This subtopic solicits innovative research for advanced material concepts that support the development of lightweight structures technologies that should be applicable for space transportation vehicle systems, propulsion systems, and planetary access and operations. Advanced materials are targeted that could be implemented into structural and propulsion systems for CEV, CLV, and lunar mission vehicles, landers, and habitats. Innovations in technology are needed to increase specific strength and stiffness, provide radiation shielding, enable thermal management, and reduce Micrometeoroid/Orbital Debris (MMOD) damage potential while maintaining safety, reliability, and reducing costs.

Advanced material systems and their corresponding manufacturing and processing techniques are desired. Examples would include, but are not limited to, advanced polymer matrix, ceramic matrix, and metal matrix composites; high performance metals material systems (e.g., advanced aluminum alloys, titanium alloys, super alloys, refractory alloys); hybrid material systems, multifunctional material systems, self-monitoring and self-healing material systems; and mature applications of nano-structured materials. Processing examples would include, but not limited to, composite fiber tape placement, non-autoclave curing, ceramic processing, freeform fabrication, bonding of composites, metallic thermal spray, and friction stir welding/processing.

Development of concepts can include material system characterization, methods of validation, and/or predictive analysis methods that improve understanding of the technology to reduce risk and need for conservatism in design and demonstration of integrated system performance. Damage tolerance is a specific area of interest to include analytical tools, non-destructive evaluation technology and experimental techniques. NDE methods and techniques are needed to include 3D imaging and modeling of defects, and NDE technologies for determining early degradation of composites.