

14TH IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND
DEVELOPMENT (D3)Novel Concepts and Technologies to Enable Future Building Blocks in Space Exploration and
Development (3)

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EUROPEAN TECHNOLOGIES FOR CREW HABITATS AND FOOD PRODUCTION IN SPACE

Abstract

Architectural concepts for space exploration habitats being developed in Europe include the Self-Deployable Habitat for Extreme Environments (SHEE), RegoLight, and LavaHive. These habitat concepts are complemented by the Evolution Design of Environmentally-closed Nutrition sources (EDEN) research initiative. SHEE is a modular test-bed for terrestrial simulations of extreme environments, deployed in a space analogue environment or laboratory conditions. The interior can be adapted to other functions such as a greenhouse, which could reduce dependence on terrestrial supplies. SHEE is the first deployable habitat simulator to be designed and constructed in Europe. Starting in 2016, the SHEE habitat will be available to the research community conducting mission simulations in analogue sites. RegoLight and the LavaHive conceptual habitat are projects exploiting ISRU technologies. The RegoLight will develop a regolith solar sintering device breadboard which will be validated to TRL5. The parts printed in a thermal vacuum chamber will undergo mechanical properties tests to build an analytical and application database. LavaHive is a modular, additive-manufactured habitat concept for planetary surface exploration using a proposed novel 'lava-casting' construction technique. A habitat concept based on LavaHive was awarded third prize in the first stage of the NASA 3-D Printed Habitat Challenge Design Competition, from over 165 competing concepts. The EDEN ISS project foresees development and demonstration of higher plant cultivation technologies future deployment on the ISS and, from a long-term perspective, in Moon and Mars exploration habitats. A Future Exploration Greenhouse will be designed with respect to future planetary bio-regenerative life support system deployments. The technologies will be tested in a laboratory environment and in the Antarctic. These technologies would support a broad range of exploration and mission scenarios, with the potential of meeting terrestrial needs for habitats and food production in extreme environments.