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Effect of Leading Edge Tubercles on Marine Tidal Turbine Blades MARK MURRAY, TIMOTHY GRUBER, DAVID FREDRIKSSON, U.S. Naval Academy — This project investigated the impact that the addition of leading edge protuberances (tubercles) have on the effectiveness of marine tidal turbine blades, especially at lower flow speeds. The addition of leading edge tubercles to lifting foils has been shown, in previous research, to delay the onset of stall without significant hydrodynamic costs. The experimental results obtained utilizing three different blade designs (baseline and two tubercle modified) are compared. All blades were designed in SolidWorks and manufactured utilizing rapid prototype techniques. All tests were conducted in the 120 ft tow tank at the U.S. Naval Academy using a specifically designed experimental apparatus. Results for power coefficients are presented for a range of tip speed ratios. Cut-in velocity is also compared between the blade designs. For all test criteria, the tubercle modified blades significantly outperformed the smooth leading edge baseline design blades.

> Mark Murray U.S. Naval Academy

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