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| Paper Title: | **Martian Greenhouse Design for eXploration HABitat** |
| Abstract: | Long duration, manned space missions to Mars create many challenges for the industry, and logistics of sustainability present some of the most significant questions. Mars' pattern of orbit brings it closest to Earth once every two years, and this is the optimal time to send payload on the two to three hundred day journey. Because of the lengthy gap between optimal launching times, designs for terrestrial missions to Mars must provide storage capable of holding two years' worth of supplies or include the ability to self-sustain. Fresh grown foods are essential for sustainability, and without sustainability, manned missions to Mars will continue to be science fiction. Regular frequent shipping is implausible for replenishing supplies on Mars; even the amount of fuel required to send this large payload during the optimal time poses a problem. This cost alone raises questions about the feasibility of such missions. In order to successfully place a station on the Martian surface, the mission design must include a means for producing food, thereby creating some degree of self-sustainability. Oklahoma State University is investigating various methods for producing food on the Martian surface as part of the 2015 eXploration Habitat (X-Hab) Academic Innovation Challenge sponsored by NASA and the National Space Grant Foundation. Previous OSU X-Hab missions developed Earth analogs for Martian transit and surface habitation, and the greenhouse complements the mission simulation. Our team is analyzing possible designs in search of the most feasible and useful concepts and will produce a full-scale model to prove their viability. The present design incorporates a solid central structure that is integrated with inflatable growing modules that maximizes plant growth footprint while reducing total mass and packed volume. In the current approach, deployment and structural design are driven by plant growth requirements and minimal crew interaction. |