Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

PIV-based study of the gliding osprey aerodynamics in a wind tunnel ROI GURKA, Ben-Gurion U., ALEX LIBERZON, Tel-Aviv U., GREGORY KOPP, ADAM KIRCHHEFER, U. of Western Ontario, DANIEL WEIHS, Technion — The hunting flight of an osprey consists of periods where the bird glides while foraging for prey. High quality measurements of aerodynamics in this flight mode are needed in order to estimate the daily energy expenditure of the bird accurately. An experimental study of an osprey model in a wind tunnel (BLWTL, UWO) was performed in order to characterize the aerodynamic forces using particle image velocimetry (PIV). The model was a stuffed osprey with mechanical joints allowing control of the the wing (angle of attack, tilt) and tail orientation. Two-dimensional velocity realizations in the streamwise-normal plane were obtained simultaneously in the two fields of view: above the wing and in the wake of the wing. Mean and turbulent flow characteristics are presented as function of angle of attack based on measurements taken at 4 different angles of attack at three different locations over the wingspan. The main outcome is the accurate estimate of the drag from the measurements of momentum thickness in the turbulent boundary layer of the osprey wing. Moreover, the gradient of the momentum thickness method was applied to identify the separation point in the boundary layer. This estimate has been compared to the total drag calculated from measurements in the wake of the wing and with a theoretical prediction.

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Date submitted: 14 Jul 2009 Electronic form version 1.4