NASA SBIR 2017 Phase I Solicitation

Z7.03 Deployable Aerodynamic Decelerator Technology

Lead Center: LaRC

Participating Center(s): ARC, GRC, JSC, MSFC

Technology Area: TA9 Entry, Descent and Landing Systems

Background: NASA is developing deployable aerodynamic decelerators to enhance, and enable, robotic and scientific missions to destinations with atmospheres such as Mars, Venus, and Titan, as well as returning payloads to Earth from Low Earth Orbit (LEO). The benefit to deployable decelerators is that relatively large atmospheric entry vehicles can be designed to fit within a comparatively small vehicle launch fairing. Deployable decelerator technology will enable delivery of an estimated 20 metric tons of payload required to support human exploration of Mars, and will also enable return of large payloads from Low Earth Orbit as well as launch asset recovery for reduced cost of space access. For Mars human exploration it is estimated that a deployable may have a diameter of 18 meters which, for an inflatable system, will require over 100 cubic meters of hydrogen gas at a weight of nearly 700 kilograms.

This subtopic area solicits innovative technology solutions applicable to deployable entry vehicles. Specific technology areas included in the subtopic can include the development of gas generator technologies used as inflation systems that result in improved mass efficiency and system complexity over current pressurized cold gas systems. Inflation gas technologies can include warm or hot gas generators, sublimating powder systems, or hybrid systems. Proposed approaches should clearly demonstrate that the inflation technology can be scaled to inflated aero-shells at a size relevant to human scale Mars exploration missions. These lightweight, high efficiency gas inflation technologies should be capable of delivering gas at 10,000 standard liters per minute.

Another research area included in the subtopic advancements in woven and non-woven textile technologies that can be used in the design and production of mass efficient flexible thermal protection systems such as durable high temperature fibrous insulators capable of operating above 1200°C that efficiently suppress both radiation and convective heat transfer. Thermal protection systems can be passive systems that do not rely on decomposition to manage heat loads, or more active systems where phase changes or material decomposition enhances thermal management capability.

Proposals in this area must clearly demonstrate large scale manufacturing capability together with durability against multiple packing and deployment cycles without loss of expected performance. Phase I products should include gas generator design and integration concepts, with Phase II delivering a prototype system at a scale capable of inflating a 3-6 m demonstration article.