

NCERA-101 Station Report
Orbital Technologies Corporation, Madison WI

March 1, 2012-March 1, 2013

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1. Impact Nugget:

ORBITEC continues to develop solid state lighting systems for for biological research, aerospace plant lighting, marine lighting, and agricultural lighting for greenhouses.

2. New Facilities and Equipment.

ORBITEC has developed a reliability testing lab. Test capability includes, but is not limited to, ionizing radiation, pyrotechnic shock, and the test methods pictured below.



3. Unique Plant Responses.

Nothing to report at this time.

4. Accomplishment Summaries.

Greenhouse lighting

ORBITEC continues to investigate development of large solid state greenhouse lighting systems (Figure 1).



Figure 1. ORBITEC greenhouse supplemental lighting systems. LED in-canopy light tower at Purdue University (L). LED light bars assembly at University of Tennessee (R).

Space Plant Biology

ORBITEC is working with the Kennedy Space Center (KSC) to fly our Veggie plant growth system (Figure 2) hardware near the end of 2013. This system consists of a LED light cap, a bellows enclosure, and a root mat capillary water delivery system. Plants are seeded in to “plant pillows” which are then placed on the capillary mat. Veggie uses air exchange with the cabin to dilute ethylene, maintain temperature, and maintain CO₂ levels. The system is for crew diet supplementation and recreation. The first test on-orbit will be with lettuce, which will undergo a complete microbial sampling. This test will be followed by a planting of Marigold and Zinna while the lettuce microbial samples are analyzed on the ground. If the microbial levels prove satisfactory, a second grow out of lettuce will be conducted for actual consumption by the crew. Two flight units have been delivered to KSC for continued functional and science testing.

ORBITEC is also working with KSC to design and fabricate the solid state lighting system for the Advanced Plant Habitat being developed at KSC. This large plant growth system is expected to fly in 2015.

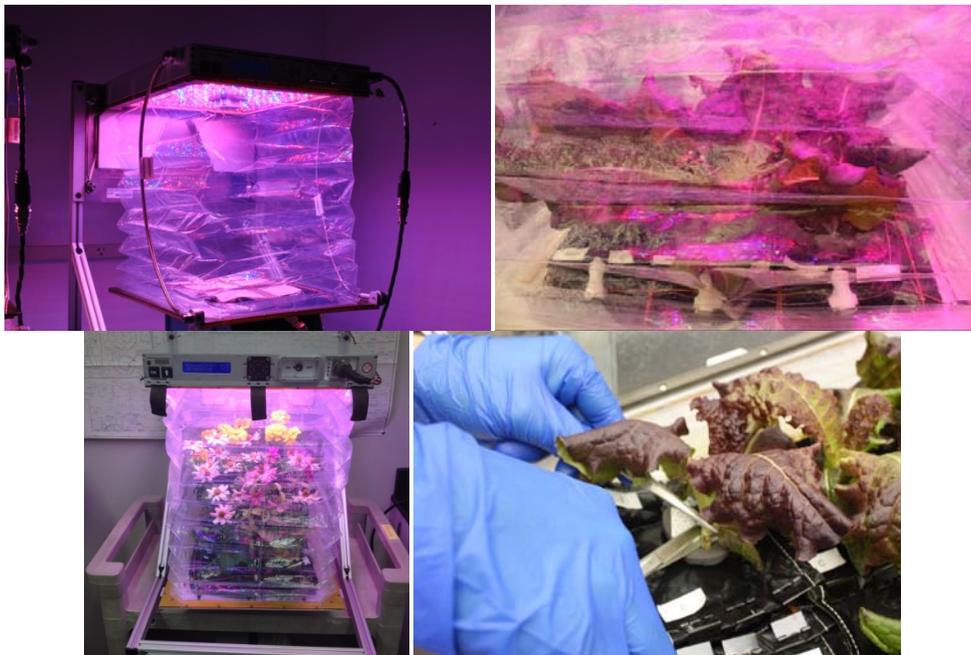


Figure 2. ORBITEC Veggie system. Clockwise from top left; Veggie flight unit, ‘Outredgeous’ lettuce growing in Veggie unit, lettuce harvest from Veggie plant pillows, Marigold and Zinna in Veggie engineering model.

Aerospace Environmental Control

ORBITEC is working with multiple Commercial Crew Integration Capabilities (CCiCap) partners for development of human Life Support and Thermal Control systems.

5. Impact Statements.

- ORBITEC is testing LED lighting configurations and control strategies with the goal of providing increased lighting system utility in addition to increased efficiency.

6. Published Written Works.

Gómez, C., R.C. Morrow, C. M. Bourget, and C. A. Mitchell. 2012. Comparison of Intracanopy Light-emitting Diode Towers and Overhead High-pressure Sodium Lamps for Supplemental Lighting of Greenhouse-grown Tomatoes in a Northern Climate. *HortTechnology* 23:93-98.

Mitchell, C.A., A.J. Both, C.M. Bourget, J. F. Burr, C. Kubota, R.G. Lopez, R.C. Morrow and E.S. Runkle. 2012. LEDs: The Future of Greenhouse Lighting! *Chronica Horticulturae* 52: 6-12.

7. Scientific and Outreach Oral Presentations.

ORBITEC provided tours of our facilities and projects, including those related to controlled environments, to the following groups during the last year:

- ♦ Camp Badger, Exploring Engineering™ at UW Madison - 90 eighth grade students interested in science and technology.
- ♦ Wayland Academy, Beaver Dam Wisconsin – 40 high school students from physics, biology and chemistry.

8. Other relevant accomplishments and activities.

- ♦ ORBITEC continues to be a vendor for Space Gardens (an outreach/education plant growth system) and lunar and mars regolith simulant materials.
- ♦ ORBITEC will be AS9100C certified in March 2013. AS9100 is a quality standard covering the design and manufacture of failure critical, flight-operational life support systems and components for space applications. (Flight Critical = single failure could cause loss of life). We are currently ISO 9001 certified for technology development, engineering services, and the design, manufacture, and testing of aerospace and high technology products.

9. Websites:

www.orbitec.com