

From Earth Missions to Deep Space Exploration (05)
Exploration Research and Technologies (2)

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HABITABLE SPACE STATIONS AS PART OF THE INFRASTRUCTURE FOR DEEP SPACE
EXPLORATION

Abstract

Human progress beyond LEO is the natural phase not only for astronautics development but for the fundamental sciences as well. The available heritage and achievements in crew space flights and robotic exploration missions alongside with the experience received in the outstanding international projects may create a robust basis for further progress in space exploration and first of all in the exploration of the Solar system objects.

The prospective programs of deep space exploration will undoubtedly require long- duration human presence far beyond LEO and that assumes the availability of the new generation habitable modules as part of the infrastructure.

The effective architecture for crew space flights into deep space is based on the following assumptions:

- Usage of the infrastructure element in key destinations for space exploration (LEO and EML-1, EML-2);
- Usage of the available infrastructure for the tests and demonstrations of technologies to be used in the next steps of space exploration;
- Large-scale international cooperation.

At the initial phase the infrastructure for deep space exploration may be built of the available elements or of those under development to support the beginning of practical space exploration in the nearest 12-15 years. Close international cooperation is vital. The experience of the ISS operation (presently it is more than 12 years, in future it is expected to be up to 25-30 years) will allow to create efficient international partnership for deep space exploration.

Currently the potential strategies for the missions into deep space are being discussed, and the common feature for all of them is deployment of habitable/visited core station in circumlunar space to support crew and robotic missions to explore the Solar system. If the priorities of exploration and mission architecture are still undefined, the optimum solution is to build multipurpose elements (Nodes) of the infrastructure in LEO and EML-1,2 to support any future human missions. One of these elements is the ISS, where even now we can demonstrate and validate the elements and technologies for future programs, as well as assemble, test and deliver stations and platforms to the designed destination.

The international exploration station in EML-1 or EML-2 will provide efficient support for the Moon and circumlunar space exploration, for the missions to asteroids, Mars, etc. In due time the station in EML-1,2 may be used to demonstrate and validate technologies and elements for deep space missions, similar to the ISS usage at the initial phase.