

## MATERIALS AND STRUCTURES SYMPOSIUM (C2)

## Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures) (2)

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## DEVELOPMENT OF EXTENDIBLE ROBOT ARM EXPERIMENT MODEL FOR ISS/JEM-EF

**Abstract**

As the usage of the ISS (International Space Station) is beginning in full-scale, the labor shortage and the overloading to astronauts is becoming the problem. Astronauts Supporting Robots, which support astronauts working with them in space, are developed in many countries.

Space Robotics Group of JAXA, an Astronauts Supporting robot which employs a new type of moving methods is developed. The robot has an extendible arm and few tethers with hooks on its end. The robot moves by hooking several tethered hooks to the handrails by using extendible arm and controlling tether length. The advantage of this way of moving is that the robot can move in wide area without any specific foothold but with the handrail that astronauts usually use. The experiment model of this robot system is equipped on JEM (Japanese Experiment Module) on ISS as REX-J project in 2011.

This paper discusses about the robot arm subsystem of this experimental model. This robot arm is called SRA (STEM Robot Arm) here in after. SRA takes advantage of STEM (Storable Tubular Extendible Member) boom in terms of light weight and high stowage performance. In the design of SRA experiment model, the following requirement should be considered;

1. It must be able to be deployed and retracted many times stably with keeping enough position precision.
2. It must have sufficient stiffness and force to carrying tethered hook.
3. It must comply with the ISS safety requirement in order to be equipped on JEM.

To solve above requirement, the motors are used as the actuators for extension and retraction and Bi-STEM boom which made of CFRP is employed as the arm structure. In safety design, sufficient structural strength against on orbit load including the EVA (Extravehicular activity) crew kick load and ISS inducing cyclic load were considered.