Paper ID: 60465
student

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Virtual Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (VP)

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MOON-TRAM, OR ESCAPE VELOCITY WITHOUT FOSSIL ROCKET PROPELLANT ?

Abstract

The advance of future Moon exploration will be defined by humanitarian and econimical factors. A spacecraft may either be manned or unmanned, but in all cases may be used for placing payloads, such as crew or mineral resources, for example, in Lunar orbit, all wich required fuel and oxidizer.

Considering the risks and estimated costs of the propellant transportation from Earth to Moon, or even the possibility of propellant production from the limited mineral resources (ISRU) and storage on the Lunar surface, can be concluded that an alternative must be found for the future.

A spacecraft may be launched into outer space from lunar surface, using electrodynamic or electromagnetic suspension methods. By developing a lunar tube formed launch system, with its entry side based in a Moon surface crater and an outlet at altitude, a spacecraft can be propelled to achieve escape velocity, minimizing or even eliminating the need for rocket propulsion.

MoonTram is a new concept for launching heavy payloads into Lunar orbit at much lower cost and much greater volume than presently possible. This study focuses on a multidisciplinary approach of the topic and provides an analysis starting from exact Moon surface site based on geographical and topological properties, continues considering aspects of physics. Moreover, it examines working principles and material structures, and provides concrete calculations.

The MoonTram design is based on existing materials, superconductors and cryogenics, and appears technically and economically feasible. It incorporates large safety margins and multiple redundancy for reliability and the avoidance of single point failures.