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SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
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RECENT FLIGHT TEST RESULT OF EXPERIMENTAL WINGED ROCKET AND ITS FUTURE PLAN FOR SUBORBITAL TECHNOLOGY DEMONSTRATION

Abstract

In 2008, Kyutech first developed a small winged rocket called WIRES (WInged REusable Sounding rocket) 011, which has the total length of 1m and initial mass of 8kg, and conducted its flight tests up to the altitude of 0.5km for 5 times in order to verify the attitude control performance of ascent phase. After completion of the flight test of conventional rocket type WIRES012 in 2010, which had the total length of 1.7m and initial mass of 34kg, in order to demonstrate a new flight termination and complete recovery system with 2-stage parachute and airbags for the safety operation, Kyutech started to develop WIRES014 from 2012 to verify the technologies of onboard real-time guidance system and attitude control system in collaboration with JAXA (Japan Aerospace Exploration Agency). WIRES014-1 is a larger winged rocket with total length of 1.7m and initial mass of 49kg, which is capable to reach the altitude of 1.7km propelled by a propulsion system of CAMUI (Cascaded Multistage Impinging-jet) hybrid rocket provided by Hokkaido University. The first test was conducted in June 2013, but failed due to the malfunction of ADS (Air Data System). The flight test of the second WIRES014-2 was cancelled due to the failure of system ground combustion test using a new commercial-off-the-shelf hybrid rocket engine called HyperTEK M1000 in December 2014. In November 2015, Kyutech finally conducted the flight test of the new WIRES014-3 by improving all the technical failure issues happened previously, and recovered the vehicle safely using the two-stage parachute system on ground. After the ignition of hybrid rocket engine, WIRES014-3 conducted the powered flight for 7 seconds, reached the maximum altitude of about 1km in 15 seconds to complete the gliding flight, and deployed the deceleration chute at 32 seconds followed by the main chute deployment, and recovered intact on ground. This paper presents the flight test result of WIRES014-3 in detail. The authors also introduces recent design and development a larger winged rocket WIRES015 (the total length of 4m and the weight of 500kg) as a pre-demonstrator of suborbital vehicle, which carries a LOX-Methane engine provided by JAXA (Japan Aerospace Exploration Agency) and capable to reach the altitude more than 6km. The flight test of WIRES015 will be conducted at Mojave California in collaboration with the University of Southern California.