

The Lunar L1 Gateway: Portal to the Stars and Beyond

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Our Solar System is interconnected by a vast system of tunnels winding around the Sun generated by the Lagrange Points of all the planets and their moons. These passageways are identified by portals around L_1 and L_2 , the halo orbits. By passing through a halo orbit portal, one enters this ancient and colossal labyrinth of the Sun. This natural Interplanetary Superhighway System (IPS) provides ultra-low energy transport throughout the Earth's Neighborhood, the region between Earth's L_1 and L_2 . This is enabled by a coincidence: the current energy levels of the Earth L_1 and L_2 Lagrange points differ from that of the Earth-Moon by only about 50 m/s (as measured by ΔV). The significance of this happy coincidence to the development of space cannot be overstated. For example, this implies that lunar L_1 halo orbits are connected to halo orbits around Earth's L_1 or L_2 via low energy pathways. Many of NASA's future space observatories located around the Earth's L_1 or L_2 may be built in a lunar L1 orbit and conveyed to the final destination via IPS with minimal propulsion requirements. Similarly, when the spacecraft or instruments require servicing, they may be returned from Earth libration orbits to the Lunar L_1 orbit where human servicing may be performed. Since the lunar L1 orbit may be reached from Earth in less than a week, the infrastructure and complexity of long-term space travel is greatly mitigated. The same orbit could reach any point on the surface of the Moon within hours, thus this portal is also a perfect location for the return of human presence on the Moon. The lunar L_1 orbit is also an excellent point of departure for interplanetary flight where several lunar and Earth encounters may be added to further reduce the launch cost and open up the launch period. The lunar L_1 is a versatile hub for a space transportation system of the future.