



NASA SBIR 2014 Phase I Solicitation

A3.01 Structural Efficiency-Aeroservoelasticity

Lead Center: LaRC

Participating Center(s): AFRC

The technical discipline of aeroelasticity is a critical ingredient necessary in the design process of a flight vehicle for ensuring freedom from catastrophic aeroelastic and aeroservoelastic instabilities. This discipline requires a thorough understanding of the complex interactions between a flexible structure and the unsteady aerodynamic forces acting on the structure and at times, active systems controlling the flight vehicle. The Fundamental Aeronautics Program's work on Structural Efficiency for the FY 2014 NASA SBIR solicitation is focused on aeroservoelasticity active structural control for lightweight flexible structures, specifically related to load redistribution, flutter prediction and suppression, and gust load prediction and alleviation. Of interest are:

- Aeroservoelastic analyses at the appropriate level of fidelity for the problem at hand.
- Aeroservoelastic experiments to validate methodologies and to gain valuable insights available only through testing.
- Development of computational-aeroservoelastic analysis tools that advance the state of the art in aeroelasticity through novel and creative application of aeroelastic knowledge.

Specific subjects to be considered include:

- Development of design methodologies that include CFD steady and unsteady aerodynamics, flexible structures, and active control systems.
- Development of efficient methods to generate mathematical models of wind-tunnel models and flight vehicles for performing aeroservoelastic studies. Example: CFD-based methods (reduced-order models) for aeroservoelasticity models that can be used to predict and alleviate gust loads, ride quality issues, flight dynamics stability and control issues, and flutter.
- Development of aeroservoelasticity concepts and models, including unique control concepts and architectures that employ smart materials embedded in the structure and/or aerodynamic control surfaces for suppressing aeroelastic instabilities or for improving performance.
- Development of techniques that support simulations, ground testing, wind-tunnel tests, and flight experiments of aeroservoelastic phenomena.