

SPACE SYSTEMS SYMPOSIUM (D1)
Innovative and Visionary Space Systems Concepts (1)

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AN ASSESSMENT OF LUNAR SETTLEMENT REQUIREMENTS AND TRANSPORTATION
OPTIONS

Abstract

The Moon will be a key destination in the commercialization and settlement of space. Despite this and over fifty years of human spaceflight, only twelve people have ever reached the lunar surface. In recent years, however, there has been renewed international civil agency and commercial interest in cis-lunar space, with entities proposing lunar-surface-based manufacturing, tourism, propellant/energy production, mining, and scientific research. Establishing a permanent presence on the Moon to support these activities will require having hundreds of people on the surface, and the ability to send large numbers of humans to the lunar surface will become critical.

This paper presents the results of an assessment of lunar settlement requirements and transportation options. The study had two goals: (1) to establish the requirements for lunar settlements, supporting the aforementioned government and commercial activities, in terms of number of people necessary and cargo demand; and (2) to consider the design space of solutions for transportation systems that can meet these requirements. In particular, innovative approaches that can achieve these goals will be showcased.

For the transportation systems, several architecture-level trades are considered. Low-thrust, long-duration mission profiles using electric propulsion are compared against high-thrust, short-duration mission profiles using chemical propulsion. In-space rendezvous using Low Lunar Orbit, Earth-Moon Lagrange-points, or Distant Retrograde Orbits is also addressed. Additionally, specific requirements, challenges, and solutions for transporting human crews are discussed.