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Author: Mr. Heet Naik
University of Mumbai, India, heetnaik@gmail.com

UTILIZATION OF RESOURCES FROM CERES AND ASTEROIDS FOR INNER SOLAR SYSTEM EXPLORATION

Abstract

Once we start colonizing Mars or any other world, we will experience need of basic survival materials such as water, materials for structure and materials for power generation. It might be possible that we do not find those materials on Mars and In-situ resource utilization might not be possible for some applications. It will be in-efficient to send raw materials from Earth all the way to Mars, which might take half-a-year. Instead, we should utilize resources from the asteroid belt giant, the dwarf planet Ceres. It is an ocean world and contains water mixed with clay and salts. It is said that Ceres is 25% water and if it's true, it has more freshwater than Earth itself. We can harness water from Ceres instead of Earth and satisfy our needs. There is enough water available on Ceres to satisfy the needs of a colony on it and still export water to mars or even moon, which will be efficient when compared to sending water from earth. This not only solves survival problems on Mars, Moon and Ceres itself but also solves transportation problem related to rare availability of fuel outside Earth. Since, Ceres is situated in the asteroid belt, other resource utilization such as metals and minerals can be solved by exploring these asteroids. Metallic asteroids contain metals such as Nickel, iron also rare metals such as gold, platinum, rhodium, palladium, etc. There are silicate and carbonaceous types of asteroids too and can be mined according to the requirement. This paper includes study on Method of transportation of extracted resources, detection of potential sites on Ceres and asteroids where required materials might be found, types of resources which can be availed, equipment and processes required to mine and extract resources as well as economic advantage of this method of resource utilization for the best overall efficiency of the mission.