Telerobotics Workstation (TRWS) for Deep Space Habitats
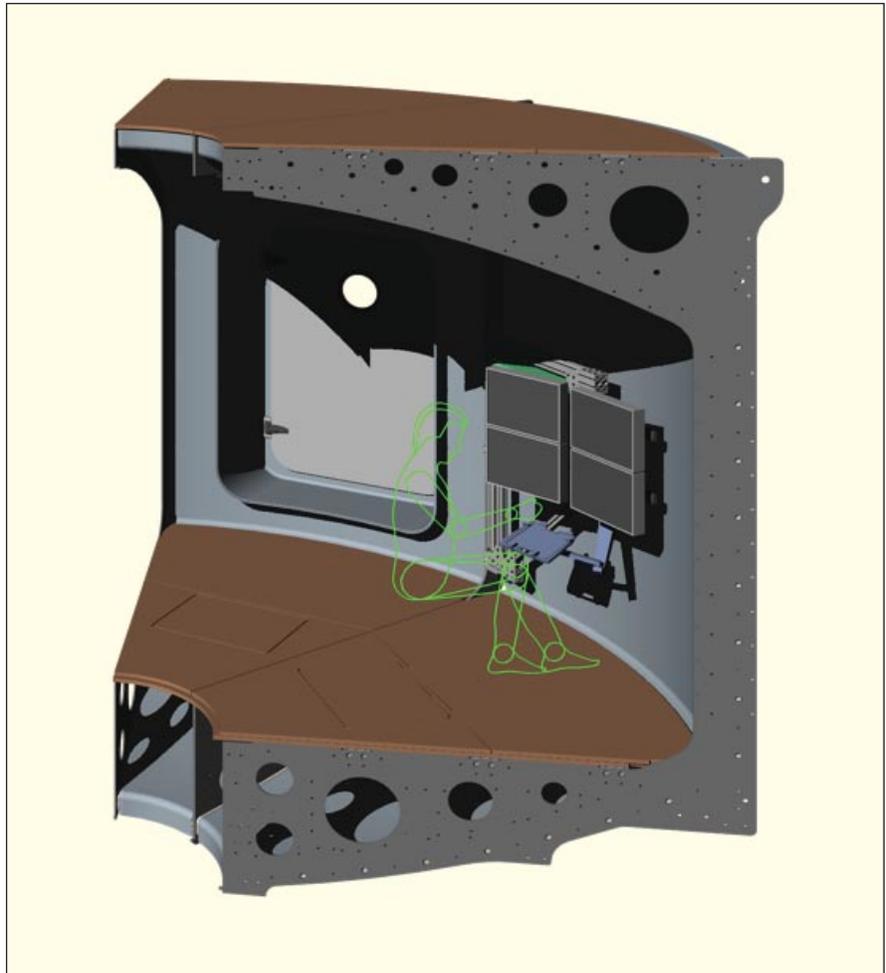
This multi-display computer workstation can be adjusted for a variety of configurations.

NASA's Jet Propulsion Laboratory, Pasadena, California

On medium- to long-duration human spaceflight missions, latency in communications from Earth could reduce efficiency or hinder local operations, control, and monitoring of the various mission vehicles and other elements. Regardless of the degree of autonomy of any one particular element, a means of monitoring and controlling the elements in real time based on mission needs would increase efficiency and response times for their operation. Since human crews would be present locally, a local means for monitoring and controlling all the various mission elements is needed, particularly for robotic elements where response to interesting scientific features in the environment might need near-instantaneous manipulation and control.

One of the elements proposed for medium- and long-duration human spaceflight missions, the Deep Space Habitat (DSH), is intended to be used as a remote residence and working volume for human crews. The proposed solution for local monitoring and control would be to provide a workstation within the DSH where local crews can operate local vehicles and robotic elements with little to no latency.

The Telerobotics Workstation (TRWS) is a multi-display computer workstation mounted in a dedicated location within the DSH that can be adjusted for a variety of configurations as required. From an Intra-Vehicular Activity (IVA) location, the TRWS uses the Robot Application Programming Interface Delegate (RAPID) control environment through the local network to remotely monitor and control vehicles and robotic assets located outside the pressurized volume in the immediate vicinity or at low-latency distances from the habitat. The multiple display area of the TRWS allows the crew to have numerous windows open with live video feeds, control windows, and data browsers, as well as local monitoring and control of the DSH and associated systems.

The **Telerobotics Workstation (TRWS)** swing frame enables the mounted computer workstation to be adjusted for a variety of configurations.

The novelty of the TRWS comes from the integration and configuration of various software and hardware elements within the context of the DSH environment. Controls, communications, power status, situational awareness information, and telemetry — though employing conventional and sometimes commercial off-the-shelf (COTS) equipment — are displayed in a unique operational environment that must compete with crew attention in a fully functional habitat. The TRWS RAPID software, hardware, structural configuration, ergonomics, and human factors combine to provide the crew with an efficient tool for carrying out mission remote asset control objectives.

This work was done by David S. Mittman, Alan S. Howe, and Recaredo J. Torres of Caltech; Jennifer L. Rochlis Zumbado and Kimberly A. Hambuchen of Johnson Space Center; and Matthew Demel and Christopher C. Chapman of JSC Jacobs Technology for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1). NPO-48503