Manufacturing & Prototyping

Modular Habitats Comprising Rigid and Inflatable Modules

Potential applications include hurricane-relief housing.

Lyndon B. Johnson Space Center, Houston, Texas

Modular, lightweight, fully equipped buildings comprising hybrids of rigid and inflatable structures can be assembled on Earth and then transported to and deployed on the Moon for use as habitats. Modified versions of these buildings could also prove useful on Earth as shelters that can be rapidly and easily erected in emergency situations and/or extreme environments: examples include shelters for hurricane relief and for Antarctic exploration.

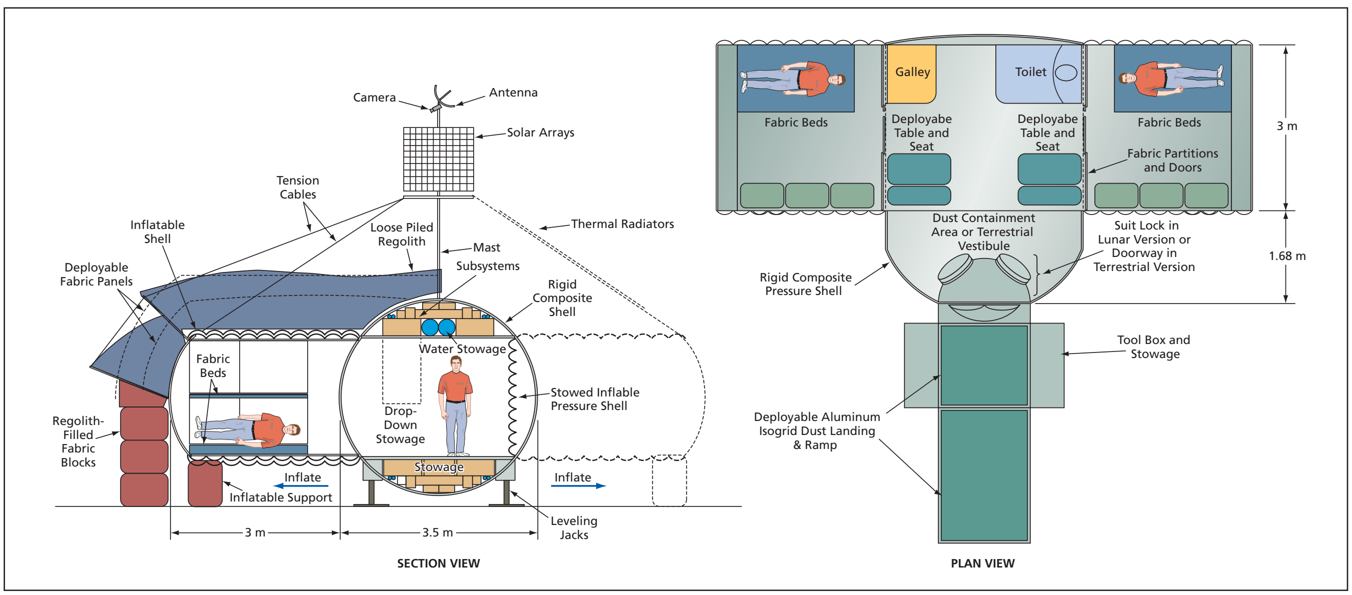
A building according to the proposal (see figure) would include a rigid composite-material module containing an inner room, plus two inflatable sections that, once inflated, would contain two anterooms. After inflation, the building as thus fully deployed (109 m^3) could have a volume significantly greater than it had when it was stowed compactly (48 m^3) for transport.

The walls of the inflatable anteroom modules would be made of a multilayer fabric-reinforced, flexible material impermeable by air, combined with high-tensile-strength cables or binding straps and with deployable rigidifying polyethylene foam. Equipment and subsystems needed for habitation would be integrated into the roof and ceiling plenum spaces of the rigid module to ensure that ducting, wiring, and plumbing all have solid connections to environmental control life support systems, avionics, power supplies, and the module structure.

Integrated into the inflatable modules would be non-flammable Nomex (or equivalent aramid) fabric floors, partitions, and furniture consisting mainly of fabric beds for crewmembers. Upon inflation, the floors, partitions, beds, and any other furniture would become deployed into place.

Attached to the rigid module would be a deployable mast that would serve as both a structural element, solar array mast, and a radio-communication tower: Tension cables attached between the anterooms and the mast would support part of the weight of the anterooms. The mast could support external electronic cameras, communication antennas, and fiber-optic light collectors.

This work was done by Kriss J. Kennedy of Johnson Space Center. Further information is contained in a TSP (see page 1). MSC-24242-1



This **Modular Building** could be deployed rapidly for use as a habitat in a hostile environment or an emergency situation.

More About N_2O-Based Propulsion and Breathable-Gas Systems

Lyndon B. Johnson Space Center, Houston, Texas

A concept was evaluated of using nitrous oxide as (1) a monopropellant in thrusters for space suits and spacecraft and (2) a source of breathable gas inside space suits and spacecraft, both by exploiting the controlled decomposition of N_2O into N_2 and O_2. Relative to one prior monopropellant hydrazine, N_2O is much less toxic, yet offers comparable performance. N_2O can be stored safely as a liquid at room temperature and unlike another prior monopropellant hydrogen peroxide does not decompose spontaneously. A prototype N_2O-based thruster has been demonstrated. It has also been proposed to harness N_2O-based thrusters for generating electric power and to use the $N_2 + O_2$ decomposition product as a breathable gas. Because of the high performance, safety, and ease of handling of N_2O, it can be expected to be economically attractive to equip future spacecraft and space suits with N_2O-based thrusters and breathable-gas systems.

This work was done by Robert Zubrin, Greg Mungas, and K. Mark Caviezel of Pioneer Astronautics for Johnson Space Center. For further information, contact the JSC Innovation Partnerships Office at (281) 483-3809.

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-23707-1, volume and number of this NASA Tech Briefs *issue, and the page number.*