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PLANETARY LANDER FOR YIELDING EXPLORATION AND RANGING (PLAYER) - CONCEPT FOR A REUSABLE LUNAR LANDER FOR SHUTTLING PAYLOADS WITHIN CIS-LUNAR SPACE

Abstract

A new concept for a medium-sized, up-scalable lunar lander is presented here, keeping in mind-reusablilty and resilience against lunar regolith for the purpose of achieving multiple surface missions. Powered by a relatively moderate sized restartable 1000N engine, it is designed keeping in mind to reduce the overall man-made surface leftover debris on the Moon after every landing mission is completed. With the possibility of relighting the engine with sufficient amount of dedicated fuel reserves, the PLAYER or Planetary Lander for Yielding Exploration and Ranging can be relaunched from the surface to get back into the lunar orbit.

This unique selling proposition of the lander specially enables it to conduct sample-return missions as well to shuttle payloads between the low Earth orbit to the lunar surface, hence acting like a taxi-service. However, given the limitation of the onboard liquid fuel, on-orbit refuelling and regular test fires are required for its continued usage. In paper, such trade-offs are thoroughly investigated and a comprehensive study is thereby presented.

The lander also houses four spherocylindrical (capsule-shaped) liquid fuel tanks and carefully calibrated interior space for dual ramp deployment on the surface. This is especially done in order to deploy multiple rovers/payloads as means of redundancy. The four retractable landing legs too are developed after carefully simulating the various truss component forces that act during the various phases of descent and touchdown. The power budgets of the craft are evaluated based upon the standard values of sunlight received on the Moon per square metre per hour, while the mass budget is calculated keeping in mind a 10 percent margin of the maximum payload lift capacity.

Based upon these various aspects of PLAYER, a holistic report is thereby presented in the paper, complete with the CAD diagrams and mission progress algorithms. And under the fairly optimistic results currently available during the study, we feel the prospect for such a lander looks promising. And we hope such a system of multiple landers comes to be more widely used in the coming Moon rush of the future, for the reason of leaving behind lesser debris of unusable landers on the Moon.