NASA SBIR 2015 Phase I Solicitation

H3.02 Bioregenerative Technologies for Life Support

Lead Center: KSC

Participating Center(s): ARC, JSC

Food Production Technologies for Space Exploration

NASA is interested in food production and related food safety technologies for ISS, transit missions, and eventual surface missions (fractional gravity). Of special interest is the use of photosynthetic organisms such as plants to produce food, and contribute to cabin O_2 production and CO_2 removal. Food production technologies should address how light use efficiency will be improved to reduce energy costs, including advanced electric and solar lighting concepts. Electric light sources should achieve at least 1.5 Âµmol photosynthetically active radiation per Joule of electrical energy, and solar collection systems should achieve at least a 40% delivery efficiency of solar light. Innovative concepts for gravity independent watering and nutrient delivery techniques are also needed. Technical approaches could include selecting or adapting the plants for optimal performance in smaller growing volumes common to space. All systems should consider minimizing power, mass, consumables, and biologically produced waste, while maximizing reliability and efficiency. Consumables and waste products that allow their residual water to be recovered or are easily refurbished are desirable. System TRLs should be 2-4 for Phase I. Phase II projects that evolve from the call are expected to deliver a working prototype to NASA.

Biological Systems for Wastewater Treatment

NASA is interested in efficient biological or biochemical approaches to assist in purifying and recycling wastewater in confined spaces such as crewed spacecraft or space habitats. Of special interest are biological approaches and bioreactors for removing carbon, nitrogen and phosphorus, and reduction of biosolids. Specific technologies or approaches are sought for:Â

- Development of long term stable inocula.
- Inoculation and start-up of bioreactors in flight, including remote operations.

Systems should consider operating with low power, low consumables, small volumes, high reliability and rapid deployment, as well as addressing multi-phase flow issues for reduced gravity. Consumables that allow their residual water to be recovered or be easily refurbished are desirable. Proposed systems shall be capable of treating combined waste waters from hygiene activities (containing surfactants/dander/body oil), human urine (with minimal flush water and a bio compatible preservative), and humidity condensate (containing VOCs). Proposed systems should also be capable of maintaining viability during long periods of quiescent operations (90-365 days) when no human generate waste water is available. Proposed systems should use fewer consumables than the current ISS physico-chemical system. System TRLs should be 2-4 for Phase I. Phase II projects that evolve from the call are expected to deliver a working prototype to NASA.Â