HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM (A5)
Going Beyond the Earth-Moon System: Human Missions to Mars, Libration Points, and NEO's (4)

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HOW TO SAVE DELTA-V AND TIME FOR A ROUND TRIP TO EML2 LAGRANGIAN POINT ?

Abstract

Space exploration follows a logical set of steps, starting with basic knowledge and culminating, it is hoped, in a sustained human presence in space. The next step, according to the Global Exploration Roadmap, released in September 2011 by the International Space Exploration Coordination Group (ISECG), which reflects the international effort to define feasible and sustainable exploration pathways to the Moon, near-Earth asteroids and Mars, is the Moon as second home in the Solar System.

On the basis of risk, cost and technology readiness criteria, the present paper aims to provide quantitative results to set a Deep Space-Habitat, as an exploration gateway, at the Earth Moon Lagrange (EML) point, on the way to the Moon colonization. The problems of highly reliable and safe systems are crucial as interplanetary resupply missions from Earth cannot reach the crew on short notice and quick return to Earth is not possible. This problem is the strong link with the previous year's article "Mission analysis for a space medical center of an exploration gateway at a lunar libration point", published at IAC in Cape Town, in 2011. Here a further analysis will be carried on to abandon the preliminary bibiliographical studies and to go deeper into the scenarios modelling.

In a first analysis, a local optimization of the deployment of the Deep-Space Habitat for an international space heaven located at EML2 is performed. After investigating different propulsion technologies, a general analysis in order to minimize the cost to join the permanent outpost in the Earth-Moon system is run. The future needs of an exploration gateway at a lunar libration point which will be developed for a 2035 timeframe, as indicated by the Global Exploration Strategy, might slightly change. As direct consequence, the number of modules composing the Deep-Space Habitat is kept unknown to make the analysis more generic and flexible.

Secondly, a focus is put to optimize locally the operational phase, with the mission analysis of the resupply cargo. The time to come back to Earth is the dimensioning parameter in order to guarantee safety in emergency cases for the astronauts.

Finally, a global optimization for the entire Deep-Space Habitat mission, encompassing deployment and operational phase can be started.