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IMPLEMENTATION OF DISRUPTIVE TECHNOLOGIES IN THE DESIGN AND MODULAR
OPERATION OF A GREENHOUSE FOCUSED ON A LONG-TERM LUNAR BASE

Abstract

Manned space exploration has contributed to the development and growth of science and technology inside and outside the habitable limits known until now. To carry out manned space exploration missions, as well as to establish long-term bases on different celestial bodies, adequate life support systems must be studied, designed, implemented and operated, which can provide the necessary resources to achieve support life in extreme conditions such as space. A key module in a life support system is the plant growth module or a greenhouse, focused on providing various resources such as nutrients, O₂ generation, treated water, as well as multiple psychological benefits, when it comes to staying in confined spaces. In this article, the implementation of disruptive technologies such as augmented reality or machine learning will be discussed in the design and operation of a greenhouse focused on a long-term lunar base, in search of the best adaptation of operation to the plant species involved. The incorporation of the in situ resource utilization to the greenhouse is also proposed, in this case the lunar regolith; seeking to increase the life support system efficiencies, reducing risks, costs and storage spaces. Likewise, application approaches are provided to scalable projects over time, focused on the permanent habitability of outer space.