



NASA SBIR 2017 Phase I Solicitation

A1.01 Structural Efficiency-Tailored Airframe & Structures

Lead Center: LaRC

Participating Center(s): AFRC

Technology Area: TA12 Materials, Structures, Mechanical Systems and Manufacturing

A primary goal of structural efficiency is to reduce structural mass. Reduced mass has the direct benefit of fuel burn savings, and it also influences noise and emissions by enabling advances in airframe configurations and in propulsion. The state of the art for lightweight airframe structures are carbon fiber reinforced polymeric composite structures which make up approximately 50% of the weight of Boeing's 787. Further improvements in structural efficiency above the state of the art are possible with tailored materials and structures. Tailored materials can improve the mechanical properties that directly affect structural mass, can provide functional properties that eliminate systems that add parasitic mass (e.g., to accommodate thermal, electrical, acoustic loads), or both. Tailored structures can improve the structural efficiency of existing airframe configurations and can enable new, non-traditional airframes. The tailoring covered for this subtopic solicitation is intended to apply to fuselage structures, and is further focused on one or more of the following:

- Tailoring mechanical properties beyond the state of the art by taking advantage of newly available product forms and precision robotic fabrication such as to control composite ply thicknesses and orientations
- Tailoring mechanical and functional properties through “designer microstructures” such as alloys that enhance fatigue, polymer composites with advanced fibers and/or nanostructured constituents, or hybrid metal-composite laminates, where the additional functional capability eliminates a parasitic mass (e.g., lightning protection, cooling systems, acoustic dampening)
- Design and analysis codes that enable development of structural concepts that utilize the aforementioned tailored properties, product forms, and fabrication processes to developed fuselage structures for traditional tube-wing and for advanced configurations.

For this subtopic, the Phase I proposal should identify an airframe component/application that would be the target of the tailored material and/or structural approach, should describe how the proposed approach would provide a significant improvement in structural efficiency over the state of the art, and should describe how the feasibility of the innovation to achieve this improvement will be demonstrated in a Phase I effort. The intention of a Phase II follow-on effort would be to develop or to further mature the necessary design/analysis codes, and to validate the approach through design, build, and test of an article representative of the component/application identified in Phase I.

Note: This subtopic is distinctly addressing materials (including product forms and processing), structures and design technologies as they relate to tailored airframe structures. If you are interested in proposing technologies addressing sensors, simulation, and analysis for NDE (and specifically how they relate to space technology) you should NOT propose to this subtopic but instead view subtopics ID# 130 and 131.

