SPACE DEBRIS SYMPOSIUM (A6)
Mitigation and Standards (4)

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QUALIFICATION RESULTS OF A SAIL DEPLOYMENT MECHANISM FOR ACTIVE PREVENTION AND REDUCTION OF SPACE DEBRIS

Abstract

Recently small satellite development activities became popular throughout the world. Many of these satellites are launched into orbits where they remain orbiting around the Earth for centuries in vain even after their mission life time. It became recently a world's serious concern that these space debris prevent human beings from safe space development and exploration activities in the near future. Therefore there is a great interest on debris prevention and reduction methods. Tohoku University has been very active in satellite development activities for years and has already successfully developed, tested, and launched its first microsatellite SPRITE-SAT (renamed as RISING-1 after the launch), has completed the second microsatellite RISING-2, is developing its third microsatellite RISESAT, and is completing its first Cubesat RAIKO. Due to the above mentioned background, Tohoku University has also initiated a development activity of sail deployment mechanisms in order to de-orbit used microsatellites by means of residual atmospheric drags. The mechanism itself has a cylinder form and utilizes unique deployable booms which can be folded down very compactly. The stored thin film inside the mechanism is pulled out of the case by the deployment force produced by the booms. After a successful verification of functional model, an engineering model has been developed and is undergoing qualification tests, such as vibration tests, thermal vacuum test, atomic oxygen test, and so on. This paper will summarize the results of these qualification tests. According to these tests, the first flight model of the mechanism will be manufactured and will be mounted on the Cubesat RAIKO which will be launched up to International Space Station by HTV in this summer and will be inserted into low Earth orbit. The above mentioned functional model had a diameter of 20 cm, a thickness of 5cm, and a mass of about 0.5 kg for deploying 1.4 m square thin film. The one mounted on the RAIKO has a diameter of 8 cm, a thickness of 4cm, and a mass of about 0.3 kg for deploying 0.5 m square thin film. A larger functional model being developed for microsatellites at the

time of writing has a diameter of 20 cm, a thickness of 8cm, and a mass of about 1.0 kg for deploying 2.5 m square thin film. This paper will also summarize all aspects of these development activities. Possibly, the results of RAIKO mission will be also included depending on the schedule.