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Mars Ship May Also Be Crew Quarters

From: **Stig Agermose <Stig Agermose@online.pol.dk>**
Date: Tue, 1 Sep 1998 02:40:48 +0200
Fwd Date: Tue, 01 Sep 1998 07:43:43 -0400
Subject: Mars Ship May Also Be Crew Quarters

Source: AP via Popular Science magazine

http://www.popsci.com/news/08241998.mars_sleeper.html

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August 23, 12:01 EDT

Mars Ship May Also Be Crew Quarters
by Marcia Dunn

AP Aerospace Writer

SPACE CENTER, Houston (AP) - Astronauts aboard NASA's future space station may find themselves eating, sleeping, exercising and unwinding inside a balloon, rather than a can.

Space station managers expect to decide by the end of September whether to replace the aluminum cylinder that's known as the habitation module with a larger yet lighter inflatable chamber designed for Mars trips.

It's called Transhab, short for transit habitat.

This huge pop-proof balloon, folded for launch and filled with air in space, is envisioned by NASA as Home Sweet Home for astronauts journeying to and from Mars. Similar balloons sent in advance would house the crews once they land.

NASA figures if Transhab is feasible for Mars or possibly an asteroid, then why not for the international space station, due to begin soaring by year's end? And what better way to further interplanetary travel than to tack on a Mars ship to the orbiting laboratory, giving both programs a plug?

"Anything that we can do that excites people and makes it more real to them, the better the chances overall" of sending astronauts beyond Earth orbit, says Doug Cooke, head of the explorations office at Johnson Space Center.

With sufficient funding, NASA could launch a Mars expedition as early as 2012, Cooke says. The agency would be a step closer to that goal, he notes, by testing Transhab on the international space station.

If Transhab is approved for the mostly metal space station being built by Boeing, construction likely would begin at Johnson in 2001. A space shuttle would carry Transhab up in early 2004, making it the last piece of the station to fly.

It would cost about the same as the original, still-incomplete habitation module - less than $200 million - but provide three times more room, according to Transhab deputy project manager Horacio de la Fuente.

Astronauts have helped de la Fuente develop a rudimentary three-level mockup, which is on display at Johnson, and a winning floor plan.

Among the frills: Cathedral ceilings. Picture windows. Penthouse gym. Kitchenette with a table that can seat 12. Six bedrooms equipped with desks and personal computers and surrounded by a 2-inch-thick wall of water to shield against noise and surges in radiation. And, of course, storage galore.

Never mind that all this luxury would be in a balloon that would be in an Earth orbit littered with dangerous space junk.

The 1-foot-thick shell would be "bulletproof" in space, de la Fuente says. The 17 or so layers would be made of ceramic fabric, polyurethane foam, polymer film and Kevlar, a tough material used in police vests, and be better than metal.

"This is very different from a child's balloon," de la Fuente explains as he shows off samples of padding. "This is much more like a football. You can drive a nail into a football and it doesn't just pop."

Like a football, the 40-foot-long, 27-foot-diameter Transhab would have a bladder system that holds in the air. The shell encompassing Transhab would have three bladders, in fact, for redundancy.

Outside these thin-film bladders would be Kevlar webbing and then sheets of ceramic fabric, each separated by 3 inches of foam. It's this ceramic, called Nextel, that would protect against micrometeoroids and other orbital clutter zooming by at tens of thousands mph.

In ground tests, aluminum marble-sized balls fired into the Transhab padding at orbital speed were pulverized by the outer ceramic layers before reaching the air-containing bladders.

Even skeptics were impressed.

"Once they see our micrometeoroid and orbital debris shots ... they begin to realize, 'Hey, this isn't a bad thing at all,' " de la Fuente says.

"You also have to remember that the aluminum (space station) module is a balloon, too. Any pressure vessel is truly a balloon. Just because it's made out of aluminum you still get the same pressure stresses."

Indeed, when identical balls were shot at 1 1/2 -inch-thick aluminum plates, 3-inch-wide craters emerged and the shock waves ripped chunks of metal off the back of the plates.

If fired at the reinforced aluminum plates intended for the bulk of the international space station, the balls would penetrate the skin, de la Fuente says.

Even in a nightmare case like last summer's near-catastrophic collision between a Russian cargo ship and Mir, astronauts and cosmonauts would be "much safer" in Transhab because of all the protective padding, de la Fuente says.

"I would feel much safer if I was in there," he says.

Unfortunately, NASA cannot use the ultrathick Transhab padding on the conventional aluminum modules that will make up the rest of the international space station, de la Fuente says. The cylinders barely fit into the shuttle cargo bay; another foot of insulation on either side would make them too wide.

That's the beauty of Transhab, de la Fuente says.

It's relatively lightweight -- only about 26,000 pounds -- and can be folded for launch. So more of it can soar.

Astronauts would have three levels instead of one in which to spend their off-duty time, providing a homier touch as well as additional privacy. What's more, an opening between the first and second floors would create the sense of open space.

All that's missing is a color scheme.

Astronaut Andrew Thomas, who returned from a 4 1/2 -month Mir tour in June, would choose blue.

"The colors inside Mir tended to be browns and grays," Thomas says. "You need to have bright, uplifting colors rather than these dull shades."

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