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Dynamic vortex interactions with flexible fibers and edges for prediction of owl noise suppression SARAH KORYKORA, JUSTIN JAWORSKI, Lehigh University — The compliant trailing-edge fringe of owls and the soft downy material on their upper wing surfaces are thought to enable their silent flight by weakening the interaction of boundary layer turbulence with these flexible structures. Previous analysis of turbulence noise generation by wave-bearing elastic edges have shown that the far-field acoustic power scaling can be weakened by up to the square of the Mach number relative to a rigid edge. However, it is unclear whether or not the wave-bearing feature or simply the flexible nature of the edge scatterer produces this noise suppression. To assess this distinction, a dynamic vortex interaction model is developed whereby the motion of a line vortex round a rigid but elastically-restrained wall-mounted fiber or trailing edge is determined numerically. Special attention is paid to the dynamic interaction between the flexible structure and vortex, which is accomplished via a conformal mapping relationship determined in closed form. Results from this analysis seek to develop a vortex sound model to discern the effect of flexible versus wave-bearing scatterers on turbulence noise suppression and help explain the mechanisms of silent owl flight.

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