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Conceptualizing Space Elevators and Tethered Satellites (3)

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VERIFICATION OF SPACE ELEVATOR TECHNOLOGIES; PRESENT STATUS AND FUTURE
PLAN IN JAPAN

Abstract

To realize space elevator, there are lots of technical issues to overcome, and they must be solved and verified step by step. In these situations, we are now trying to verify two basic technologies of space elevator by using Microsatellites and obtain data for future design, one is the tether (cable) deployment technology, and other is the climber operation along tether in space. A tether deployment is performed by a CubeSat called 'STARS-C (Space Tethered Autonomous Robotic Satellite - Cube)'. STARS-C consists of Mother Satellite (MS), Daughter Satellite (DS) and 100m tether between them, and its mission is focused on deploying tether to study the tether dynamics during the tether deployment. STARS-C was released from the Japanese experimental module Kibo in ISS on December 19, 2016, and is under operation including the adjustment of its transmission for performing tether deployment mission at present. We also have been developing another Microsatellite called 'STARS-E' (Space Tethered Autonomous Robotic Satellite - Elevator) under the Grant-in-Aid for Scientific Research parallel to STARS-C. STARS-E is the satellite of 500 mm size to verify the climber operation in space, and consists of MS, DS, 1200 m tether between them, and a climber moving along tether. STARS-E is in EM phase at present. Following these space experiments, we are now planning the experiments and development of the hybrid space elevator. The hybrid space elevator consists of the orbital elevator which extending STARS-E, the stratospheric elevator using balloon or airship in the atmosphere, and the high speed airplane with hybrid engine of jet and rocket which connects between elevators as a first step of space elevator. The basic concept of space elevator system was proposed by Shizuoka University and Nihon University group, and the plan was put together with the plans of spaceplanes and then proposed as "Research and Development of Revolutionary Low Cost Space Transportations for Space Infrastructure Constructions" from the Japan society for aeronautical and space science. This is 10 years plan, and the establishment of basic space elevator and spaceplane technologies are performed in first 5 years and then the verification experiments of hybrid space elevator and spaceplane technologies are performed in next 5 years by nationwide groups. This plan was selected as one of the master plan 2017 of Science Council Japan. The details of the status of STARS-C, E and this future plan in Japan will be presented at the congress.