

66th International Astronautical Congress 2015

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Life Support, habitats and EVA Systems (7)

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BIOREGENERATIVE LIFE SUPPORT EXPERIMENTS IN CHINESE LUNAR PALACE 1: RESULTS
AND FUTURE PLANS

Abstract

A 105-Day bioregenerative life support experiment with a multiple-member crew was carried out in the Chinese closed integrative experimental facility, Lunar Palace 1 (Stage I) regenerating basic living necessities and disposing wastes to provide life support for crew. Stage I project of Lunar Palace 1 includes a comprehensive cabin (which includes bedrooms, a living room, a bathroom and a waste treatment room), and a plant cabin. In Stage I, we totally cultivated 21 plant candidates, including 5 food crops, 15 vegetables and 1 fruit. The results showed that air-tightness, environmental conditions as well as the gas balance between O₂ and CO₂ of the system were well maintained during the 105-day experiment, plants in the system kept a harmonious coexistence relationship. 20.5% of nitrogen recovery from urine, 41% solid waste degradation, and a small amount of insect in situ production were achieved. The characteristics of mass flow relationships among the components involved in the stabilized operation of BLSS were also obtained. In addition, during the 105-day of closed experiment, 100% regeneration of oxygen and water was achieved, and 55% of the food was regenerated. The overall coefficient of system closure reached 97%. Total power requirement of Lunar Palace 1 for 105 days was about 59 KW. During and after the 105 day experiment, the crew maintained healthy, their body weight changes were less than 2 kg. In the future, Lunar Palace 1 will be upgraded to increase one more plant cabin. The whole system will meet the life support demand for 4 crewmembers. Experiments with 4-member-crew for longer duration will be carried out. Lunar Palace 1 can be used as a collaborative research platform for international counterparts.