

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
Heavy Lift Launchers Capabilities and New Missions (8)

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ATMOSPHERIC FLIGHT VEHICLE SYSTEM TECHNOLOGIES FOR HUMAN EXPLORATION OF  
MARS.**Abstract**

Mars has been characterized as the “ultimate destination” for human exploration within the solar system. The most recent system studies show that it will be necessary to develop and demonstrate entry, descent, and landing (EDL) technologies to substantially increase the payload sizes that can be safely landed on the surface if this goal is to be accomplished. Current technologies limit the payload mass to the surface of Mars to approximately 1 metric ton and landing sites are also limited to lower altitudes and those relatively free of hazards. Progress towards Mars as a destination for human exploration will require investments in advanced transportation system technologies and appropriate demonstrations to reduce risk, including exploration robotic precursor missions.

The authors offer a set of candidate high-value mission objectives for Mars robotic precursor concepts. These include the set of transportation system technologies and additional precursor needs to enable future human-scale missions. These objectives are based on several recent studies, including systems studies, technology roadmaps, and concept trade studies.

Additionally, NASA is making investments in advanced technologies necessary to build the portfolio of capabilities needed for these future missions. These include atmospheric deceleration systems, thermal protection systems, relative navigation sensors for precision landing, and others. The cross-cutting potential of these technologies also extends to Earth Entry for many different applications, including return from deep space destinations, and robotic missions to other planetary destinations. The paper briefly discusses the readiness level of technologies for future precursor mission opportunities.