under high spin rate of about 1.4Hz to 1.8Hz. We performed the Motion Table Test 'Real-time Simulation Test' with the flight models of the avionics for verification of Rhum-line control design and the Soft-wear-In-the-Loop Test 'SWIL' for verification of the Flight Soft-wear functions. Active Nutation Control 'ANC' function after Rhum-line control phase is also equipped for the reduction of the nutation angle caused by RCS thrust disturbance during attitude maneuver. We shows the outline of the rocket system and developments, especially the Rhum-line control system with the compact avionics system. Finally the first flight results are showed and we show one of the future enhanced ideas of SS-520 No.5 type launcher for over 10 kilogram class satellites in the presentation.