



## NASA SBIR 2018 Phase I Solicitation

### A1.07 Electrified Aircraft Propulsion & Concepts

Lead Center: GRC

Participating Center(s): AFRC, LaRC

Technology Area: TA15 Aeronautics

Proposals are sought for the development of enabling power systems, turbofan engines, range extenders, electric machines, batteries, power converters, electrical fault management systems, protective devices (such as circuit breakers), and related materials that will be required for future thin/short haul aviation or commercial transport vehicles which use turboelectric, hybrid electric, or all electric power generation as part of the propulsion system. Electrified Aircraft Propulsion work for urban air mobility (UAM) should be proposed against subtopic A1.06 Vertical Lift Technology and Urban Air Mobility. Turboelectric, hybrid electric, and all electric power generation as well as distributed propulsive power have been identified as candidate transformative aircraft configurations with reduced fuel consumption/energy use and emissions. However, components and management methods for power generation, distribution, and conversion are not currently available in the high-power ranges with the necessary efficiency, power density, electrical stability and safety required for thin haul/short haul, or transport-class aircraft. Novel developments are sought in: aircraft power systems operating at or above 1000V, turbofan engines in which >20% of power is extracted electrically, range extenders which consume fuel and produce electricity with significantly higher efficiency than available turbogenerator or diesel generators, batteries and other energy storage systems with specific energy >400Whr/kg at the system level and cycle life >10,000 cycles, electric machines (motors/generators) with efficiency >98% and specific power >13 kW/kg, converters (inverters/rectifiers) with efficiency >99% and specific power >19kW/kg, light weight AC and DC electrical fault management systems and protective devices (such as circuit breakers), soft magnetic material with high magnetic saturation and/or lower losses for 100kHz-300kHz operation, hard magnetic materials with an energy product greater than neodymium iron boron, conductors with a specific resistivity less than copper or aluminum and cable insulation materials with increased dielectric breakdown strength, and significantly higher thermal conductivity ( $1\text{W/m}\cdot\text{K}$ ) and resistance to ageing effects such as corona, ozone, humidity and dust operating at greater than 3kV. Individual components should target the 15kW-3MW size range and would be combined into power systems in the range of 200kW-10MW total power.

Areas of particular interest this year are: turbofans in which >20% of power is extracted electrically, range extenders which burn fuel and produce electricity with significantly higher efficiency than available turbogenerator or diesel generators, and light weight AC and DC electrical fault management systems.