Abstract Submitted for the DFD14 Meeting of The American Physical Society

Aerodynamic Performance of Electro-Active Membrane Wings IOAN-ALEXANDRU BARBU, ROELAND DE KAT, BHARATHRAM GANAP-ATHISUBRAMANI, University of Southampton — Electro-active polymers offer due to their multivariate compliant nature a great potential for integrating the lift producing system and the control system into one. This work presents the first step in describing both the mechanical and aerodynamic performance of such materials and focuses on both understanding their behaviour in aerodynamic applications and on analysing their aerodynamic performance. Photogrammetry and load measurements are conducted in a wind tunnel for both silicone-based and acrylic-based membranes at zero prestrain supported in a perimeter reinforced frame in electrically passive, active and pulsing conditions. A wide range of fixed voltages and pulsing frequencies are considered. Due to their hyper-viscoelastic nature, both short and long term hysteresis analysis are conducted in terms of aerodynamic performance. Along with these tests, analyses of the effects of the percentage electrode area and silicone content on aerodynamic performance are conducted.

Bharathram Ganapathisubramani University of Southampton

Date submitted: 30 Jul 2014 Electronic form version 1.4