Paper ID: 20128
oral
student

SPACE PROPULSION SYMPOSIUM (C4)
New Missions Enabled by New Propulsion Technology and Systems (6)

Author: Ms. Vibha Vibha
International Space University (ISU), India

IN-SITU RESOURCE UTILIZATION ON MARS FOR HUMAN SPACEFLIGHT TO GENERATE FUEL FOR A NUCLEAR THERMAL PROPULSION SYSTEM

Abstract

The next giant leap in the history of the Human Space Race will be the Manned Mission to Mars. The asset of the mission is the CREW, the HUMANS on board who should be brought back to Earth safely in a module termed the Earth Return Vehicle (ERV). The success of the mission depends upon the performance of this vehicle and also on the linking up of the ERV with the other modules of the mission. The propulsion to be used for the return journey is the Nuclear Thermal Propulsion system. This paper focuses on the feasibility of using in-situ resources available on Mars to produce the working fluid, in particular, liquid Hydrogen for the nuclear propulsion system. It is based on the fact that water in the form of ice is found at the poles of Mars. The paper would focus on the feasibility of using the water in the form of ice to extract Hydrogen and Oxygen by electrolysis. The temperature at the Martian poles during the winter season goes down to approximately -125 degrees Celsius. This can impact and enhance the further processing for liquefaction and storage of the extracted Hydrogen and Oxygen. The behaviour of different tank materials needed to store the cryogenic fuel on the Martian surface will be analyzed. The extracted liquid Oxygen would be used as an afterburner fuel which increases the thrust of the engine. If the results show that extracting Hydrogen and Oxygen from the ice would not be appreciable, the analysis would then focus on extracting Oxygen from the abundant Carbon dioxide present in the Martian atmosphere.