



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. NASA seeks innovative technologies to enable plant growth systems for food production for in-space and planetary exploration missions.

- *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. 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. Consideration should be given to improving water and nutrient retention characteristics, and remediation of potentially toxic perchlorate compounds common to Mars regolith.
- *CO₂ Control for Plant Chambers* - More advanced plant chambers for space typically manage their internal atmosphere separately, which allows recycling of transpired humidity. But this requires the use of consumable, compressed CO₂ sources for controlling the plant chamber. Cabin air typically has high CO₂ levels and technologies are sought to scavenge or adsorb cabin CO₂ from cabin air and allow careful, controlled additions of the CO₂ to the plant chamber.
- *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. Concepts need to address integration with watering and nutrient/fertilizer systems (whether soil/media based, hydroponic, or aeroponic). Systems should address whether they are microgravity compatible, surface gravity compatible, or both.