

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS (D2)  
Future Space Transportation Systems (4)

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TRANSPORTATION CONCEPT FOR MISSIONS TO MARS BASED ON EVOLVED CAPABILITIES

**Abstract**

**Purpose**

The purpose of this paper is to explore possible International Space Station (ISS) based mission scenarios that utilize existing or near-term evolve capabilities of the ISS International Partners as the basis for human expeditions to Mars.

**Methodology** Over the last 50 years there have been multiple studies conducted independently by several nations on the technical aspects of developing, launching and conducting a human mission to Mars. Most of the various studies and proposals have addressed the final configuration or architecture of a mission to Mars without much thought on technology development and the political and budgetary resources needed to conduct the mission. As such, proposals that have been developed in both Russia and the United States have to-date not been able to garner the necessary political will or budget resources necessary to seriously begin developing the technical and operational capabilities to conduct a human mission to Mars. The methodology used to develop this proposed Mars mission scenarios will be based on existing and near term capabilities that do not require orders of magnitude increases in political or budgetary support. The proposed missions will rely on portions of previous proposals and studies such as the NASA Mars Design Reference Architecture 5.0 and the recent Russian Mars mission proposal as well as the existing capabilities of the ISS and possible technology development activities. Development of the mission scenarios will also take into consideration propulsion elements, habitation, power systems, Mars transit and landing transportation elements, reusability and possible areas of cooperation between partners.

**Results** Mission scenarios will be presented in a step-wise architecture along with the technology development activities, operational capabilities and pre-cursor missions that are needed to build up the capabilities and knowledge necessary to execute sustainable human Mars missions.

**Conclusion** The outcome of this paper may provide a basis for further investigation into possible joint Mars mission architectures and partnership opportunities that will be viable from a technology, policy and budgetary viewpoint.