SUMMARY OF MASTER'S DISSERTATION

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Title

Marketing and the Airframe Design Optimization of a Flying Car

Abstract

A flying car is envisaged as a futuristic transportation for an air taxi, an air ambulance, a sightseeing aircraft, etc. Especially, the air taxi service by a flying car called electrical Vertical Take-Off and Landing (eVTOL), urban air mobility or passenger drone has potential to relieve serious ground traffic jams in urban cities by point-to-point movement in the air. First, the demand forecast of the air taxi service in the USA is conducted for marketing by the multinomial logistic model. The result shows 29 percentages share in the USA. It is not that the demand of a flying car as on-demand service cannot present in the USA. However, stakeholder interviews for the requirement analysis of a flying car shows that an air ambulance service is earlier than an air taxi service to be implemented due to its higher social acceptance. Secondly, the design optimization of both a multicopter and a tilt-rotor is conducted by the weighted multiple objective optimization method in the case of an air ambulance to prove that a tilt-rotor is more efficient than a multicopter and to provide lower level requirements of a rotor and a battery. A flying car model refers to Cartivator's multicopter and tilt-rotor. The simulation scenario is based on the requirement analysis with stakeholder interviews. The result shows that a tilt-rotor type is 37 percentages efficient at least in terms of energy. The require battery system energy density is over 230 Wh/kg at least. Thus, the evolution of a battery capacity is necessary for realizing a electrical flying car.

Key Word(5 words)

Flying car, System optimization, System design, Multinomial Logistic Model, Airframe analysis