The Power of Eta in Propulsive Engineering

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The problem that faces every mechanical engineer, aerospace engineer, automobile manufacturer, airplane designer, and anyone working with engines in general is how to obtain more efficiency. Ascertaining this would contribute to the solution of many problems in mechanics today, such as lack of fuel efficiency. Therefore, in order to work towards a solution, this project worked to improve the propulsive efficiency of the propeller on a widely used, small military reconnaissance UAV (Unmanned Aerial Vehicle), Raytheon's Silver Fox. Since propellers have great bearing on the overall efficiency of an aircraft, because they are the instrument that transforms engine power to thrust, the UAV would be greatly improved if greater propeller efficiency was achieved. It was hypothesized that it is possible to design a propeller that is more efficient than the current. This is possible because entities such as the pitch, thickness ratio, chord length, and angle of attack can be changed for greater efficiency. The results showed that the newly designed propeller was able to greatly increase the propeller efficiency. In fact, the efficiency increase was 125.38% compared to the efficiency from the stock propeller. At cruise speed (about 29 m/s) the optimized propeller was able to achieve 77% efficiency while the stock propeller only reached 41%, a 36% difference. Conclusively, the optimized propeller was able to profoundly affect the overall efficiency and performance of the UAV, thereby accepting the hypothesis.

Awards Won: