

Buzz Aldrin's Mars Vision: There and Back Again

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Buzz Aldrin suggests that space tourists could orbit the Earth in 'hotel' stations, perhaps with occasional opportunities to circle the moon, as well. 'The trip to Mars will be much more affordable once we've established viable tourism in low-Earth orbit.'

Cyclers would take advantage of the gravitational forces of the sun, the two planets and their moons for "gravity assists." As a spacecraft nears a planet, its flight path is bent, causing it to whip around the planet while boosting its speed. This "slingshot" trajectory enables a spacecraft to achieve the proper speed and heading.

"The cyler essentially is in orbit around the sun and makes regular flybys of Earth and Mars," said team member James Longuski, a professor of aeronautics and astronautics at Purdue.

"Once you put your vehicle into a cyler orbit, it continues on its own momentum, going back and forth between Earth and Mars. You may need to carry some propellant for an occasional boost, but it's pretty much a free trip after that," he added.

In their report to JPL, researchers said a cyler would practically fly itself and "become a permanent, man-made inner solar system companion of Earth and Mars, tapping the free and inexhaustible 'fuel supply' of gravitational forces to maintain orbit. Like an ocean liner on a regular trade route, a cyler will glide perpetually along its beautifully predictable orbit."

Eccentric Orbit

However, it is difficult to design cyler trajectories precisely, because of the complex orbital relationship between Earth and Mars as the planets travel around the sun. While the Earth orbits the sun in a nearly circular route, Mars' orbit is oblong, or elliptical.

Thus, the distance between Mars and the Earth varies dramatically depending on Mars' orbital position around the sun, complicating the design of spacecraft trajectories between the two planets.

Longuski told NewsFactor that he and his students, who are handling the trajectory issues, have looked at a variety of possible courses for the cyclers based on the synodic period of just over two years, in which Mars and Earth essentially line up.

An initial plan that called for two craft to make the round trip once per

synodic period left the cyclers passing the planets so fast that taxi vehicles would have a hard time making a rendezvous. They are now looking at three and even four synodic periods per full orbit, requiring three or four cyclers.

Three-Year Getaway

"When you increase the number of synodic periods [per single cycler orbit], you increase the number of vehicles you need," Longuski said. He said the cyclers' orbits would vary to work to astronaut's advantage.

The cycler from Earth to Mars would make that trip in about six months, but not return to Earth for another two years or more. Another cycler would have an orbit that would go from Earth to Mars in that longer arc, but cover Mars to Earth in the shorter course of six to eight months. Thus, travelers would never have to take the longer leg of the orbit.

However it works out, travelers to Mars will need a really good friend to collect their mail and turn on the porch light. "A non-stop flyby of Mars would take at least two and one-half years," Longuski said. "If they stop on Mars, they have to stay long enough for the next cycler. That will easily make a trip of more than three years."

That is why three cyclers would be needed, Aldrin said.

"These cyclers would be like space hotels," said Longuski. "They would provide the usual creature comforts."

Shelter from the Storm

The craft would rotate to create an artificial gravity that would prevent one of the major health hazards of space travel -- weightlessness.

"The major other problem, besides weightlessness -- which causes calcium loss in bones and loss of muscle tissue -- is radiation," Aldrin said.

"Once you get above the radiation belts around Earth, you experience much steadier background radiation, and there are also solar flares that can be quite intense," he explained. "You need some kind of protective storm shelter against the radiation."

Technologically, he said, it is something scientists are ready to do. While it would take years to conceive and execute a viable design, the actual ability to do so would not be a miracle.

"I don't think we need any major breakthroughs," he said. "We just need to learn to deal with reusable spacecraft and [design for] long durations in space, which we're doing somewhat with the International Space Station."

First Small Steps

Aldrin is working on getting the first stage of the cycler effort off the ground.

"We've submitted our proposal to NASA's Innovative Aeronautic Concepts (NIAC)," he said. "We're hoping for a six-month phase-one study that might begin in May."

The research efforts are ongoing. Purdue engineers are working on the interplanetary celestial mechanics of getting back and forth between Earth and Mars. Researchers at the University of Texas and MIT are helping with other critical aspects of the trip, such as getting a cycler into the proper position to begin its trip to Mars and learning how to design the taxis.

"We have to look at the configuration of those taxis and how much energy will be needed to intercept the cyclers," Aldrin said. The cyclers would pass the planets at speeds of thousands of miles per hour.

It is an enormous effort, and Longuski credits Aldrin's drive and expertise for directing it. "He's put together this team of experts from various universities, and at NASA, including a number of people from the Apollo program," he said. "Together, we're all contributing on this larger scale he's imagining." "Some day, people will be going to Mars on a regular basis," Longuski said. "Most people are convinced that we are going to do this. The only question is when."

Mars Odyssey: 2018

The first cyclers could fly around 2018, according to Aldrin. But it is a lot of work in the meantime.

"We're working on mission definition," he said. "The first mission will be more conservative, and it will have more safety supports until we are sure we know what we are doing."

What Aldrin is most surely doing is continuing with dogged determination to dedicate himself to the exploration of space -- a quest with ramifications that will extend far beyond his lunar footsteps and his life on Earth.

"Earth," Longuski noted, "is too small a place for a man like Buzz Aldrin."