

Evaluation of the Influence of the Slot Installation Angle on the Thrust Force of a Slotted Propeller of an UAV

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Abstract

The use of unmanned aerial vehicles (UAVs) has grown significantly in recent years. Quadcopters and octocopters, which can perform a variety of functions depending on the mission and UAVs parameters, are attracting particular attention. The aerodynamics of UAVs propellers is one of the factors that determines the efficiency and acoustic emissions of UAVs. This paper examines the characteristics of slotted UAV propellers. Previous studies have shown that placing a slot in the middle of the blade at 50% of the chord allows for a 10% increase in propeller thrust. This paper evaluates the effect of the slot angle on propeller thrust changes under different operating conditions. The object of study is a 10X4.5 propeller. Thrust tests were conducted in the rotation speed range of 4000–7000 RPM. Calculations were performed in Ansys CFX. The slot angle varied from -70° to 45° . The results of the tests showed that the slot angle and propeller operating mode influence the amount of thrust generated. A propeller with a slot angle of -45° is the most optimal; thrust increases by 11% compared to a propeller without a slot. The resulting effect is similar to the flow around an aircraft wing with a flap. Future studies are planned to examine the effect of slot length on propeller efficiency.

Keywords

Propeller, Thrust, Slot, CFD, Efficiency, Abstract, UAV.

