

## Progress on a 100 kW Superconducting Propulsion Unit for Zero Emission Aviation

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***Abstract***—This presentation summarizes the development and testing progress of a 100 kW superconducting propulsion unit designed for zero-emission aviation. The findings draw from two major UK-funded projects, in collaboration with Airbus UpNext. The propulsion unit features an axial-flux fully superconducting motor and an integrated cryogenic drive system. The motor, comprising two HTS stators and one HTS rotor, is designed to achieve a power density target of 15 kW/kg.

The HTS stator utilizes double-stacked HTS windings to increase current loading while maintaining relatively low AC losses. The HTS rotor incorporates a novel charging system that enables persistent-current operation with low-resistance soldered joints. Complementing the motor, the cryogenic drive system features three-phase IGBT switches with customized cryogenic gate drives.

The presentation will detail the latest advancements in motor and drive design, along with testing results for the customized cooling system, HTS stators, HTS rotor, and the cryogenic motor drive. These developments represent significant progress toward achieving sustainable propulsion systems for future aviation.

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