NASA STTR 2018 Phase I Solicitation

T7.02 Space Exploration Plant Growth

Lead Center: KSC

Participating Center(s): JSC

Technology Area: TA7 Human Exploration Destination Systems

Producing food for crew consumption is an important goal for achieving Earth independence and reducing the logistics associated with future exploration missions. Â NASA seeks innovative technologies to enable plant growth systems for food production for in-space and planetary exploration missions.Â

- *Regolith to Soil* - Cultivation of crops for a Mars surface mission could be done hydroponically, or in combination with solid media generated from mineral regolith found near the landing site. Â NASA is interested in testing and developing concepts for generating "soil" media from Mars-like regolith to support food crop growth and allow uptake of essential minerals. Â Consideration should be given to improving water and nutrient retention characteristics, and remediation of potentially toxic perchlorate compounds common to Mars regolith. Â Â
- *CO_2 Control for Plant Chambers* - More advanced plant chambers for space typically manage their internal atmosphere separately, which allows recycling of transpired humidity. Â But this requires the use of consumable, compressed CO_2 sources for controlling the plant chamber. Â Cabin air typically has high CO_2 levels and technologies are sought to scavenge or adsorb cabin CO_2 from cabin air and allow careful, controlled additions of the CO_2 to the plant chamber. Â
- *Cultivation and Growth Systems* - Spacecraft systems are constrained to utilize minimal volume and require minimal crew time for management and operation. Future systems may even require autonomous start-up and operation prior to crew arrival. NASA seeks innovative systems for plant growth and cultivation that are volume efficient, flexible for a range of plant types and sizes (examples: tomatoes, wheat, beans, and potatoes).

Technologies should be adaptive for the entire life cycle (from seeding, to managing plant growth and spacing, through harvest), and reusable across multiple harvests. Â Concepts need to address integration with watering and nutrient/fertilizer systems (whether soil/media based, hydroponic, or aeroponic). Â Systems should address whether they are microgravity compatible, surface gravity compatible, or both.