

HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM (A5)
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Points and NEO's (4-D2.8)

Author: Prof. Jean-Marc Salotti
Laboratoire de l'Intégration du Matériau au Système, France, jean-marc.salotti@ensc.fr

Mr. Richard Heidmann
Planete Mars, (*country is not specified*), RHeidmann@aol.com

REALISTIC ROADMAP FOR THE FIRST HUMAN MISSION TO MARS

Abstract

New scenarios for human missions to Mars have been recently proposed [1]. An important recommendation is the reduction of the size of the space vehicles in order to simplify the entry, descent and landing phase (EDL) [1]. These new concepts suggest the redefinition of the roadmap that will pave the way to the first human mission. Two important steps are proposed: - If a single launch by a heavy launcher is sufficient to send one of the vehicles of the scenario, a logical step of the roadmap is to undertake a robotic mission with a vehicle of the same shape and mass in order to test and qualify the interplanetary vehicle and the EDL systems, which are key issues of the manned mission. The best option for a heavy robotic mission is a Mars sample return (MSR). Advantageously, the production of propellant using in situ resources and the launch from the Martian surface might also be tested. Several concepts for a MSR mission have already been proposed. This new concept, however, is more oriented towards the preparation of the first human mission, which will have to be designed first. The total mass of the lander will be around 33 tons (TBD) with a payload mass about half of it. A lighter lander could be sufficient but the objective is to qualify the EDL systems of the human mission. - The second objective of the roadmap is to qualify the habitable module of the Mars mission for a three years journey in full autonomy. The test can be performed in high Earth orbit with the rotation of several crews. It is proposed to send two habitable modules that can rotate around each other in order to provide a kind of artificial gravity and to test the living conditions in an analog of the Martian habitat. [1] J.M. Salotti, Revised Scenario for Human Missions to Mars, Acta Astronautica, vol. 81, p. 273-287, 2012.