



### ⚙️ Deployable Crew Quarters

*Lyndon B. Johnson Space Center, Houston, Texas*

The deployable crew quarters (DCQ) have been designed for the International Space Station (ISS). Each DCQ would be a relatively inexpensive, deployable box-like structure that is designed to fit in a rack bay. It is to be occupied by one crewmember to provide privacy and sleeping functions for the crew. A DCQ comprises mostly hard panels, made of a lightweight honeycomb or matrix/fiber material, attached to each other by cloth hinges. Both faces of each panel are covered with a layer of Nomex cloth and noise-suppression material to provide noise isolation from ISS.

On Earth, the unit is folded flat and attached to a rigid pallet for transport to the ISS. On the ISS, crewmembers un-

fold the unit and install it in place, attaching it to ISS structural members by use of soft cords (which also help to isolate noise and vibration). A few hard pieces of equipment (principally, a ventilator and a smoke detector) are shipped separately and installed in the DCQ unit by use of a system of holes, slots, and quarter-turn fasteners.

Full-scale tests showed that the time required to install a DCQ unit amounts to tens of minutes. The basic DCQ design could be adapted to terrestrial applications to satisfy requirements for rapid deployable emergency shelters that would be lightweight, portable, and quickly erected. The Temporary Early Sleep Station (TeSS) currently on-orbit is a spin-off of the DCQ.

*This work was done by William C. Schneider, Kriss J. Kennedy, and Nathan R. Moore of Johnson Space Center and James Mabie of Muniz Engineering. Further information is contained in a TSP (see page 1).*

*In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:*

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*Refer to MSC-23132-1, volume and number of this NASA Tech Briefs issue, and the page number.*

### ⚙️ Nonventing, Regenerable, Lightweight Heat Absorber

*Lyndon B. Johnson Space Center, Houston, Texas*

A lightweight, regenerable heat absorber (RHA), developed for rejecting metabolic heat from a space suit, may also be useful on Earth for short-term cooling of heavy protective garments. Unlike prior space-suit-cooling systems, a system that includes this RHA does not vent water. The closed system contains water reservoirs, tubes through which water is circulated to absorb heat, an evaporator, and an absorber/radiator. The radiator includes a solution of LiCl contained in a porous material in titanium tubes.

The evaporator cools water that circulates through a liquid-cooled gar-

ment. Water vapor produced in the evaporator enters the radiator tubes where it is absorbed into the LiCl solution, releasing heat. Much of the heat of absorption is rejected to the environment via the radiator. After use, the RHA is regenerated by heating it to a temperature of 100 °C for about 2 hours to drive the absorbed water back to the evaporator. A system including a prototype of the RHA was found to be capable of maintaining a temperature of 20 °C while removing heat at a rate of 200 W for 6 hours.

*This work was done by Michael G. Izenson and Weibo Chen of Creare Inc. for Johnson*

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*In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:*

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*Refer to MSC-23914-1, volume and number of this NASA Tech Briefs issue, and the page number.*

### ⚙️ Miniature High-Force, Long-Stroke SMA Linear Actuators

**Stroke forces, stroke lengths, cycle speeds, and structural strengths are increased.**

*John H. Glenn Research Center, Cleveland, Ohio*

Improved long-stroke shape-memory alloy (SMA) linear actuators are being developed to exert significantly higher forces and operate at higher activation

temperatures than do prior SMA actuators. In these actuators, long linear strokes are achieved through the principle of displacement multiplication, according to

which there are multiple stages, each intermediate stage being connected by straight SMA wire segments to the next stage so that relative motions of stages are