

HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM (A5) Human Exploration of the Moon and Cislunar Space (1)

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INTERNATIONAL INDUSTRY CONCEPTS FOR AN OUTPOST AT THE EARTH-MOON L2 REGION

Abstract

Since 2009, a team of leading international space companies has been developing plans for future human spaceflight missions as an industry parallel to the Global Exploration Roadmap produced by the national space agencies represented in the International Space Exploration Coordination Group (ISECG). Our goal is to extend the successful cooperative relationships developed during the International Space Station program to future exploration missions beyond Low Earth Orbit. The industry team includes Airbus Defence and Space (formerly EADS Astrium), The Boeing Company, Lockheed Martin, MDA, Mitsubishi Heavy Industries, RSC Energia, and Thales Alenia Space.

The companies on the team agree with ISECG that the first deep space missions should send astronauts to an outpost in a halo orbit around the Earth-Moon Libration Point 2 (EM-L2) approximately 65,000 km beyond the Moon. The outpost could be moved to other circumlunar locations such as L1 or a Distant Retrograde Orbit if desired. Technical mission objectives include preparing for missions to Mars by testing biomedical responses, hardware, and operational procedures in the deep space environment. Science mission objectives could include human-assisted sample return from the geologically important SPA and Schrodinger basins on the farside of the Moon, returning samples of lunar polar volatiles, deploying radio astronomy instruments in the radio quiet zone on the farside, and exploring a redirected asteroid. Accomplishing these objectives would feed forward to robotic Mars Sample Return missions and also to eventual human missions to Mars.

Crew transportation would be provided by Orion spacecraft developed by the US and Europe and launched on SLS, and also by the Russian Advanced Crew Vehicle when it is ready. We envision a Russian-built habitable module as the backbone of the outpost augmented with a docking node and perhaps later with additional permanent modules. There are multiple options for logistics vehicles derived from ISS resupply vehicles in use today and launched on existing launch vehicles (such as ATV, HTV, Cygnus, and Progress). Some of these may require a next-generation robotic arm for berthing, which could be provided by Canada. Japan, Canada, and European nations, could contribute robotic lunar landers and rovers for surface operation. A farside outpost at EM-L2 is ambitious but achievable for all of the partner nations. The time has come for decision making for this ambitious but achievable program.