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AN ANALYSIS INTO THE FEASIBILITY OF A LUNAR BASED QUENCH GUN LAUNCH SYSTEM FOR LUNAR-MARTIAN PAYLOADS.

Abstract

Spaceflight has traditionally used reaction engines to power and propel payloads within a space and launch environment. This paper analyses another launch option; the utilisation of a superconducting coil gun, a quench gun, located on the Lunar surface. This quench gun based launch system would be designed to send payloads on interplanetary missions, with a large focus on Lunar-Maritan trajectories. The system is proposed to be located on the Lunar surface for 2 primary reasons: The lack of atmosphere enables payloads to be accelerated and launched at interplanetary velocities from the Lunar surface, and the relatively fast orbit of the Moon around the Earth would enable the use of Earth slingshot maneuvers regularly. The high velocities generated by the proposed launch system would enable direct trajectories between the Lunar surface and Maritan orbit, enabling missions to be sent easily and readily. This, combined with the vision of a manufacturing hub on the Lunar surface, could be used to cheaply and reliably sustain a Martian colony without costly launch vehicles from Earth.

A primary detriment of traditional launch vehicles is the struggle with re-usability, even with modern technology. This drives up launch costs dramatically, increasing the cost of planned missions. With the Lunar quench gun system, a permanent base can be established, albeit at great initial cost. This will however, dramatically lower the costs of launches and thus interplanetary missions. Furthermore, rather than weekly or yearly launches, hourly launches can be utilised, given the correct transfer window, allowing for greater, more elaborate missions to be planned.

This paper aims to prove the feasibility of this idea. This will be done by initially demonstrating possible mission trajectories to Mars and then elaborating on the delta-V requirements of each launch window. From these delta-V requirements, the scale of the quench gun can be decided, as well as design requirements. We can then determine what the Lunar base will require to support this operation.