Blown Away: Improving Propeller Efficiency with Natural Flow Propeller Shrouds

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Propeller shrouds can increase propeller efficiency. The purpose of the experiment was to determine if a propeller shroud modeled after the propeller's natural slipstream could increase propeller efficiency. Three shrouds were created; one modeled after the propeller's slipstream in a dynamic environment, one modeled after the slipstream in a static environment, and one modeled after a straight slipstream. It was hypothesized that the highest propeller efficiency could be achieved with the propeller shroud modeled after the propeller slipstream. Each shroud was built in sections of 5, 10, 15, 20 cm so that different shroud chords could be tested. The thrust (N) of the propeller driven by a battery powered motor was measured and recorded by the thrust stand consisting of 3 load cells and 3 load cell amplifiers. The power (W) was measured by a power analyzer. Results showed that a natural flow propeller increased efficiency the most in the environment it was modeled after. The dynamic flow shroud improved efficiency 25.0% in the dynamic environment. The static flow shroud improved efficiency 44.45% in the static environment. In conclusion, a propeller shroud modeled after the shape of the slipstream provided a significant efficiency increase. The data suggests that a natural flow shroud could increase flow efficiency in any fluid flow application.

Awards Won:

Society of Experimental Test Pilots: Second Award of $1000