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LUNAR ELEVATOR - PAYLOAD TRANSFER ON EARTHBOUND FLOW

Abstract

The weight of the heat shield for Earth atmosphere entry is rather heavy, but such hardware is needed for lunar sample return. However, it is inefficient and expensive to soft land this equipment on to the lunar surface. It would be more efficient to store the heat shield at the Earth-Moon L1 lagrange location.

This can be done in conjunction with a lunar elevator tether system. Samples from the lunar surface are collected via a lunar elevator. The tether climber leaves the lunar surface and moves earthwards reaching a cruise speed of about 700 m/sc. In order to maintain maximum payload throughput over time we need to maintain the velocity and not slow down. The climber needs to rendezvous and connect with the heat shield with a smaller closing velocity to avoid damage or destruction. Hence we must start the heat shield moving earthwards at a few hundred metres per second, with a small enough velocity that the climber can catch up with it in a reasonable time, but large enough to avoid destructive impact.

We will need to analyze various velocity profile of the heat shield module, and the starting time of the acceleration.

The collision between the climber and the heat shield is softened by shock absorbers and the payload is then connected to the heat shield by latches. The climber then separates from the payload and decelerates to a stop. The heat shield with payload are released from the tether and fall ballistically to Earth where they enter the atmosphere and are recovered.

The climber returns to the EML1 location (or other point along the tether) where it is loaded with a new payload which it then transports to the lunar surface.

This cycle is then repeated an arbitrary number of times.