

Factorial study on seated aircraft passengers' body heat harvesting

ABSTRACT

The increased electrical power demand for aircraft subsystems drives the search for a new alternative onboard power source. One of the solutions that have been proposed is the heat energy harvesting of the aircraft passengers' body. Taking advantage of the Seebeck effect phenomenon, the dissipated heat from seated passengers' body can be converted into useful electrical power using a thermoelectric generator. The main objective of this study is to establish whether the performance of such heat harvesting system is highly dependent on the passengers' body features and cabin environmental temperature. An experiment with 10 volunteers using a mock-up aircraft passenger cabin setup is conducted and the temperature readings when they are seated on the aircraft seat is recorded through installed thermal sensors. The collected data is then analyzed using Analysis of Variance (ANOVA) method to find the factorial contribution of volunteers' age, weight, height and gender, plus the ambient temperature, on the performance of the heat harvesting system. In this case, potential performance of such energy harvesting is measured by the maximum temperature differential that can be possibly obtained. Based on ANOVA results, the passengers' weight, height, age and gender do not have a significant effect on the temperature differential. This can be taken to imply that the heat harvesting performance is not highly dependent on the passengers' characteristics. In contrast, ambient temperature is found to be influential, meaning that operational performance of such heat harvesting mechanism can be controlled through appropriate setting of the cabin environmental temperature.

Keyword: Heat energy harvesting; Aircraft electrical power; Passenger body heat; Analysis of variance