



CALL FOR MARS500 CANDIDATES

Within the framework of the Mars500 programme, the European Space Agency (ESA) initiates a call for candidates to participate in up to three isolation and confinement studies. ESA is looking for 2 European candidates and 2 back-up candidates per study. The first in a series of isolation and confinement studies will commence in the timeframe May-July 2008. Serious applicants are asked to fill out an application form, which can be obtained by download from:

www.spaceflight.esa.int/callforcandidates

ESA has started an ambitious exploration programme, in which a series of activities are taking place - ranging from a robotic outpost on Mars to ground-based preparatory studies for a human mission to Mars by about 2030.

From a human point of view, such a long-duration spaceflight mission will be characterized by isolation (separation from the normal or daily physical and social environment) and confinement (restriction within a highly limited and sharply demarcated physical and social environment). This environment may be expected to pose challenges related to human performance and well-being, for example due to crowding, lack of privacy, high workload, mechanical breakdowns, boredom with available food and limited communication with mission control, family and friends. Acquiring knowledge on those psychological and also on medical aspects is a fundamental part of preparing for a manned mission to Mars. Ground-based isolation and confinement studies, in which participants are separated from the outside world, provide a relevant, analogous environment for learning how to manage the human aspects of complex, long-duration missions.

ESA has gained already significant expertise in isolation and confinement studies in the past, such as in the 30 day Isolation Study for European Manned Space Infrastructures (ISEMSI) in 1990, in the 60 day Experimental campaign for European Manned Space Infrastructures

(EXEMSI) in 1992 and in the HUBES (Human Behaviour in Extended Spaceflight) study in 1994, in which the mission duration and the crew number, as well as many others organizational and operational aspects were modelled after the EuroMIR-95 mission.



Artist's impression of a human mission to Mars.
Credits: ESA

Currently ESA is preparing for its participation in the Mars500 programme initiated by the Institute of Biomedical Problems (IBMP) in Moscow, Russia in order to expand knowledge of human psychological, medical and physical capabilities and limitations in space through fundamental and operational research. In this programme it is foreseen to organize a Mars mission simulation of approximately 500 days, involving an international crew of 6 who will live and work in hermetically sealed modules at the

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IBMP facility in Moscow (Figure 1). Before proceeding with the simulation of 500 days, up to two pilot studies of approximately 100 days are planned to be performed.

During those studies, an experimental programme will be performed, which will consist of several different scientific, mainly medical and psychological, studies, which are selected following a review by independent experts.

Except for weightlessness and radiation, the simulations will be as close to a real Mars mission as possible and therefore the following characteristics will apply:

- The crew will follow a programme designed to simulate travel to Mars (250 days), a 30 day Mars surface exploration phase and travel back (240 days).
- They will live and work in a facility in Moscow, which has been specifically designed for the needs of these simulations. The facility (total surface area: approximately 200m²) comprises:

- a medical module: it will accommodate up to 2 crewmembers in case of illness, and has equipment for routine medical and laboratory investigations
- living quarters with 6 individual compartments (each room approx. 3m²), a kitchen-dining room, living room and a toilet
- a Mars landing module, which will only be used during the 30 day Mars orbiting phase and
- a storage module containing food supplies, an experimental greenhouse, sauna and gym

- Nutrition and hygiene of the crewmembers will be comparable to that on-board the International Space Station, i.e. food will be predefined and carefully rationed, there will be no shower, and water supply will be limited. Smoking and consumption of alcoholic beverages will not be allowed.

- The crew will largely be autonomous, which will be expressed in independent decision-making, control of the environmental situation and of consumable resources, to name a few.
- A signal passage delay of up to 20 minutes one-way during communication of the crew and the ground-based control center will be gradually built in with the aim of simulating a real interplanetary mission. Additionally, private communication to family and friends will be limited comparable to a spaceflight situation.

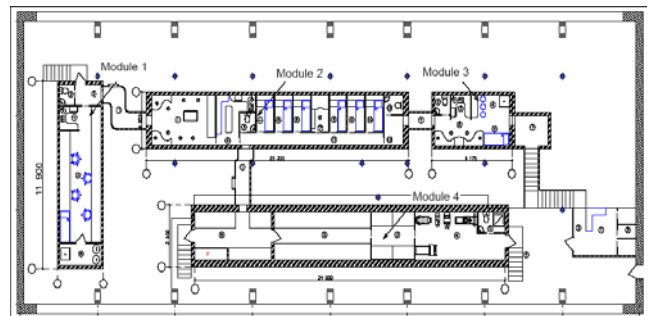


Fig.1: Module 1: Medical module, Module 2: Living quarters, Module 3: Mars landing module, Module 4: Storage module

- The daily routine will be similar to the schedule of crews in orbital flights (7 day week with two days off) and will consist of 8 hours of work, 8 hours of leisure time and 8 hours of sleep per day. In addition all crewmembers will operate on night-shifts for one week each, in rotation.
- During work time the crew will conduct scientific experiments, perform physical exercise (1hour per day), as well as tasks related to maintenance of the facility, life support system control and maintenance, skill maintenance and learning, sanitary and hygienic procedures, etc.
- The scientific experiments may involve invasive medical procedures, for example blood draws, urine and saliva samples, for which the crewmembers will be test subjects.

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- In addition to the daily routine, off-nominal and emergency situations will be simulated, for example sickness or failures of on-board systems and equipment.
- During “Mars surface operations” the crew will be divided into two groups of three people each. Once the first group of crewmembers has moved to the Martian surface, the hatch between the Martian simulation module and the rest of the facility will be closed for the entire duration of the Mars surface stay simulation.
- Prior to the isolation and confinement studies, the crewmembers will undergo a training programme, in which they will familiarize themselves with the habitat and the equipment and procedures they will be expected to use and perform during the simulation.
- After completion of the isolation period, the crewmembers will be expected to participate in follow-up studies for up to one year after the simulation, as part of the scientific experimental programme.



Artist's impression - human mission to Mars
(Credits: ESA)

The candidates will be selected based on education, professional experience, medical fitness and social habits. Following a positive pre-selection assessment, potential candidates will have to submit results from medical tests and will then be invited for an interview, during which they will be screened in a process similar to that currently used in astronaut selection. Accepted candidates will have the opportunity to pose any question they may have concerning the Mars500 programme,

before agreeing to sign an information, treatment and participation consent form. Volunteers are free to discontinue their participation at any time for any reason, without personal or professional consequences; however, due to the effort and expense required for such an undertaking, one goal of the psychological evaluation during the selection process is to select those candidates, who are likely to cope with the challenges of the study until completion.



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The main selection criteria are as follows:

- Aged 25-50 years
- Good health
- High motivation
- Height up to 185cm
- Background and work experience in one of the following fields: medicine, biology, life support systems engineering, computer engineering, electronic engineering, mechanical engineering
- The working languages during the studies will be English and Russian, therefore fluency in one and working knowledge of the other language is highly desired.
- Availability for the whole duration of the study
- Non-smoker, no addictions (alcohol, illicit drugs, etc.)
- Candidates must be willing to volunteer for medical and psychological investigations.
- The candidate's nationality and residence is restricted to ESA member states participating in the ELIPS and/or Aurora core programs (Austria, Belgium, Switzerland, Germany, Denmark, Spain, France, Greece, Italy, Ireland, Norway, The Netherlands, Portugal, Sweden, United Kingdom or Canada).

The main exclusion criteria are as follows:

- Refusal to participate in medical and psychological experiments
- Relevant medical disorders
- Personal or family history of psychological disturbance or disease, which could adversely affect data or increase risk to the subject during the study
- Body Mass Index below 20 or above 28
- Need for special diet
- Refusal to give permission for general practitioner to be informed of participation in the trial
- Imprisoned persons
- Inadequate language skills

Reimbursement: For successful completion of the entire study including training before and follow-up after the isolation, the respective volunteer will receive a fixed compensation that is in line with international standards for participation in clinical studies.

**Serious applicants are asked to fill out the application form,
which can be obtained by download from:
www.spaceflight.esa.int/callforcandidates**

**The completed and signed application form should be sent to:
Mars500@esa.int**

**Submission deadline:
September 30th, 2007**