NASA SBIR 2017 Phase I Solicitation

H8.01 ISS Utilization and Microgravity Research

Lead Center: JSC

Participating Center(s): ARC, GRC, JPL, KSC, LaRC, MSFC

Technology Area: TA7 Human Exploration Destination Systems

NASA continues to invest in the near- and mid-term development of highly-desirable systems and technologies that provide innovative ways to leverage existing ISS facilities for new scientific payloads and to provide on orbit analysis to enhance capabilities. Additionally, NASA is supporting commercial science, engineering, and technology to provide low earth orbit commercial opportunities utilizing the ISS. Utilization of the ISS is limited by available up-mass, down-mass, and crew time as well as by the capabilities of the interfaces and hardware already developed and in use. Innovative interfaces between existing hardware and systems, which are common to ground research, could facilitate both increased and faster payload development and subsequent utilization. Technologies that are portable and that can be matured rapidly for flight demonstration on the International Space Station are of particular interest.

Desired capabilities that will continue to enhance improvements to existing ISS research and support hardware, with the potential of reducing crew time needs, and those that promote commercial enterprise ventures include but are not limited to, the below focus areas:

- Projects leading to the development of new research facilities and the enhancement of others in focus areas involving granular material research, material science for polymerization, soldiering, thermal diffusivity of organic liquids, particles suspension in plasma, and safe containment of samples while undergoing microscopy imaging. Additionally, projects that address enabling on-orbit capability for utilization of larger rodents for neuroscience research are of high interest.
- Technologies and flight projects that can enable significant terrestrial applications from microgravity development and lead to private sector and/or government agency product development within a number of discipline areas, including biotechnology, medical applications, material sciences, electronics, and pharmaceuticals. This includes modifications to existing flight instruments as well as the development of novel flight hardware for deployment on the ISS.
- Innovative software and hardware to facilitate enhanced station operations. The technology should increase the efficiency of crew operations by simplifying training and procedures, and provide teleoperation and tele-collaboration capabilities within the station, and between the station and ground operations.
- Instruments that can be used as inspection tools for locating and diagnosing material defects, leaks of fluids and gases, and abnormal heating or electrical circuits. The technology should be suitable for hand-held portable use. Battery powered wireless operation is desirable. Specific issues to be addressed include: pitting from micro-meteoroid impacts, stress fractures, leaking of cooling gases and liquids and detection of abnormal hot spots in power electronics and circuit boards.
- Mid-TRL space technology experiments are solicited to fly on a new space environmental effects platform on the outside of the ISS. The new platform is called MISSE-FF (MISSE-Flight Facility). MISSE-FF provides

experiment accommodations for both active experiments (requires power and communications) and passive experiments. The technology can be materials or non-materials (devices). The physical size of the experiments can vary depending on the technology being demonstrated (1 inch by 1 inch up to 7.84 inches by 14 inches). Of special interest are space technologies already developed under the NASA SBIR Program, particularly technologies that would mature in TRL due to successful demonstration in the space environment. The proposal should justify the need for spaceflight exposure and justify that the ISS environment is adequate to gather the data they need. The MISSE-FF commercial partner, Alpha Space Test & Research Alliance, LLC, plans to service MISSE-FF every 6 months. The MISSE-FF data will be made available to the global community of researchers through the NASA Physical Sciences Informatics (PSI) system. Phase I deliverables could be data from ground testing the candidate technology and passive specimens for flight on MISSE-FF. Phase II deliverables could include an active technology experiment, packaged and ready for flight on MISSE-FF.

For the above, research should be conducted to demonstrate technical feasibility and prototype hardware development during Phase I and show a path toward Phase II hardware and software demonstration and delivering an engineering development unit or software package for NASA testing at the completion of the Phase II contract that could be turned into a proof-of-concept system which can be demonstrated in flight.