

DESIGN OF A MARS POLAR RESEARCH BASE WITH A CRANE SYSTEM

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The ice from the Martian North Pole is estimated to contain information on the formation of Mars, its climate and is also a great candidate for searching for extra-terrestrial life traces in the Solar System. Despite this, its secrets are yet to be unveiled by mankind. To do so, ice samples must be extracted by drilling and analyzed in-situ. Additionally, the Northern polar regions of Mars also hold the potential to harbor human life, as the polar cap constitutes a water reservoir. Therefore, proposing a crewed mission to the Mars North Pole would greatly advance the resolution of sub-objectives in all main goals set for the exploration of Mars by NASA in 2015. But how could such a mission be executed and what could the base be like?

This talk proposes to look at the design of a mission scenario and base with high technology readiness level that could sustain a crew of six near the North Pole of Mars, during Martian summer. It allows the crew to drill for and analyze ice samples in a laboratory located on the planet. The possibilities offered by in-situ available resources and the selection of a strategy for constructing the base, life support system and in-situ propellant production will be discussed. Furthermore, all design steps necessary to guarantee the security and successful operation of the mission will also be presented.

In the conclusion, the key technologies that still need to be developed in order to allow for humans to wander to Mars are presented, along with a proposition to include several experiments in a first generation crewed mission on Mars to facilitate a long-term presence of humans on the planet.

Furthermore, as a consequence of the requirements identified during the design of the mission, it has become apparent that a crane system for transfer between Mars' orbit and surface is required and could even benefit other crewed or robotic missions. Therefore, a concept for a Mars crane system is also presented in this talk.

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