

SPACE LIFE SCIENCES SYMPOSIUM (A1)

The International Space Station in LEO and the Deep Space Habitat in Cis Lunar Space as platforms for simulated Mars voyages (4)

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INTEGRATED SIMULATIONS OF MARS FLIGHTS ON THE ISS

Abstract

The ISS is the most valuable existent integrated analogue for deep space exploration. For specific aspects other ground based analogues may provide better solutions, however, ISS is the only "integrated" analogue, where the impact of microgravity, radiation, living and psychological conditions that astronauts will face during a deep space cruise, can be mimicked at the same time, in part or in full. It is therefore conceivable to use the ISS as test bed for final integrated space tests for many of the individual scientific/technological solutions needed to allow for deep space voyages. These tests would optimize synergies in the operations based on those solutions, exploiting the values of each 'single' result. As individual issues are solved these can provide more and more "complete" tests, where a larger number of solutions are integrated in a single flight simulation. This might lead to a real 'dry-run' of a deep space mission (such as a mission to Mars), as close as reasonably possible to what will be the real voyage. This Mars ISS dry run could last several hundred days, mimicking most of the challenges which will be undertaken such as length, isolation, food provision, decision making, time delays, health monitoring diagnostic and therapeutic actions and more: not a collection of "single experiments", but a complete exploration simulation where all the pieces will come together for the first in space simulated Mars voyage (ISS4Mars). The results would provide essential information to best design more advanced tests on the planned Deep Space Habitat in cis-Lunar space. Science and technological challenges to enable deep space exploration are being solved by dedicated works. ISS4Mars would help in focusing these investigations on exploration, providing a last step for an integrated operational validation. In ISS4Mars all the different aspects of the voyage would be simulated. In principle i) The arrivals/departure of spacecrafts will not affect in any way the crew involved in the simulation; 2) Proper communications delay with ground will be simulated; 3) Decision processes will migrate from Ground to ISS; 4) If feasible, part of the permanence on Mars will be simulated. This talk will describe some important scientific issues still open (see for example the disciplinary reports of the THESEUS project), as well as give some examples of the challenging tests and simulations that could be performed, including some of the relevant operational issues.