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Space Architecture: Habitats, Habitability, and Bases (1)

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AGRICULTURE IN MARS: HABITAT MARTE FINDINGS

Abstract

This research describes efforts developed in the Biohabitat greenhouse operating in the Brazilian Mars analog research station Habitat Marte (www.HabitatMarte.com). During the simulated missions in Rio Grande do Norte State, Brazil, operational protocols for an aquaponic farming system were developed. How to produce food in space habitats? This is one of the main questions related to space habitats sustainability. It is more feasible transport seeds to space habitats (Mars and Moon) and cultivate food crops in these destinations. Food production systems presents challenges about: 1) save energy, 2) guarantee the surveillance of the crops, 3) be autonomous managed; 4) guarantee high and efficient production in limited areas; 5) guarantee avoidance plagues; 6) guarantee adequate amount of nutrients for the plants; 7) Easy maintenance; 8) Easy assembly; 9) Existence of routines and procedures; 10) Existence of guidelines. In BioHabitat/ Habitat Marte was possible identify relevant results associated to development of food routines and protocols that would be replied in space habitats: 1) analysis, 2) diagnosis; 3) ensure the proper management of circular systems; 4) assure the fidelity of methodologies during the cultivation process; 5) orientation for maintenance; 6) detect possible failures to be fixed. Was possible to create a database with physical and biochemical parameters, such as: temperature, humidity, levels of nitrogenous compounds (NH3, NO2, NO3) and pH of water. In this way, the correct management of space food systems enables better control of the variables in the space agriculture process. The challenge of the research developed is establish partnership with space agencies and space research groups to develop cooperative research, focusing how the automation and Internet of Things-IoT sensors would be a fundamental technology to guarantee the confidence related to food production in space habitats.