SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2) Future Space Transportation Systems (4)

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REUSABLE SOLAR ELECTRIC PROPULSION (SEP) TUGS AS PART OF A CIS-LUNAR EXPLORATION ARCHITECTURE

Abstract

Solar Electric Propulsion (SEP) technology has become an important aspect of today's GEO communication satellite market. Nearly all of the major geosynchronous spacecraft providers have adopted SEP as the primary propulsion technology for orbit raising and station-keeping. The increased efficiency of SEP reduces the overall propellant required to place a payload into orbit. This efficiency also has benefits for many of the proposed Human space exploration architectures being defined by NASA and the international exploration community. Although the majority of the current SEP analysis for exploration has been focused on Mars campaigns, this paper will address the applications and benefits of SEP for cislunar campaigns including proving ground technology demonstration missions and in-space transportation systems.

Our analysis will examine the primary parameters of a typical SEP tug system designed for cis-lunar exploration campaigns including power level, ISP, and propellant type. Key SEP application variables will also be examined including mission design, trip duration, reusability, logistics (manifest size and content) and extensibility. The effect on total architecture cost (both non-recurring and sustaining) will also be addressed, including launch vehicle size, flight rate, and orbit dynamics.