

Robonaut 2 – Initial Activities On-Board the ISS

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Abstract—Robonaut 2, or R2, arrived on the International Space Station in February 2011 and is currently undergoing testing in preparation for it to become, initially, an Intra-Vehicular Activity (IVA) tool and then evolve into a system that can perform Extra-Vehicular Activities (EVA). After the completion of a series of system level checks to ensure that the robot traveled well on-board the Space Shuttle Atlantis, ground control personnel will remotely control the robot to perform free space tasks that will help characterize the differences between earth and zero-g control. For approximately one year, the fixed base R2 will perform a variety of experiments using a reconfigurable task board that was launched with the robot. While working side-by-side with human astronauts, Robonaut 2 will actuate switches, use standard tools, and manipulate Space Station interfaces, soft goods and cables. The results of these experiments will demonstrate the wide range of tasks a dexterous humanoid can perform in space and they will help refine the methodologies used to control dexterous robots both in space and here on earth.

After the trial period that will evaluate R2 while on a fixed stanchion in the US Laboratory module, NASA plans to launch climbing legs that when attached to the current on-orbit R2 upper body will give the robot the ability to traverse through the Space Station and start assisting crew with general IVA maintenance activities. Multiple control modes will be evaluated in this extra-ordinary ISS test environment to prepare the robot for use during EVAs. Ground Controllers will remotely supervise the robot as it executes semi-autonomous scripts for climbing through the Space Station and interacting with IVA interfaces. IVA crew will locally supervise the robot using the same scripts and also teleoperate the robot to simulate scenarios with the robot working alone or as an assistant during space walks.