

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)  
Interactive Presentations - IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (IP)

Author: Mr. Kevin Kempton  
NASA, United States, kevin.s.kempton@nasa.gov

Ms. Christina Ciardullo  
Carnegie Mellon University, United States, cnc2001@columbia.edu

TECHNICAL RISK REDUCTION FOR THE MARS ICE HOME HABITAT CONCEPT

**Abstract**

A realistic human mission to Mars requires an effective habitat where crews can operate on long surface stays and where they are well protected from the harsh Martian environment. Galactic Cosmic Rays (GCRs) are a significant issue for human health on long duration Mars surface missions. Any effective habitat for Mars must provide GCR shielding for crews. It is impractical to transport the needed shielding material from Earth. Burial is an option but has many engineering and operational challenges. The Mars Ice Home is a low launch mass deployable Mars habitat concept based on an inflatable structure that incorporates water ice collected on location by In Situ Resource Utilization (ISRU) water collection systems as radiation shielding. The Mars Ice Home also provides a large, flexible, and cost effective workspace that can be used for many of the key activities that will be critical for the long term success of a human outpost on Mars. The Mars Ice Home incorporates many human factors features that will provide a comfortable home for future explorers to Mars and other deep space locations where water resources are available.

The original Mars Ice Home study in 2016 developed an initial design that received worldwide publicity. A follow on risk reduction study in 2017 addressed many of the key technical risks such as deployment, filling, and water cell material performance. Several candidate water cell materials were tested at NASA's Langley Research Center and methods of freezing water at low pressures was tested at Brown University. In addition the 2017 study team refined the Mars Ice Home water cell design and performed GCR shielding assessments of specific designs to better understand the tradeoffs between water collection requirements and shielding requirements.