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MULTI-CRITERIA ANALYSIS OF THE LOCATION OF A LUNAR PROPELLANT DEPOT: ORBIT VS SURFACE

Abstract

Recent evidences of water ice deposits on the lunar poles foster the idea of in situ propellant production. Lunar propellant depots are therefore being actively considered in various mission architectures to enhance capabilities and reduce reliance from Earth commodities. This paper provides a preliminary multi-criteria analysis (weighted trade-off matrix) in order to assess what would be the most suitable location for a lunar propellant depot: in orbit, or on the surface. Specifically, the considered locations are either a depot in halo orbit around Earth-Moon Lagrange point 2 or a depot located at the rim of polar craters. The assessed criteria include costs, strategic position for exploration, risks, operations, and technological benefits. Weights, scoring rules, and justifications are largely discussed. The trade-off result shows a total score of 83