Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Quantitative analysis of fish wake dynamics using volumetric PIV data LEAH MENDELSON, ALEXANDRA TECHET, MIT — In the study of swimming hydrodynamics, the fluid impulse in the wake is used to quantify the momentum transferred by the fish as it swims. This impulse is typically computed from planar PIV measurements of the wake circulation and geometry by assuming an axisymmetric vortex ring model. However, in many propulsive and maneuvering scenarios, three-dimensional effects are of substantial importance, and wake features are not often an isolated, symmetric vortex ring. Volumetric PIV data provides a complete measure of the vortex geometry and orientation, and circulation can be determined over multiple planar slices through the volume. Using sample datasets obtained from synthetic aperture PIV (SAPIV), we demonstrate how the availability of volumetric PIV data enables more detailed analysis of hydrodynamic impulse and characterize the uncertainty created by planar measurements. Special attention is paid to unsteady maneuvering behaviors that generate asymmetric and linked wake features.

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Date submitted: 30 Jul 2013 Electronic form version 1.4