Paper ID: 62263
student

Ground-Based Preparatory Activities (11)
Ground-Based Preparatory Activities (1) (1)

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# DEVELOPMENT OF THE LOWER BODY MODULAR ANTHROPOMORPHIC ROBOTIC SPACE-SUIT JOINT TESTER

**Abstract**

The return of astronauts to the moon and the future plans for the exploration of Mars will lead to an increase in mission duration and an emphasis on surface Extra-Vehicular Activities (EVAs). To make the most of these extended missions an advanced EVA space suit system will be required. Space suits that allow astronauts to move freely and easily will be critical as humans return to planetary surfaces. The Modular Anthropomorphic Robotic Space suit (MARS) joint tester provides the joint testing capability to characterize the mobility of space suit joints. Originally designed to replicate the flexion and extension of a human elbow joint, the MARS joint tester has been modified to replicate the flexion and extension of a human knee. With this unique testing potential, further research into the complex interaction between space suit sizing and suit mobility is possible. The MARS joint tester is a space suit joint testing device developed at the Human Spaceflight Laboratory at the University of North Dakota. The testing device replicates the mechanics of a human limb moving a pressurized space suit joint while measuring the torque induced on the human-shaped robotic limb by the pressurized space suit limb assembly. The device is modular in that different sized limbs can be attached to the system replicating a wide range of anthropometry. The pressurization interface of the tester is designed in such a way as to accommodate a range of space suit joint geometries. The design of mobile space suit leg joints requires a new joint testing system. With the MARS joint tester, a range of limb sizes can be tested using several space suit joints of varying sizes. Using this data, space suit joint designs can be evaluated and refined.