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Virtual journey to Mars to begin on 31 March 2009

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Ready to board: German Mars500 crew member Oliver Knickel

Germany is prominently involved in the 'Mars500' isolation study in Moscow

The isolation study 'Mars500' focuses on the question how human beings can stay physically and psychologically fit in the extreme conditions of a journey to Mars. On 31 March 2009, the very ambitious isolation experiment will start at the Institute for Biomedical Problems (IBMP) of the Russian Academy of Sciences. Six people will be shut inside an isolation chamber for a period of 105 days, in order to train for some aspects of a simulated journey to Mars. Together with IBMP and the European Space Agency (ESA), the German Aerospace Agency (Deutsches Zentrum für Luft- und Raumfahrt; DLR) is participating in the 'Mars500' study by providing a number of experiments as well as financial support. In addition to four Russians and a Frenchman, the crew includes Oliver Knickel, a 28-year old German Bundeswehr officer from Eschweiler, near Aachen.

The conditions created for 'Mars500' constitute a unique test environment. The merits of a portable gas sensor system for detecting microbiological contamination, also known as an electronic nose, will be demonstrated for the first time. The research centres that are in charge of this part of the project - IBMP, DLR and UFT (the Centre for Environmental Research and Sustainable Technology of the University of Bremen) aim to qualify the device for use in the Russian segment of the International Space Station (ISS). Inside the Russian space station MIR, a predecessor of the ISS, scientists have found numerous and in some cases mutant species of bacteria and fungi. Most of these were found on cold surfaces and in the proximity of condensation. They caused extensive damage to glass, cables and plastic parts. Especially during a longer mission, for instance to Mars, uncontrolled growth of such cultures could pose a serious threat. The electronic nose, developed by the Airsense Analytics company with financial support from DLR, could help solve this problem – it is capable of learning to recognise different smells, yielding objective results within a matter of minutes.

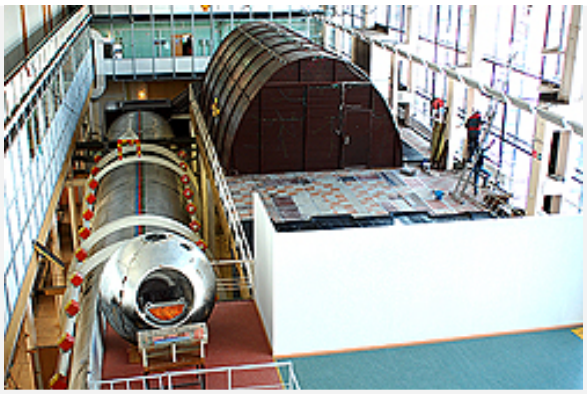
Test subject Cyrille Fournier gets acquainted with the human physiological experiments

The human organism is also a vitally important factor in human spaceflight missions. For this reason, it is the object of a separate 'Mars500' experiment. The food intake and metabolism of the test subjects will be meticulously monitored and documented. Scientists from the Friedrich Alexander University of Erlangen-Nuremberg will investigate the salt and water homeostasis in the human body over a longer period of time. This will be complemented by other experiments that are concerned with issues such as the influence of salt intake on blood pressure in relation to stress and workload. The new insights that these experiments are expected to generate in the field of space medicine will also benefit patients on Earth. Scientists from DLR in Cologne and Hamburg and from the German Sport University in Cologne are taking part in this research as well as in investigations of bone metabolism during periods of restricted activity and psychophysiological fitness in extreme conditions. The effects of stress on the immune system will be thoroughly investigated by physicians from the Ludwig Maximilian University in Munich.

Distance to target: at least 56 million kilometres

The distance between Earth and the Red Planet fluctuates between 56 and about 400 million kilometres. Even if the two planets are favourably aligned, a return journey would take about 500 days in total, excluding a one-month stay on the Red Planet itself for conducting research.

Such a human spaceflight mission, which could become a reality in about twenty to thirty years, places extremely high demands on the crew. Apart from long microgravity and short hypergravity phases and the influence of cosmic radiation, which is not being investigated in the context of the Mars500 mission, the loss of visual contact with Earth must be compensated for and vital decisions will need to be taken autonomously due to delayed radio communication with the ground. In addition to this, astronauts should also be able to service the technical systems of their spacecraft without deliveries of additional equipment.



Mars500 isolation chamber in Moscow

Only three square metres of private space

The isolation chamber that will be home to six people from 31 March onwards is a tube-shaped modular system containing 180 square metres of living and working space. In addition to this, there are cold storage and freezer units for food, most of which is provided by German suppliers, as well as a small quarantine station. The air pressure and gravity field are normal. Every test subject has a cabin with three square metres of floor space at his disposal, which also accommodates a narrow bed. Radio traffic

to and from the 'ground station' takes place with a 40-minute delay. The participants are also allowed to send e-mails and video messages.

Twelve participants – the six members of the container crew and a backup team of the same size that also acts as the ground crew – will practice all essential procedures right up to the start of the experiment. The final medical and psychological checks will be carried out in parallel.

The members of the container crew are:

1. Oliver Knickel, Germany
2. Cyrille Fournier, France
3. Sergey Ryazanskiy, Russia
4. Aleksey Baranov, Russia
5. Aleksey Shpakov, Russia
6. Oleg Artemiev, Russia

On the European side, the Frenchmen Cedric Mabilotte and Arc'hanmael Gaillard act as backup and ground team members.

Logo of the 'Mars500' isolation study

The second round of the experiment, which will cover a period of 520 days as a realistic simulation of an actual mission to Mars, including a stay on the planet's surface, is expected to start in December 2009. A Mars lander and a virtual Martian surface are currently being built especially for this purpose.

DLR is the national aerospace research centre of the Federal Republic of Germany. It is engaged in a wide range of research and development projects in national and international partnerships, covering the fields of aeronautics, space, transportation and energy. In addition to conducting its own research projects, DLR also acts as the German Space Agency. As such, it is responsible for planning and implementing the German space programme on behalf of the German federal government, and for advancing German interests on the international scene. DLR serves as the umbrella organisation for the largest project management agencies in Germany.

The Institute of Biomedical Problems of the Russian Academy of Science is Russia's lead agency in fundamental research in space biology and medicine, biomedical support for piloted space missions, development of methods and means ensuring safety and effective functioning of space crews, and of maintaining human health and performance in extreme conditions. The IBMP includes research divisions, the Chief Designer's facility and auxiliary departments and services. The institute has unique benchmark testing facilities.

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