Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Aerodynamics of a freely flying owl from PIV measurements in the wake HADAR BEN-GIDA, Technion, ROI GURKA, Coastal Carolina University, DANIEL WEIHS, Technion — The mechanisms of the silent flight of owls have been the subject of scientific interest for many decades and a source of inspiration in the context of reducing flight noise. Over millions of years of evolution, owls have produced many specialized configurations to reduce the aerodynamic noise, which is found to be essential for successful hunting of potential prey. Here, we study how the three-dimensional flow field formed over the wing affect the vortical structures develop in the wake of a freely flying owl. We study the unique flight patterns of the Boobook owl; a mid-sized owl, which has the feature of stealth flight during both gliding and flapping flight. The owl was flown in a hypobaric avian wind tunnel at its comfort speed for various flight modes. The wake velocity field was sampled using long duration high speed PIV whilst the wing's kinematics were imaged using high speed video simultaneously with the PIV. The time series velocity maps acquired during few consecutive wingbeat cycles enabled to describe the various flow features as formed at the owl's wake by reconstructing the wake patterns and associate them with the various phases of the wingbeat cycle. The stealthy flight mode, which is a result of noise reduction mechanisms, formed over the wings (presumably by the leading-edge serrations) results in a unique signature in the wake flow field, which is characterized using the present data.

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Date submitted: 29 Jul 2015 Electronic form version 1.4