Paper ID: 63729
student

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Space Exploration Overview (1)

Author: Ms. Minal Jain
University of Bremen, Germany

Mr. Darshan Gohil
University of Bremen, Germany
Mr. Ahmed Elghareeb
University of Bremen, Germany

PROPELLANT DEPOTS FOR SPACE EXPLORATION.

Abstract

The fundamental urge to explore has led humankind to step on the Moon and present-day aiming to land on Mars and beyond. This desire to explore comes with innumerable challenges. The high value of propellant mass fraction at every stage has a profound effect on any space mission. An alternate source to ensure a continuous supply of propellants could harbor long-term missions. Hence, the propellant depot can turn out to be a significant element in large-scale manned spaceflight. This paper presents a comprehensive background and spadework in the last few years on the concept of the propellant depot, moving towards the recent developments with arguments on a suitable location for the depot, challenges encountered with long term propellant storage in microgravity conditions, and possible solutions to alleviate the same. Furthermore, ideas for future exploration and technological developments are also addressed to make propellant depot a functional reality. The study suggests that refueling in orbit from propellant depot can reduce the total lift-off mass at the time of launch and can generate the option to use lighter launch vehicles from the Earth. The partial/fractional filling of the propellant tanks for upper stages can create opportunities for increased payload capacity. A propellant depot would serve as a viable option to foster long-term crewed space flights in the current scenario.

Keywords: delta-v, depot, microgravity, propellant, refueling.