Robonaut

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Robonaut is an in-house research and development (R&D) effort at Johnson Space Center (JSC) that is producing a new generation of robotic systems that can help humans work and explore in space. The central theme of the project is to accept human capability as a common denominator in the assembly and maintenance of flight hardware and to build machines that can fit into that role, working with existing extravehicular activity (EVA) tools and within EVA access corridors. Complementing the capabilities of the remote manipulator system and the Space Shuttle remote manipulator system, Robonaut is designed to handle tools, materials, and other flight equipment not designed in advance with special robotic interfaces. Its small size and dexterity allow Robonaut to serve as an astronaut assistant by, for example, handing tools and equipment to the crew on demand. Operated with a user interface called telepresence, Robonaut uses much of the same virtual-reality gear now used by the crew for mission training. Robonaut extends this technology, however, allowing crew or ground personnel to take a virtual spacewalk with an actual machine that can do work on the outside of the spacecraft. In this mode, astronauts may set up a work site using Robonaut prior to their spacewalk, familiarizing themselves with the work site's current condition

and arranging tools or other gear in advance of an EVA.

Since the late 1990s, JSC has been advancing the Robonaut technologies in a series of integration milestones, starting with arm and hand subsystems and progressing through the development of a dual arm torso. Robonaut A has two dexterous limbs with a neck for pointing its head-mounted cameras, all integrated onto a torso with a three-axis waist that is able to move it above a fixed pedestal. The fixed nature of Robonaut A has allowed the system to be tested with a wide assortment of auxiliary computers housed off board in the pedestal and external rack. This has enabled a series of autonomy experiments and R&D with the freedom to use any number of computers.

In 2002, the team developed Robonaut B with fully embedded avionics, miniaturizing many of the components held in Robonaut A's pedestal. The integral packaging of the torso makes Robonaut B portable. It has been mounted on multiple lower bodies for demonstration of mobile manipulation. The lower body options include a 0g stabilizing leg for operation in space, and a two-wheeled Segway base for demonstrating surface operations.