Abstract Submitted
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Flow-structure interaction of falling cones in unbounded flow media DAN TROOLIN, LAI WING, TSI, YAQING JIN, A.H. HAMED, Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, CARLO ZUNIGA ZAMALLOA, University of Illinois at Urbana-Champaign, LEONARDO P. CHAMORRO, Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign — The kinematics of falling objects in a fluid media at rest are dominated by the vorticity dynamics generated in the vicinity of the object. At a critical Reynolds number, the large-scale vortical structures shed by the body lose their axisymmetric character leading to unsteady lift and, consequently, body rotation. The dynamics of these motions depend on the body shape and can range from simple oscillatory motions to chaotic behavior. In this study, 2D and 3D Particle Image Velocimetry (PIV) are used to characterize the turbulence in the vicinity of cones of various shapes (aspect ratios) falling in a fluid media at complete rest. Translations and rotations experienced by the cones are tracked with a miniature and highly sensitive 3-axis accelerometer and 3-axis gyroscope inserted in the object. Coupling between vortex dynamics and body motions is characterized at various Reynolds numbers and cone shapes.

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