

Abstract Submitted
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Separation Control on a Hydrofoil Using Leading Edge Protuberances¹ DERRICK CUSTODIO, WPI, CHARLES HENOCH, US Navy, HAMID JOHARI, WPI — Experiments were conducted on a series of two dimensional symmetric hydrofoils with leading edge protuberances. The foils were CNC machined, each having sinusoidal protuberances of fixed amplitude and period. The protuberance amplitude ranged from 2.5 to 12% of the chord. The mean chord Reynolds number was 1.8×10^5 , and angles of attack up to 30 degrees were used. Lift and drag of foils with leading edge protuberances were compared to that of a baseline foil. To visualize the flow separation, surface tufts and dye injection were also employed. Mapping of the velocity field in the vicinity of protuberances was accomplished by a two component LDV system. The results indicate that the foils with leading edge protuberances do not experience stall in the same manner as the baseline foil. Moreover, the foils with leading edge protuberances produce greater lift than the baseline foil at post-stall angles of attack with little or no drag penalty. The flow visualization indicates induced streamwise vortex pairs at the shoulders of the protuberances. These streamwise vortices are thought to be responsible for the improved post-stall performance of foils with leading edge protuberances.

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