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M3Or3B-04: Test Results for the Commissioning of NASA's AC Loss Superconducting Coil Test Rig

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Achieving sustainability in commercial aviation hinges on the transformation of large transport aircraft (>150 passengers), which are the principal contributors to aviation emissions. These 150+ passenger aircraft have powertrains with rated power in excess of 20 Megawatts. System studies have shown that the highest possible aircraft efficiencies can be obtained for fully superconducting electrified aircraft, which rely on electric machines that contain superconducting coils. Two superconducting wires that may meet NASA's demands for electrical current density and low alternating current (AC) loss under dynamic magnetic and electrical excitation are magnesium diboride (MgB2) and BSCCO-2212 (Bi:2212). To enable these aircraft that utilize fully superconducting motors and generators, testing of high-current, low-AC-loss superconducting wires, cables, and coils such as MgB2 and Bi:2212 must be performed. NASA Glenn Research Center has recently developed an AC loss test rig that can excite specimens with magnetic fields of about 0.5 T at frequencies up to 400 Hz while cooling them to temperatures between room temperature and 20 K. The magnetic field excitation is relevant to electric machines, because it is applied by a spinning permanent magnet rotor. This presentation will summarize the capabilities of the new test rig and cover test results towards commissioning of the rig that have been performed to-date.

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