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Experimental Investigation of Dynamic Stall on an Airfoil with Leading Edge Tubercles[1] JOHN HRYNUK, DOUGLAS BOHL, Clarkson University — Humpback whales are unique in that their flippers have leading edge "bumps" or tubercles. Past work on airfoils modeled after whale flippers has centered on the static aerodynamic characteristics of these airfoils. In the current work, NACA 0012 airfoils modified with leading edge tubercles are investigated to determine the effect of the tubercles on the dynamic characteristics, specifically on dynamic stall vortex formation, of the airfoils. Molecular Tagging Velocimetry (MTV) is used to measure the flow field around the modified airfoils at nondimensional pitch rates of $\Omega =$ 0.1, 0.2, and 0.4. The results show that the characteristics of the dynamics stall vortex are dependent on the location relative to the peak or valley of the leading edge bumps. These characteristics are also found to be different than those observed in dynamic stall on a smooth leading edge airfoil. In specific, the location of the dynamic stall vortex appears to form further aft on the airfoil for the tubercle case versus the smooth case.

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