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[Invited] Development of Cryogenic/Superconducting Components for Aircraft Electric Propulsion

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Megawatt (MW) class electric power systems will be needed in the next 5-10 year timeframe, not only for directed energy (DE) applications, but also for hybrid-electric or electric propulsion drivetrains for aerospace vehicles. There is question whether conventional technologies already established can meet this challenge with sufficient power densities and efficiencies, or whether alternate technologies might be needed such as cryogenic and/or superconducting. It is already established that Cu-wire technologies, as heavy as steel, are simply too heavy for some aerospace applications Superconducting/cryogenic power system components have intrinsic advantages for MW power systems, such as greatly size, weight and power (SWaP) requirements. In this paper, these unique properties and technical readiness assessment of different cryogenic and superconducting components will be reviewed, and compared to alternate traditional technologies such as Cu-wire based and semiconducting. The impact of these technologies will also be provided, for case-studies of hybrid-electric aircraft.

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