Paper ID: 39985
oral
student

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Interactive Presentations (IP)

Author: Ms. Nanette Valentour
University of North Dakota, United States

DEVELOPMENT OF PLANT PRODUCTION MODULE FOR PLANETARY LIFE SUPPORT

Abstract

Long duration missions to Mars may require the capability to grow plants for life support. Past research on plant growth in reduced gravity has determined plant growth chamber requirements for sufficient yield. Large plant production systems have not been tested in space due to their inherent complexity and launch vehicle payload mass limitations. Plant production systems for space must be constructed for testing and optimization on Earth before launch. Earth testing for space systems is difficult due to the nonstandard conditions that must be implemented to attain the most similar analog. The UND Space Studies Department is developing a Plant Production Module as part of the Inflatable Lunar/Mars Habitat, under a NASA grant. The Plant Production Module was designed to achieve minimal hardware and maximum growth area. Current preferences for planetary habitat architecture suggest the module be cylindrical, an unconventional shape for a greenhouse on Earth. Inside, plant shelves span the majority of the module to maximize the planting area. The vertical spacing of the shelves is reduced to create more usable space. However, this reduction is not so much to prevent crew members from performing procedures comfortably. LED light panels will be placed on the bottom of each shelf to illuminate the plants below. As the plants grow, reconfigurable shelf trays can be used to adjust the distance from light source to plant leaves. This paper will describe the engineering solutions used to develop a planetary plant production analog on Earth. The unique configuration of the cylindrical module includes the aspects of plant production mentioned above and is human rated for testing under 1-g. The Plant Production Module is designed to provide the vegetarian portion of crew members' diets for extended isolation missions in the Inflatable Lunar/Mars Habitat. Data obtained from the analog missions can provide insight into the optimal configuration of a plant module for planetary life support.