



T0140-P Lunar Plant Habitat

Problem Statement

- No plant-based biological spaceflight experiment has ever hydrated seeds in lunar gravity. Risk of bubbles or of uneven dispersion were deemed too great.
- This flight opportunity helps verify the microfluidics delivery system will disperse water to all seeds under lunar gravity. This experiment will be a first step towards a watering system for the Moon.
- Users to include HEOMD's space life sciences payloads for ISS centrifuges, the Moon and beyond.

Technology Development Team

- Chris McKay PI, NASA Ames, Chris.mckay@nasa.gov
- Support includes ARC-awarded CIF funds, GoPro Cameras, Park Seeds, Lockheed Martin IS&GS

Supports STR goals TA06 - Human health, Life Support & habitation systems; TA07 - Human Exploration Destination systems; TA12 - Materials, structures, mechanical systems and manufacturing

Proposed Flight Experiment

Experiment Readiness:

- Experiment will be ready for flight before 18th August. Water system has been successfully tested in freeze-thaw and vibration environments.

Test Vehicles:

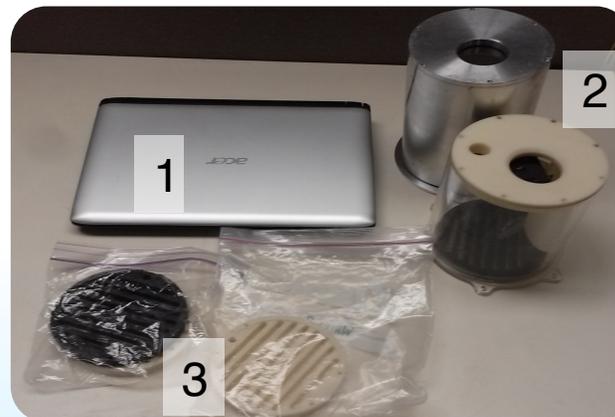
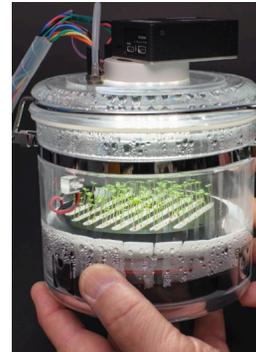
- Parabolic aircraft

Test Environment:

- Simulated lunar gravity ≥ 20 seconds to hydrate a 100-seed root module.

Test Apparatus Description:

- During the flight a laptop(1) will control the habitat (2) water pump and camera simultaneously via an Arduino. 20 seconds should allow complete wetting of the whatman filter paper in the root modules (3) as shown by a change in color of the indicators.



Technology Maturation

- Through lunar parabola during the parabolic flight the TRL of the system will be elevated from 5 to 6 .
- It is a flight-critical sub system
- The lunar g parabolic flight is an integral test to mature the technology
- The technology has to be tested before the end of FY 2014 to meet the timelines of the lunar launch service providers

Objective of Proposed Experiment

- To evaluate the water delivery system under lunar gravity preceded by hyper gravity
- To evaluate the root module's water distribution to all seeds
- To test software to control the complete system, including running the pump and capturing images to collect flight data.
- **Successful functioning of the system will enable high confidence in plant growth for our landed lunar mission.**