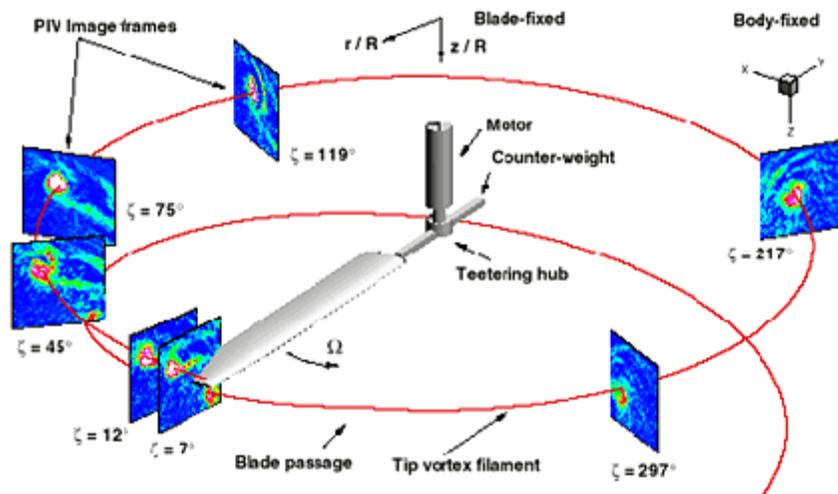


# HOVERING HELICOPTER ROTOR WAKE

APPLICATION NOTE STEREOPIV-001

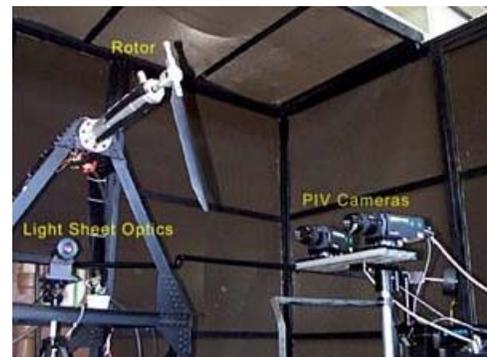
Courtesy: University of Maryland



[Play Rotor Wake Animation](#)  
(Flash Movie - 511 KB)

[Play Image Frame Animation](#)  
(Flash Movie - 324 KB)

An improved understanding of the formation and evolution of the wake and tip vortices trailed from the blades of a helicopter rotor is one key to advanced vehicle designs. The blade loads and overall performance of the rotor system are highly dependent upon the strengths and locations of the tip vortices relative to the rotor. In addition, during descending low-speed forward flight, blade-vortex interaction (BVI) results in locally large unsteady airloads on the blades, leading to increased rotor vibration levels and the generation of impulsive rotor noise.



A PowerView™ StereoPIV system was used to make measurements in the wake field of a helicopter rotor. The single rotor blade is shown as well as the motor and counterweight. The rotor is thrusting upwards and the flow passes down through the X-Y plane. Trailing from the tip of the blade is a vortex filament shown by the red line. In contrast



to a fixed-wing aircraft, the vortices trailing from a hovering helicopter remain in close proximity to the aircraft lifting surfaces.

Slices of the flow field (PIV image frames) are shown at various azimuthal locations with respect to the rotor blade. In each frame contours of vorticity are plotted. The vorticity is computed from the 3-D measurements of the velocity field.

The data was acquired during a cooperative effort between the University of Maryland and TSI, Inc. The TSI PowerView™ PIV System integrates Tecplot® into its INSIGHT™ software so that the results of many velocity field measurements are easily combined into a summary figure such as this.

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