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MISSION SCENARIOS UTILIZING LOTUS: LANDER/ORBITER TRANS-UPPER STAGE

Abstract

Mars is humanity's next destination according to the ISECG (International Space Exploration Coordination Group), NASA and numerous other national space agencies. The path to the red planet includes Earth's moon and nearby asteroids as essential stepping-stones. In the past few years, the space program, government and private, has realized an unprecedented number of missions to the outer planets and asteroid belt as well. These exiting destinations crescendo alongside a resurgence in launch vehicle performance. The SLS Block 1B, New Glenn, Heart of Gold and other massive rockets boast incredible lift performance in some cases exceeding even the renowned Saturn V. This renaissance in space exploration and launch capacity converge at a time when ridesharing has become acceptable. SpaceX via Spaceflight Industries now offer launch services rather than a launch vehicle and other vehicles are likely to follow as smaller spacecraft boast larger budgets. Space Systems Loral now sells deployment services for satellites located within their 1300 structure. Companies such as OneWeb, Terra Bella and Planet are basing their business models on small satellites. However, despite this progress secondary payloads remain challenged by the limited destinations and the risk-averse, schedule-bound nature of the primary payload. With the launch window and final orbit limited by its host payload, capabilities of secondaries are drastically limited by propulsion demands.

LOTUS is a propulsive secondary ring leveraging high Isp bi-propellant coupled with High Power Solar Electric Propulsion (HP-SEP). Such a platform will enable a surge in exploration possibilities while offering realistic capabilities to Earth orbiting spacecraft and constellations.

The following mission scenarios include LOTUS insertion studies for Mars, Ceres, 2008 Ev5, 16 Psyche, Venus and Jupiter using this new suite of powerful engines. Energy requirements and related propulsion systems will be balanced alongside other subsystem demands such as power, and communication to enable both standardization and performance.