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A Computational Modeling Mystery Involving Airfoil Trailing Edge Treatments YEUNUN CHOO, BRENDEN EPPS, Thayer School of Engineering, Dartmouth College — In a curious result, Fairman (2002) observed that steady RANS calculations predicted larger lift than the experimentally-measured data for six different airfoils with non-traditional trailing edge treatments, whereas the time average of unsteady RANS calculations matched the experiments almost exactly. Are these results reproducible? If so, is the difference between steady and unsteady RANS calculations a numerical artifact, or is there a physical explanation? The goals of this project are to solve this thirteen year old mystery and further to model viscous/load coupling for airfoils with non-traditional trailing edges. These include cupped, beveled, and blunt trailing edges, which are common anti-singing treatments for marine propeller sections. In this talk, we present steady and unsteady RANS calculations (ANSYS Fluent) with careful attention paid to the possible effects of asymmetric unsteady vortex shedding and the modeling of turbulence anisotropy. The effects of non-traditional trailing edge treatments are visualized and explained.

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