

Vibration Energy Harvesting from Aircraft Structure Using Piezoelectric Transduction

Authors : M. Saifudin Ahmed Atique, Santosh Paudyal, Caixia Yang

Abstract : In an aircraft, a great portion of energy is wasted due to its inflight structural vibration. Structural components vibrate due to aeroelastic instabilities, gust perturbations and engine rotation at very high rpm. Energy losses due to mechanical vibration can be utilized by harvesting energy from aircraft structure as electrical energy. This harvested energy can be stored in battery panels built into aircraft fuselage and can be used to power inflight auxiliary accessories i.e., lighting and entertainment systems. Moreover, this power can be used for wireless Structural Health Monitoring System (SHM) for aircraft and as an excellent replacement of aircraft Ground Power Unit (GPU)/Auxiliary Power Unit (APU) during passenger onboard time to power aircraft cabin accessories to reduce aircraft ground operation cost significantly. In this paper, we propose the design of a noble aircraft wing in which Piezoelectric panels placed under the composite skin of aircraft wing will generate electrical charges from any inflight aerodynamics or mechanical vibration and store it into battery to power auxiliary inflight systems/accessories as per requirement. Experimental results show that a well-engineered piezoelectric energy harvester based aircraft wing can produce adequate energy to support in-flight lighting and auxiliary cabin accessories.

Keywords : vibration energy, aircraft wing, piezoelectric material, inflight accessories

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