



NASA SBIR 2011 Phase I Solicitation

A2.09 Rotorcraft

Lead Center: ARC

Participating Center(s): GRC, LaRC

The challenge of the Subsonic Rotary Wing thrust of the NASA Fundamental Aeronautics Program is to develop validated physics-based multidisciplinary design-analysis-optimization tools for rotorcraft, integrated with technology development, enabling rotorcraft with advanced capabilities to fly as designed for any mission. Technologies of particular interest are as follows:

Experimental Capabilities: Instrumentation and Techniques for Rotor Blade Measurements

Instrumentation and measurement techniques are encouraged for assessing scale rotor blade boundary layer state (e.g., laminar, transition, turbulent flow) in simulated hover and forward flight conditions, measurement systems for large-field rotor wake assessment, and fast-response pressure sensitive paints applicable to blade surfaces.

Acoustics: Interior and Exterior Rotorcraft Noise Generation, Propagation and Control

Interior noise topics of interest include, but are not limited to, prediction and/or experimental methods that enhance the understanding of noise generation and transmission mechanisms for cabin noise sources (e.g., power-train noise), active and combined active/passive methods to reduce cabin noise, and novel structural systems or materials to reduce cabin noise without an excessive weight penalty. Exterior noise topics of interest include, but are not limited to, noise prediction methods that address the understanding of issues such as noise generation, propagation, and control. These methods may address topics such as novel or drastically improved source noise prediction methods, novel or drastically improved noise propagation methods (e.g., through the atmosphere) to understand and/or control noise sources and their impact on the community. Methods should address one or more of the major noise components such as: harmonic noise, broadband noise, blade-vortex interaction noise, high-speed impulsive noise, interactional noise, and/or low frequency noise (e.g., propagation, psychoacoustic effects, etc).

Rotorcraft Power Train System Improvements

Health management of rotorcraft power trains is critical. Predictive, condition-based maintenance improves safety, decreases maintenance costs, and increases system availability. Topics of interest include algorithm development, software tools and innovative sensor technologies to detect and predict the health and usage of rotorcraft dynamic mechanical systems in the engine and drive system. Rotorcraft health management technologies can include tools to: increase fault detection coverage and decrease false alarm rates; detect onset of failure, isolate damage, and assess damage severity; predict remaining useful life and maintenance actions required; system models, material failure models and correlation of failure under bench fatigue, seeded fault test and fielded data; tools to correlate propulsion system operational parameters back to actual usage and component fatigue life; Also of interest are advanced gear technologies for rotorcraft transmissions.

Proposals on other rotorcraft technologies will also be considered as resources and priorities allow, but the primary emphasis of the solicitation will be on the above three identified technical areas.

