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

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Bioregenerative Life Support Systems for Mars Missions

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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_2, 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_2 while removing CO_2, 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.