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Space Elevator and Tethers (3)

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DEVELOPMENT OF MICROSATELLITES FOR VERIFYING THE BASIC TECHNOLOGIES OF SPACE ELEVATOR IN SPACE

Abstract

To realize space elevator, there are a number of technical issues to overcome, and they must be solved and verified step by step. Among them, some technologies, such as fiber formationof carbon nanotube, wireless transmission of energy to climber, etc., are still immature, but some of them can be realized at present technology and they must be verified in space. We try 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)' which will be carried by HTV and released from the Japanese experimental module Kibo on ISS in 2016. 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 for designing smooth tether deployment possible in future tether mission including space elevator. MS and DS have the common subsystems as satellite such as power system, communication system, and also have the tether unit with spool and reel mechanism as mission system to control tether tension. STARS-C is in the FM phase at present (autumn in 2015). We also have been designing the next-step Microsatellite called 'STARS-E' (Space Tethered Autonomous Robotic Satellite - Elevator) under the Grant-in-Aid for Scientific Research. STARS-E is the satellite of 500 mm size to verify the climber operation in space, and consists of MS, DS, 2000 m tether between them, and a climber moving along tether. The experimental

data also will be used for verifying our developing space-elevator cable-dynamics models. The detail design and plan of STARS-C and STARS-E experiments will be presented at the conference.