



NASA SBIR 2017 Phase I Solicitation

A1.03 Low Emissions Propulsion and Power-Turboelectric and Hybrid Electric Aircraft Propulsion

Lead Center: GRC

Participating Center(s): AFRC, LaRC

Technology Area: TA15 Aeronautics

Proposals are sought for the development of enabling power systems, electric machines, power converters, and related materials that will be required for future small (9 + pax) to large (500 + pax) commercial transport vehicles which use turboelectric or hybrid electric power generation as part of the propulsion system. Turboelectric and hybrid electric power generation as well as distributed propulsive power have been identified as candidate transformative aircraft configurations with reduced fuel burn 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 transport-class aircraft. Novel developments are sought in:

Power Systems:

- Aircraft power systems operating above 1000V.
- Novel power system topologies that minimize the weight and electrical losses.

Power Components:

- Electric machines (motors/generators) with efficiency >98% and specific power >13 kW/kg, power >200kW.
- Converters (inverters/rectifiers) with efficiency >99% and specific power >19kW/kg, power >200kW.
- Circuit protection devices significantly lighter and with lower losses than the state of the art.
- Aircraft Energy Storage:
 - Rechargeable energy storage with usable specific energy at the integrated level (packaging and power management system included) >500 W-hr / kg.
 - Rechargeable energy storage with usable specific energy at the integrated level (packaging and power management system included) >250 W-hr / kg, >5C charge rate and full discharge cycle life >10,000 cycles.

Materials:

- Soft magnetic material with magnetic saturation >2.5 T.
- Hard magnetic materials with an energy product greater than neodymium iron boron.
- Conductors with a specific resistivity less than copper.
- Cable insulation materials with significantly higher dielectric strength and thermal conductivity than the state

of the art.

Individual components should target the 50kW-3MW size range and would be combined into power systems in the range of 500kW-10MW total power.