

From Earth Missions to Deep Space Exploration (05)  
International Plans and Concepts (4)

Author: Mr. Josh Hopkins  
Lockheed Martin Corporation, United States, josh.b.hopkins@lmco.com

Mr. Yury Makushenko  
S.P. Korolev Rocket and Space Corporation Energia, Russian Federation, Yury.Makushenko@rsce.ru  
Ms. Anastasia Murashko  
RSC Energia, Russian Federation, Anastasiya.Murashko@rsce.ru  
Dr. Stephan Walther  
Astrium Space Transportation, Germany, Stephan.Walther@airbus.com  
Mr. Hidemasa Nakanishi  
Mitsubishi Heavy Industries, Ltd., Japan, hidemasa\_nakanishi@mhi.co.jp

INTERNATIONAL COOPERATION MISSION (ICM) TOWARDS FUTURE SPACE EXPLORATION

**Abstract**

In 2009 an international industrial working group, consisting of Lockheed Martin, RSC Energia, EADS Astrium and Mitsubishi Heavy Industries, was formed to support the advancement of human space exploration. Aiming to create a scenario of establishing an affordable and sustainable exploration architecture that would enable international cooperation, advance human space exploration capabilities and leverage existing partnerships and assets, particularly those developed for the International Space Station and those currently in development by NASA such as the Orion MPCV and the SLS Heavy lift Launch Vehicle, the ICM partners carried out a study of a potential mission, demonstrating these new capabilities in a reasonable time frame. Our international industrial partnership proposes a cooperative endeavor that addresses these goals, establishing a new milestone in human spaceflight prior to further deep space human exploration missions. Several options were investigated and one candidate has been identified as a potential mission of interest for the next global international cooperation initiative. This mission is named the International Cooperation Mission (ICM). ICM milestones:

- International cooperation by sharing mission responsibility across multiple space agencies;
- Implementation of early agreements of responsibilities, avoiding duplication of efforts to reduce costs;
- Establishment a Lunar Farside Outpost – human-attended space platform – at the Earth-Moon Lagrange point 2 (EML-2);
- Significant global space science and technology advancement and exploration research;
- Step-by-step building of architecture for future human space exploration (Moon, asteroids, Mars).

The Lunar Farside Outpost consists of elements provided by the participating space agencies, which are ISS-improved products and services and will be further evolved for deep space exploration. Due to the unique location of the EML-2 orbit, the Lunar Farside Outpost facilitates autonomous, unmanned space operations with minimal orbit-keeping operations required. The basic configuration offers internal/external science research, lunar observation/telerobotics/sample collection, far-space radio frequency observation, and a proving platform for deep space exploration/technologies.

This EML-2 based Lunar Farside Outpost platform can also be transferred to EML-1 if needed to provide an alternative location to support manned or automated deep space missions (Moon, asteroids, Mars), and can serve as a key element of future space exploration architecture.