

## **OIL FILM INTERFEROMETRY (FLOW VISUALIZATION AND SKIN FRICTION DRAG CALCULATION)**

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Oil film interferometry on a polished airfoil surface can be used to visualize the flow near the surface, especially when laminar flow transitions to turbulent flow. Beyond just qualitative flow visualization, this method can be used to generate quantitative local aerodynamic wall-shear stress. This flow can be photographed, and the observed interferometry images can be used to calculate aerodynamic forces.

Some preliminary work has already been completed by the U of I Aerodynamics team and a prior capstone design team using aerodynamic shapes in the low-speed wind tunnel. The prior capstone team was able to estimate the increased drag caused by round-headed rivets, which can be reduced using flat-headed, countersunk rivets in the panels on the aircraft.

The idea behind this project is to develop an apples-to-apples comparison between similar shapes in the wind tunnel and in flight using a Kodiak aircraft. As an example, a horizontal tail leading edge could be modeled in full scale, equipped with the necessary mirrored surface, and tested in the wind tunnel; at the same time, the same airfoil could be installed in a Kodiak aircraft, flown, and photographed to compare the results and demonstrate the large-scale applicability of this measurement technology. Additional research could include the effects of rivets and skin discontinuities on the visualization results.

The available budget for student spending is ~\$800, with potentially more available if needed.

Engineering Disciplines: ME