

NCERA-101 Station Report
Sierra Nevada Corporation/ORBITEC, Madison WI

April 1, 2017 – March 31, 2018

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1. Impact Nugget:

SNC will continue to develop environmental control technologies for space based biological and physical-chemical life support systems, technologies that may have applications for terrestrial environmental control systems.

2. New Facilities and Equipment.

SNC continues to expand hiring and is currently building out a third facility in the Madison WI area that will be used to develop flight hardware for life support and propulsion systems.

3. Unique Plant Responses.

Nothing to report.

4. Accomplishment Summaries.

Life Support Systems

SNC is continuing work on the development of Exploration Life Support Salad Crop production as an early stage implementation of hybrid life support systems (combination of bioregenerative and physical-chemical life support technologies). Current efforts include development of aeroponic and nutrient film technique (NFT) hydroponic systems for use in the space environment as a way to significantly reduce the mass, power, and volume of plant nutrient delivery systems while maintaining good plant productivity.

Space Plant Biology

SNC continues to work with the Kennedy Space Center (KSC) to support the Veggie plant growth system hardware that is on-board the ISS. A second Veggie unit was installed on the ISS in 2017.

SNC delivered the Advanced Plant Habitat hardware to the Kennedy Space Center. The Advanced Plant Habitat system was installed on the ISS in late 2017 to be used for a wide range of microgravity plant research. This system is the largest plant growth system put in space to date. An initial check out with Apogee wheat and Arabidopsis was completed in the spring of 2018.

Aerospace Environmental Control

SNC continues to work with Commercial Crew Integration Capabilities partners for development of human Life Support and Thermal Control systems for space habitats.

SNC is continuing development of a deep space, long-duration, human habitat prototype for NASA.

5. Impact Statements

- SNC is working toward development of hybrid life support systems for space applications, integrating biological and physical/chemical technologies.
- SNC is advancing the technology of controlled environment systems to meet the performance and quality needs of long duration space applications. Some of this technology may be transferable and scalable to protected agriculture systems.
- SNC is developing LED lighting configurations and control strategies for plant and human lighting applications to provide increased lighting system utility for aerospace and gravitational biology applications.

- SNC is using its space biology controlled environment work and human life support work to spark interest in high school and college students in controlled environment technology and STEM.

6. Published Written Works.

- Morrow, R.C., J.P. Wetzel, R.C. Richter, and T.M. Crabb. 2017. Evolution of Space-Based Plant Growth Technologies for Hybrid Life Support Systems. 47th International Conference on Environmental Systems. ICES-2017-301.
- Surdyk, R.J., R.C. Morrow, and J.P. Wetzel. 2017. Life Support Multidimensional Assessment Criteria. 47th International Conference on Environmental Systems ICES-2017-306.

7. Scientific and Outreach Oral Presentations.

- Accommodating Space Biology Sortie Missions in the Post Space Shuttle Era. ASGSR 2017
- Mass Measurement Device: Applications for Space Life and Physical Sciences. ASGSR 2017
- Hybrid life support system technology demonstrations. Deep Space Gateway Workshop 2018.

8. Other relevant accomplishments, news and activities.

ORBITEC was purchased by Sierra Nevada Corporation and former ORBITEC operations in Madison WI are now referred to as "Sierra Nevada Corporation Propulsion and Environmental Systems".

9. Websites:

Sierra Nevada Corporation <http://www.sncorp.com/>