

Mars500 returns

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Six volunteers have stepped back into the outside world after spending the last 18 months locked in an isolation module in Moscow to simulate the effects of a return trip to Mars.

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A Mars500 crew member walks on the simulated Mars surface.

Credit: ESA

On 3 June 2010, a six-man crew bid farewell to the world and embarked on one of the most challenging endeavours in the history of space research. Their vessel: a series of interconnected steel tubes installed within a hangar in Moscow. Their mission: simulate a 520-day round-trip to Mars, while never leaving Earth.

The would-be cosmonauts took part in Mars500, an extraordinary study of humanity's ability to cope with the travails of long-duration space travel. A collaboration between Russia's Institute for Biomedical Problems (IBMP) and the European Space Agency (ESA), the project aimed to gather data in preparation for a future real-life manned mission to Mars.

To this end, the six highly skilled volunteers, chosen from a field of several thousand applicants, were sealed inside a mock-spacecraft in a purpose built facility at the IBMP. There they undertook an uninterrupted land-based simulation of every step of a Mars expedition: travelling to the Red Planet, entering orbit, landing and returning home.

Living and working like astronauts aboard the International Space Station, the crew were almost entirely self-reliant, with only water, electricity and some air being provided from outside.

Despite having no contact with the outside world - except for a 20-minute communication lag designed to replicate the delay in an interplanetary radio link - they were under the constant scrutiny of a team of 'mission control' researchers. Ongoing assessments of each participant's physical and psychological welfare measured everything from general health and immunity, to mood and sleep quality.

Last Friday, the volunteers stepped out into the outside world after spending the last 18 months locked away in isolation. The crew showed no ill effects after emerging from the capsule, but were clearly delighted they had completed their earth-bound 'journey' to the Red Planet.

After the pressure in the capsule was equalised with the outside, a researcher broke the seal and then opened the door of the module. All six crew members, dressed in blue overalls, walked out one-by-one in good health. Looking slightly dazzled by their first encounter with other human beings for 18 months, the crew of one Chinese, one Italian, one Frenchman and three Russians lined up in a row to receive the congratulations from scientists.

"The international crew has completed the 520 day mission," said commander Alexei Sityov, one of three Russian participants in the experiment. "The programme has been fully carried out. All the crew members are in good health. We are now ready for further tests."

Italian Diego Urbina, who clenched his fists with delight as he finally stepped out of the capsule, said it had been an honour to have been involved in the programme. He said he hoped that the experiment would help humans reach "a distant but reachable planet".

The deputy head of the Russian space agency, Vitaly Davydov, said a manned voyage to Mars was being considered sometime in the mid-2030s, although he noted that humans would have to return to the Moon first. "The end of Mars-500 is not only the start of serious preparation for a real voyage to Mars," he says. "The results are going to be used in the bio-medicine sector and will be used in the national space programme up to 2030."

Controversially, the experiment did not include a woman, with researchers clearly wanting to avoid it degenerating into a scientific version of television's sexual tension-filled *Big Brother*.

Each of the participants is receiving three million rubles (around US\$100,000) for his work. Initially, the Russians were to receive less but the sum was increased once ESA revealed how much its two volunteers were being paid, Interfax said.

Here's a rundown of the components of the Mars500 experiment:

Mars surface

Connected to the Mars Lander is a fifth chamber that simulates the Martian surface. The three crew members that undertook surface operations donned authentic Orlan spacesuits before passing through the 'air-lock' for touchdown.

Mars lander

After 250 days 'travelling' through space, the craft entered simulated orbit around Mars. During this stage of the mission, three crew members were sealed off in the landing module for a 30-day stay on the 'Martian' surface. Inside the 6 x 6 m module are three bunk beds, two workstations, a toilet and a communications and data collection system.

Storage module

Split into four compartments, the 24 m long storage module houses a refrigeration unit, a food store for non-perishables, a greenhouse and a gym, bathroom and sauna. The crew's diet was identical to that used on the International Space Station, with the exception that they had access to fresh produce grown in the greenhouse.

Though mired to Earth's gravity, and without the muscle and bone-wasting effects of weightlessness, the crew still had to exercise for two hours a day to maintain physical shape in their restricted environment. Instead of a shower, they cleaned themselves once a week with wet towels in the sauna.

Medical module

The medical module is equipped with two beds, a lab and equipment for examinations. Given the autonomous nature of the mission, two physicians were included in the crew. This module doubled as the lab for scientific investigations, too.

Habitable module

While by no means luxurious, the 20 m long living quarters are an improvement on standard spacecraft lodgings. Decked out in retro wood panelling, the habitable module has a kitchen and dining room, living room, main control room, a toilet and six bedroom compartments. Personal space is at a premium, with each bedroom measuring 2.8 x 3.2 m²; enough for a bed and a desk.