



---

The Space Congress® Proceedings

2004 (41st) Space Congress Proceedings

---

Apr 30th, 8:00 AM

## Paper Session II-B - Bioregenerative Life Support Systems for Mars Missions

John C. Sager

*NASA, Biological Sciences Office, YA-E4-B, Kennedy Space Center*

Raymond M. Wheeler

*NASA, Biological Sciences Office, YA-E4-B, Kennedy Space Center*

Follow this and additional works at: <https://commons.erau.edu/space-congress-proceedings>

---

### Scholarly Commons Citation

Sager, John C. and Wheeler, Raymond M., "Paper Session II-B - Bioregenerative Life Support Systems for Mars Missions" (2004). *The Space Congress® Proceedings*. 16.

<https://commons.erau.edu/space-congress-proceedings/proceedings-2004-41st/april-30/16>

This Event is brought to you for free and open access by the Conferences at Scholarly Commons. It has been accepted for inclusion in The Space Congress® Proceedings by an authorized administrator of Scholarly Commons. For more information, please contact [commons@erau.edu](mailto:commons@erau.edu).

**EMBRY-RIDDLE**  
Aeronautical University™  
SCHOLARLY COMMONS

## **Bioregenerative Life Support Systems for Mars Missions**

John C. Sager and Raymond M. Wheeler

NASA, Biological Sciences Office, YA-E4-B, Kennedy Space Center

Human space travel to Mars will require traveling further and staying longer in space than ever before. The traditional approach of stowing life support consumables (i.e., food, O<sub>2</sub>, and clean water) will be transport dependent and too costly, and regenerative technologies will be required. One approach would involve the use of bioregenerative life support systems, where plants would produce food, clean water, and O<sub>2</sub> while removing CO<sub>2</sub>, and microbial systems would process liquid and solid wastes. These systems might provide a small fraction (e.g., 5-25%) of life support needs for early missions, but increase as surface outposts expand. Through bioregenerative systems and especially the use of green plants to complement human metabolic products, surface outposts can achieve a high level of autonomy and hence become less dependent on resupply from Earth. Significant increases in power, mass and volume will be required to accommodate these bioregenerative systems. To achieve reliable operations of plant production systems and microbial waste processors, innovative and cost effective methods will be needed to sustain long-term missions to optimize the components of life support systems.