



## NASA SBIR 2014 Phase I Solicitation

### H5.04 Hot Structures

Lead Center: LaRC

This subtopic seeks to develop innovative low cost, mass and structurally efficient high temperature materials for hot structures applications.

The National Aeronautics and Space Administration (NASA) has developed hot structure technology for several hypersonic vehicles. Significant reductions in vehicle weight can be achieved with the application of hot structures, which do not require parasitic thermal protection systems (TPS). The most significant technical issue that must be addressed in hot structure design is the development of cost effective, environmentally durable and manufacturable material systems capable of operating at temperatures from 1500 °C to 3000 °C, while maintaining structural integrity. The development of these durable and affordable material systems is critical to technology advances and to enabling future economical hypersonic vehicles. Atmospheric re-entry from cis-lunar space will push the boundaries of thermal structures system technical capabilities. Advanced hot structures are required to enable these future missions.

This subtopic seeks innovative technologies in the following areas:

- Light-weight, low-cost, composite material systems that include continuous fibers.
- Significant improvements of in-plane and thru the thickness mechanical properties, compared to current high temperature laminated composites.
- Decreased processing time and increased consistency for high temperature materials.
- Low conductivity, low thermal expansion, high impact resistance.
- High temperature performance improved with oxidation resistant coatings.

Overall looking for 20% or greater reduction in mass and an order of magnitude reduction in cost.

For all above technologies, research, testing, and analysis should be conducted to demonstrate technical feasibility during Phase I and show a path towards Phase II hardware demonstration with delivery of a manufacturing demonstration unit for NASA testing at the completion of the Phase II contract.

Phase I Deliverables – Test coupons and characterization samples for demonstrating the proposed approach to develop the hot structure material product (TRL 2-3). Matrix of verification/characterization testing to be performed at the end of Phase II, along with specific quantitative pass-fail ranges for each quantity listed.

Phase II Deliverables – Test coupons and manufacturing demonstration unit for proposed material product. A full report of the material development process will be provided along with the results of the conducted verification matrix from Phase I (TRL 3-4). Opportunities and plans should also be identified and summarized for potential commercialization.

