

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

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MANNED SPACE FLIGHTS BEYOND LEO: DEPENDENCE/INTERDEPENDENCE

Abstract

International cooperation has been recognized as one of crucial factors for successful implementation of beyond LEO manned space flight programs.

International missions realization assumes significant mutual dependence of the partners. On the other hand, partners will benefit from the synergy obtained from the advanced technologies and elements combination, resources saving and intensification of space exploration activities (joint results utilization for the national programs implementation).

With the growth of beyond LEO manned flight distances the level of international program integration will be enhanced dramatically. For the cis-lunar international missions partial integration with the partial dependence from each other could be implemented, but as for the longer mission, profound integration and interdependence will be requested. However, redundancy on key elements should be implemented for the program robustness and vitality. This will require some parallel developments (relatively independent, since system requirements and interfaces coordination will be needed to ensure compatibility of elements). Specialized elements do not back-up each other, but augment the infrastructure in a complementary way.

Manned spacecraft and heavy-lift launch vehicle for it are the key elements of the infrastructure. Habitable and node modules, air lock, manipulators, scientific modules or spacecraft, rovers, etc. are considered to be specialized elements.

Deployment of an international infrastructure to support both joint and national activities is an efficient solution for future programs, at least for the initial phase of deep space exploration. To support national programs some additional or stand-alone national segments could be deployed.

The main objective for the potential international infrastructure is support missions to the cis-lunar space, Moon surface, Mars and other Solar system bodies. This support includes habitation, safe shelter in case of contingencies, storage of resources and propellant, etc. Later on temporary scientific capabilities/instruments storage can be provided (before, after or between utilization sessions). As well as spacecraft repair and servicing capabilities.

Taking into account currently discussed deep space exploration plans, the most reasonable locations for the international infrastructure are the ones in cis-lunar space (EML2, DRO or low lunar orbit) and, as a next step, on the Moon surface (concrete location has to be determined, the most probable one – South pole of the Moon, the Atkinson basin).

The principals of development and utilization of such an infrastructure should be determined separately.