Mechanics/Machinery

Dual-Compartment Inflatable Suitlock

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There is a need for an improvement over current NASA Extravehicular Activity (EVA) technology. The technology must allow the capacity for quicker, more efficient egress/ingress, allow for "shirtsleeve" suit maintenance, be compact in transport, and be applicable to environments ranging from planetary surface (partial-g) to orbital or deep space zero-g environments. The technology must also be resistant to dust and other foreign contaminants that may be present on or around a planetary surface. The technology should be portable, and be capable of docking with a variety of habitats, ports, stations, vehicles, and other pressurized modules.

The Dual-Compartment Inflatable Suitlock (DCIS) consists of three hard inline bulkheads, separating two cylindrical membrane-walled compartments. The Inner Bulkhead can be fitted with a variety of hatch types, docking flanges, and mating hardware, such as the Common Berthing Mechanism (CBM), for the purpose of mating with vehicles, habitats, and other pressurized modules. The Inner Bulkhead and Center Bulkhead function as the end walls of the Inner Compartment, which during operations, would stay pressurized, either matching the pressure of the habitat or acting as a lower-pressure transitional volume.

The Inner Compartment contains donning/doffing fixtures and inner suitport hatches. The Center Bulkhead has two integrated suitports along with a maintenance hatch. The Center Bulkhead and Outer Bulkhead function as the end walls of the Outer Compartment, which stays at vacuum during normal operations. This allows the crewmember to quickly don a suit, and egress the suitlock without waiting for the Outer Compartment to depressurize. The Outer Compartment can be pressurized infrequently for both nominal and off-nominal suit maintenance tasks, allowing shirtsleeve inspections and maintenance/repair of the environmental suits. The Outer Bulkhead has a pressure-assisted hatch door that stays open and stowed during EVA operations, but can be closed for environmental protection of the suits, suit maintenance, and pressurization.

This work was done by Kriss J. Kennedy, Peggy L. Guirgis, and Robert M. Boyle of Johnson Space Center. Further information is contained in a TSP (see page 1). MSC-24914-1

Modular Connector Keying Concept

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For panel-mount-type connectors, keying is usually "built-in" to the connector body, necessitating different part numbers for each key arrangement. This is costly for jobs that require small quantities. This invention was driven to provide a cost savings and to reduce documentation of individual parts.

The keys are removable and configurable in up to 16 combinations. Since the key parts are separate from the connector body, a common design can be used for the plug, receptacle, and key parts. The keying can then be set at the next higher assembly.

This work was done by Scott Ishman, Scott Dukes, and Gary Warnica of Honeywell, and Guy Conrad and Steven Senigla of Lockheed Martin for Johnson Space Center. For further information, contact the JSC Innovation Partnerships Office at (281) 483-3809. MSC-25074-1

Genesis Ultrapure Water Megasonic Wafer Spin Cleaner

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A device removes, with high precision, the majority of surface particle contamination greater than 1-micron-diameter in size from ultrapure semiconductor wafer materials containing implanted solar wind samples returned by NASA's Genesis mission. This cleaning device uses a 1.5-liter/minute flowing stream of heated ultrapure water (UPW) with 1-MHz oscillating megasonic pulse energy focused at 3 to 5 mm away from the wafer surface spinning at 1,000 to 10,000 RPM, depending on sample size.

The surface particle contamination is removed by three processes: flowing UPW, megasonic cavitations, and centripetal force from the spinning wafer. The device can also dry the wafer fragment after UPW/megasonic cleaning by continuing to spin the wafer in the cleaning chamber, which is purged with flowing ultrapure nitrogen gas at 65 psi (≈448 kPa). The cleaner also uses three types of vacuum chucks that can accommodate all Genesis-flown array fragments in any dimensional shape between 3 and 100 mm in diameter. A sample vacuum chuck, and the manufactured UPW/megasonic nozzle holder, replace the human deficiencies by maintaining a consistent dis-