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Impact of Pulsed Power Loads on Advanced Aircraft Electric Power Systems with Hybrid Fuel-Cell/Battery APU

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Pulsed power loads such as electromagnetic guns, electron lasers, high-power radars, electromagnetic launch and recovery systems can cause significant stress on aircraft electric power systems. In this paper, the performance characteristics of a fully integrated advanced aircraft electric power system (AAEPS) with a hybrid fuel cell-battery auxiliary power unit and connected pulsed power loads are investigated. Connected pulsed power loads on aircraft electric power systems may cause the power generator to undergo transient behavior which in turn can cause significant stresses in the shaft and the actuator. Moreover, pulsed power loads can also affect the power quality and voltage stability of the aircraft electric power system. Drawing short-duration high power in an intermittent fashion by the pulsed loads can cause frequency and voltage fluctuations which may lead to sensitive load malfunctioning and instability of the aircraft power distribution network. In this paper, the impact of pulsed power loads has been studied with different scenarios and case-studies. The results obtained stresses the need develop and install compensating devices to maintain the stability of the AAEPS in the event of severe pulsed power load operation.

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