

THE AERODYNAMICS OF BIRD FLIGHT

Background

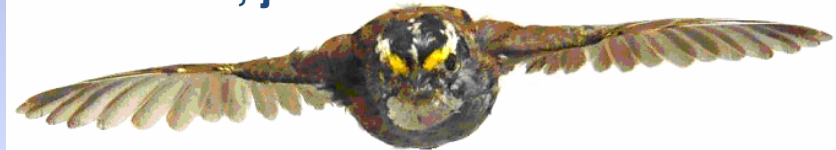
In order to assess how bird migration may be affected by climate change, it is necessary to understand the relationship between flight dynamics and energy consumption.

Objective

The new climate-controlled wind tunnel (part of the Advanced Facilities for Avian Research at UWO) will be used to determine the aerodynamics of live birds using real-time PIV wake measurements.



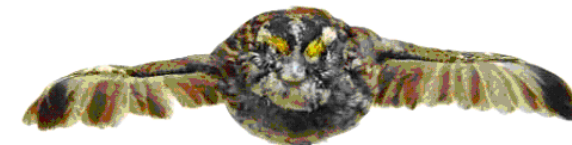
Wings fully extended over the back, just before down stroke



Mid down stroke



Bottom of the down stroke



Mid up stroke

Bird models (white-throated sparrow)

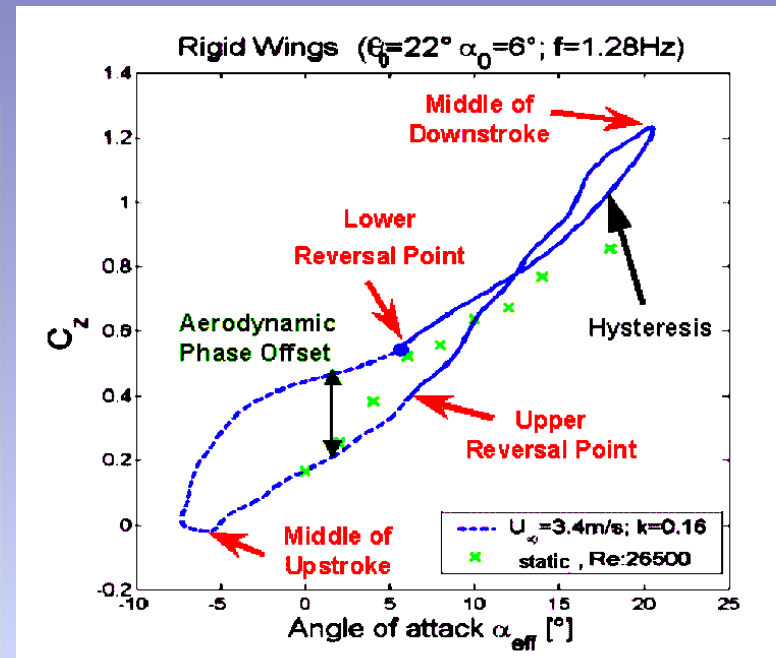
Research To Be Carried Out

In order to carry out such challenging measurements an initial program of work is in progress, using static models with fixed wing positions attached to a force balance. Wake velocity data, taken in planes using PIV, will be correlated to these forces.

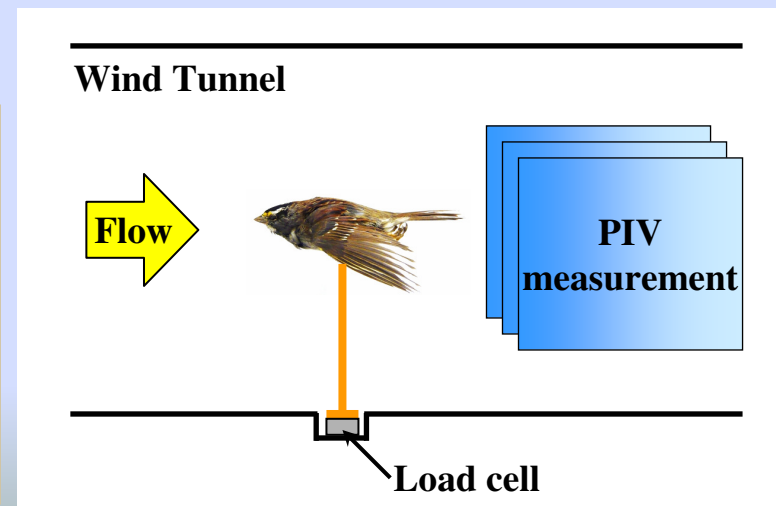
Expected Outcomes

Establishment of a validated methodology for determining the aerodynamic forces acting on a live bird during flight, using time-resolved PIV measurements.

^[1]T. Hubel and C. Tropea, 2006, "Experimental investigation of a flapping wing model", 12th Int. Symp. on Flow Visualization, Göttingen



Vertical force coefficient versus effective angle of attack ^[1]



Schematic of force and wake profile measurements