NASA SBIR 2005 Phase I Solicitation

A2.05 Electric Drive Components, Power Management and Distribution Technologies

Lead Center: GRC

Participating Center(s): GSFC, JPL, JSC

Future environmentally harmonious aircraft propulsion systems may be driven by electric power. These new systems will likely be fueled by hydrogen stored as a cryogenic liquid. Like all flight systems, these new electric based propulsion concepts will require each component to be extremely lightweight, especially when compared to similar ground-based systems. Future specific power requirements for the entire propulsion system from power supply to electric motor could reach 20-kW/kg. The total electric power supplied for aircraft will be orders of magnitude higher than for existing flight-rated secondary electrical systems. Future high power electric systems present a number of challenges for application to volume and weight limited aircraft. NASA is interested in the development of innovative technologies that demonstrate the feasibility of high power densities (>5kW/kg) for electric power delivery and propulsion. Specific areas of interest include but are not limited to the following:

- High power density electric motors and actuators, including superconducting, cryogenic and non-cryogenic systems;

- Cryogenically cooled lightweight, possibly superconducting, high power transmission lines;

- Cryogenically cooled and non-cryogenic lightweight power conditioning and control technology including technologies for isolation of noise-sensitive avionics power busses from main propulsion power busses;

- Cryogenically cooled and non-cryogenic lightweight high voltage high power density power management components;

- Highly integrated dual function components and systems that have the potential to reduce overall vehicle and subsystem weight (e.g., power conductors that are integrated into the airframe structure, motors directly integrated into the fan/propeller structure);

- Advanced enabling technologies such as nanoelectronics, smart sensors, and actuators;

- Advanced diagnostics, health monitoring and control concepts, smart sensors, electronics and actuators for enabling self-diagnosis and prognosis, and self-reconfiguration capabilities;

- Concepts that integrate distributed sensing with actuation and control logic for micro-level control of parameters (such as propulsion system internal flows, electrical states, etc. that impact performance and environment).
Proposals must show improvements to the state-of-the-art and viable application to aircraft.