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How to Put Humans on Mars by 2035

TECH WEDNESDAY

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posted: 07:00 am ET
31 October 2001

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At a meeting of space-settlement enthusiasts earlier this year at Princeton University, Kerry Nock asked for a show of hands from people who think there *won't* eventually be some sort of permanent base on Mars. No hands went up. He knew none would. This was an audience of believers.

Nock, president of Global Aerospace Corporation, was there to get them believing in his vision of a realistic way to get to Mars — not just once, but regularly — without the political baggage of nuclear power or weighty concerns over gargantuan do-it-all spacecraft.

And without any pie-in-the-sky technology.

Nock's two-way Red Planet rapid-transit system would transfer passengers from Earth to the International Space Station (ISS), then to a farther-out spaceport using swift but cramped "taxis," which would then intercept the Astrotel, a 10-passenger flying Motel 6 that never stops moving.

Global Aerospace wants to jumpstart an idea, first laid out in the early 1980s and later popularized and refined by former astronaut Buzz Aldrin, to use gravity to help propel the Astrotel. By robbing a little orbital energy from both Earth and Mars, the ever-moving craft gets a largely free ride back and forth. Similar slingshot maneuvers have been used by NASA since the 1970s to boost space probes around planets at higher speeds and onto new paths.

Nock's setup would zip you from Earth to Mars in five months.

Meanwhile, several robotic "supertankers" would make slow but regular deliveries of food and equipment. It's a build-as-you-go system touted by Nock as wasting neither time, nor energy, nor precious metal.

He paints the plan in bold but efficient strokes, contrasting it against the image of spent rockets, discarded spacecraft and assorted junk orbiting the Earth or plastered on the surfaces of Mars and the Moon over the past four decades.

In Nock's future, there's no such thing as an Earth-to-Mars vehicle. Instead, a permanent interplanetary transportation system would rely on a chain of specially designed spacecraft, each saving money because it does just one thing, and does it well. Instead of sending a few figurative wagons into the new frontier, Nock wants to send trains, laying down the rails as he goes.

TECH WEDNESDAY

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Images

One concept for an Astrotel along with a Taxi docked at one end.

He figures a sustained Mars base can be realized by 2035, using technology that would be tested and proven no later than 2010. He does not want to bank on any futuristic technology that might or might not work.

Global Aerospace's design work on the Astrotel concept has been funded by the NASA Institute for Advanced Concepts. However, before any spikes are driven on the track to Mars, Nock's company would need support from a major backer, most likely NASA. Despite attempts at shaving costs, this is still a multi-billion dollar dream. Global Aerospace could provide the plans and assist with engineering and design but another large aerospace company would be needed to do most of the major building.

All aboard!

It is the year 2037, and your trip to Mars, courtesy of Global Aerospace and partners, begins on Earth with nine other intrepid explorers. Your group represents the second human mission to Mars.

A space shuttle takes you to the now-aged ISS, 242 miles above the planet. From there, a small taxi carries you to the recently completed Earth Spaceport, which sits at a point most of the way to the Moon. This spot, called L1, where the gravity of the Earth and Moon are the same, provides the spaceport a relatively stable orbit.

The spaceport is not as impressive as in the movies — no grand spinning wheel in space. It is just a pit stop, a warehouse for supplies and a transfer station for crews. It is uninhabited most of the time, and mostly self-sufficient. Lunar ice and minerals are mined at a Moon base and transported to the spaceport, where the ice is processed into the rocket fuel that will be used on the next leg of your journey.

That leg is a 7- to 10-day ride in another taxi to intercept the Astrotel. The taxi is cramped but efficient — not unlike Hollywood's version of the Apollo 13 cockpit.

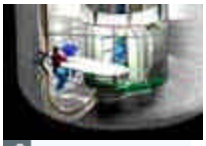
"We don't want to take anything but human beings and the life support they need to the Astrotels, because the taxis need to be very small, swift vehicles," Nock said.

The taxi docks with the Astrotel, then stays attached for the trip to Mars.

The Astrotel itself is a Spartan craft, a high-tech autonomous flying machine with budget-motel accommodations. Inside it looks very much like TransHab, a habitation module designed for the ISS but scuttled in March 2001 to help trim growing ISS costs. There is an exercise room, a dining area, and crew quarters.

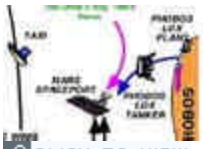
Since it never stops moving, the Astrotel does not need to be powered up at the beginning of a trip — a significant savings of fuel. In fact, it is solar powered, running on a low-output but long-running ion engine, which was proved way back at the turn of the millennium by the Deep Space 1 spacecraft.

Unlike other grand designs, the Astrotel does not attempt to create simulated gravity, something that would be required on longer flights in order to protect the health of the crew.



The inside of the Astrotel would resemble this scrapped NASA design for an ISS TransHab module

A taxi performs an aerocapture, one loop around Mars, to go into orbit



Components of Global Aerospace's rapid transit system to Mars

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"All of the comforts of home require mass," Nock explains. "And that mass occasionally has to be moved around. And *that* requires mass. And it starts to snowball, and pretty soon you have very large vehicles, huge expenditures of propellant."

Approaching the Red Planet

Five months later, as you approach Mars, the Astrotel keeps moving while you reboard the taxi, which will carry you to the Mars Spaceport, anchored above the Red Planet near the moon Phobos. The taxi uses the thin Martian atmosphere to slow itself down, an "aerocapture" maneuver that requires just one loop around Mars.

No one greets you. The Mars Spaceport also operates without a crew. And you won't stay long. You're just a few days from Mars, a short hop aboard the Mars Shuttle.

Meanwhile, slower-travelling cargo vehicles transfer food and other supplies between the spaceports.

"I think of those as the supertankers," Nock said. "They're slow, they're huge, they take a long time to go to Mars. But who cares? If you have a supertanker leaving Saudi Arabia to go to Japan, you don't care if it takes six months, as long as one is leaving every two weeks."

Similar cargo vessels run between Earth orbit and the Astrotel, keeping it stocked with food and other consumables.

Finally, at the surface of Mars, you are greeted by the 10 original settlers. At the Mars base, you find all the food and other supplies you'll need — mostly grown or manufactured on Mars. Water and oxygen are extracted from the Martian soil and atmosphere. Robots do much of the work.

Counting your travel time, the time you will stay on Mars — two to three years — and layovers at the spaceports, you'll be away from Earth for five years.

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