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# Progress Toward an Understanding of Wake Ingestion through Experiments in the High Contraction Wind Tunnel

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## ABSTRACT

Recently, there has been a renewed interest at major aircraft and engine companies in increasing the thrust per horsepower of aircraft jet engines by ingesting the aircraft's wake. However, the phenomenon is not well understood and at least four different equations have been published to calculate the propulsive efficiency, defined as the ratio of the power required to the power supplied. The objective of this research is to obtain data that will test these different definitions of propulsion efficiency to improve our understanding of the phenomenon. The approach will be to conduct an experiment to measure the thrust and power of a propeller ingesting the boundary layer from a model aircraft fuselage. Performance metrics will be analyzed using a simple axisymmetric body to generate thick boundary layers at various velocities in the Purdue High Contraction wind tunnel. An electric motor with measurable power input is used to drive a propeller blade to generate thrust equal to the body drag. Power input will be determined using a torque and watt meter. Total pressure profiles downstream of the body and the propeller will be measured using an array of Pitot tubes. The measured propulsive efficiency will be compared to the different definitions of efficiency.

## KEYWORDS

Wake Ingestion, Boundary Layer, BLI, Propulsion, Propeller Efficiency