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SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and Development (1)

Author: Mr. Charles Radley
Leeward Space Foundation, United States

Mr. Thomas Marshall Eubanks
LiftPort, United States

COMMERCIAL LUNAR MINING ENABLED BY LUNAR ELEVATOR

Abstract

The Earth's Moon is a treasure trove of mineral resources, such as precious metals, rare earth elements, Helium-3 and Oxygen for propellants. However, the cost of soft landing on the Moon is currently very high. Using modern fibers we can build a lunar elevator which reduces the cost of lunar landing sixfold. Furthermore, the cost of lunar sample return is reduced by about one thousand times versus chemical rockets. For soft landing payloads, the LSE pays for itself in 20 payload cycles; for sample return it can pay for itself in as little as one payload cycle.

The lunar elevator concept is a long tether which is loaded under tension by terrestrial and lunar gravity. One end is anchored on the Moon and the other end free, hanging towards Earth. The orbital center of mass of the system is located at an Earth-Moon Lagrange location, either L1 or L2, approximately 50,000 kilometres from the lunar surface. Such a tether can now be built inexpensively from commercially available materials.

A lunar elevator can now be built for under $1B. This prototype will softly deliver an infinite number of payloads to the lunar

A lunar elevator is far cheaper than electromagnetic mass drivers. The lunar elevator eliminates the delta-vee advantage of near Earth asteroids. Everything you find in asteroids is available in lunar regolith at somewhat lower concentrations.

Helium-3 today sells for a million dollars per ounce on the secondary market, demand far exceeds supply. It is abundant on the Moon but rare on Earth. US supplies are rationed and will be exhausted by 2030. This is nothing to do with nuclear fusion energy.

Lunar rocks [meteorites] today sell for about $200,000 per kg$.

Rare Earth Elements (REEs) are vital to defense and high technology industries, today 96

Use of lunar oxygen would reduce the cost of geosynchronous spacecraft launch by about 7 times.

A lunar elevator could return lunar material to Earth and generate sufficient commodity revenues to amortize the capital cost over reasonable period of time, and then operate the system at a net profit. The lunar elevator could reduce the cost of lunar mining of such commodities to a par with terrestrial mining.