



NASA SBIR 2011 Phase I Solicitation

X5.02 Advanced Fabrication and Manufacturing of Metallic and Polymer Matrix Composite Materials for Lightweight Structures

Lead Center: LaRC

Participating Center(s): GRC, KSC, MSFC

The objective of the subtopic is to advance technology readiness levels of lightweight structures for launch vehicles and in-space applications, by using advanced materials and manufacturing techniques, resulting in structures having affordable, reliable, predictable performance with reduced costs. Performance metrics include: achieving adequate structural and weight performance; manufacturing and life cycle affordability analysis; verifiable practices for scale-up; validation of confidence in design, materials performance, and manufacturing processes; and quantitative risk reduction capability. Research should be conducted to demonstrate novel approaches, technical feasibility, and basic performance characterization during Phase I, and show a path toward a Phase II design allowables and prototype demonstration. Emphasis should be on demonstrable materials/manufacturing technology combinations that can be scaled up for very large structures.

Materials topics should focus on lightweight monolithic metallic materials or Polymer Matrix Composites (PMC) that, in combination with design modifications, can significantly reduce structural mass. Research should include assessment of the material response to forming and joining methods and verification of post-forming properties. Also of interest are high temperature PMC materials for high performance composite structures (high temperature applications), particularly those which are compatible with current composite manufacturing techniques. High temperature PMCs should enable reduction of vehicle mass through elimination or reduction of thermal protection systems. Another area of interest covers development of lightweight damage-tolerant materials that are compatible with forming methods that can significantly reduce structural mass. Proposals to each area will be considered separately.

Fabrication technology topics should focus on near-net-shape and automated manufacturing methods, which can reduce structural weight, processing, and assembly steps, and minimize joints, resulting in increased reliability and reduced cost, and characterization of material response to forming and joining methods. Other interests include development of laboratory scale test methods to accurately simulate large scale manufacturing for use in screening material behavior. Research should include computational modeling and simulation of material behavior and testing to characterize material properties and validate manufacturing methods.

