The Expandable Structures subtopic solicits innovative structural concepts that support the development of lightweight structures technologies for expandable exploration space modules and surface based habitats. The targeted structural concepts are desired for utilization in primary pressurized volumes and in secondary structures internal to the deployed primary volume. Innovations in expandable structures technology is desired to minimize launch mass, volume, and costs, while maximizing operational volume and structural performance of a crewed or material transfer pressure vessel.

Inflatable structures is a research area within expandable structures, which offers a viable solution for increasing the volume of habitats, airlocks, and other crewed vessels. Inflatable structure concerns, due to the low level of maturity include: consistent and reproducible mechanical behavior, durability in the presence of micrometeoroid impact, incorporation of material for radiation shielding, crew-induced damage, and repair techniques for long term survivability. Other areas of concern include, pre-integration solutions, storage of a pressurized volume within an expandable structure, and deployment techniques. Solicitations which address topics in these areas would be welcomed.

One remaining area of interest is the development of innovative deployable secondary structures that have minimal mass, high packaging efficiency, and multi-functional utilization. One simple example of a secondary structure could be a walkway internal to a lunar surface habitat, which could be reconfigured as a storage container or a radiation shield during a major solar flare event. These secondary multi-functional structures should provide highly robust, stiff and mass efficient surfaces that enable the useful outfitting and pre-integration of subsystems within the primary structural volume.

In general, development of structural concepts can include structural components, methods of validation, and/or predictive analysis capabilities. Analytical and numerical methods to analyze the behavior of soft-goods from a global scale, down to the fabric and strap level are desired. Methods and designs for integrating instrumentation into soft-goods, including the ability to detect damage, creep (strains), loads in the primary restraint layers, and temperatures are also desired. Research should be conducted to demonstrate technical feasibility during Phase I and show a path toward a Phase II hardware demonstration, and when possible, deliver a demonstration unit for functional and environmental testing at the completion of the Phase II contract.