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Rotor Vortex Wake in Close Proximity of Walls in Hover MEHMET FATIH KONUS, OMER SAVAS, University of California at Berkeley — Expanding flight envelopes of rotorcraft raise concerns about their behavior in very close proximity of walls or corners where the separation between the wall and the rotor disk can almost vanish. A series of experiments are conducted in a water tank to study the hover behavior of the wake of a 25-cm diameter three-bladed rotor at 8 rev/s. Particle image velocimetry, strain gage force balance measurements and flow visualization are employed. The vortex wake, which is axisymmetric on the average in an unbounded surrounding, is distorted increasingly with decreasing separation from a wall or corner. The vortex wake bends toward the wall and into the corner. The individual helical filaments off the rotor tips are distorted and closely follow the wall. Intermittent reversed vortical flow regions appear upstream of the rotor disk in the proximity of the wall. The mean streamlines indicate that the wake is bent toward the wall or into the corner. The component of the thrust vector along the axis of the rotor decreases. These observation suggest that the thrust vector progressively deviates from the geometric axis of the rotor.

> Omer Savas University of California at Berkeley

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