

HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM (A5)  
Human Exploration of Mars (2)

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DEMONSTRATION TEST OF ELECTRICAL LIGHTING SYSTEMS FOR PLANT GROWTH IN  
HI-SEAS ANALOG MARS HABITAT**Abstract**

Greenhouse modules and regenerative life-support systems are critical for long-duration space missions and future settlements on the Moon and Mars; understanding their mechanisms and issues on Earth in remote areas is a first step towards their space adaptation. To follow up with studies performed in NASA's Deep Space Habitat and deployed at NASA Desert Research and Technology Studies test site in 2011 and at NASA Johnson Space Center in 2012, three sole-source LED lighting systems – commercial-off-the-shelf “UFO” red and blue LED grow lights, AIBC's super-slim whiteEx70Dim panels, and Heliospectra multispectral L1 lamp – were tested during the four-month HI-SEAS (Hawaii Space Exploration and Analog Simulation) analog mission. The primary objectives of this study were the identification of technical and engineering challenges regarding set-up, crew operations and maintenance of the systems and the development of ways to mitigate these. Power requirements, crew time and lighting efficiencies (e.g. light distribution, intensity, and homogeneity) were also assessed. Finally this study also covered the effects of different wavelengths on lettuce and radish growth in a semi-controlled environment. A Biomass Production System for Education (BPSe) unit developed by ORBITEC and developed after their Deployable Vegetable Production System was placed inside the habitat and available for crew interaction and recreational purposes. Preliminary results regarding psychological benefits of plants in remote areas during long-term isolation are presented.