Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Numerical Investigations of an Optimized Airfoil with a Rotary Cylinder KOMAL GADA[1], HAMID RAHAI[2], CEERS/COE/CSULB — Numerical Investigations of an optimized thin airfoil with a rotary cylinder as a control device for reducing separation and improving lift to drag ratio have been performed. Our previous investigations have used geometrical optimization for development of an optimized airfoil with increased torque for applications in a vertical axis wind turbine. The improved performance was due to contributions of lift to torque at low angles of attack. The current investigations have been focused on using the optimized airfoil for micro-uav applications with an active flow control device, a rotary cylinder, to further control flow separation, especially during wind gust conditions. The airfoil has a chord length of 19.66 cm and a width of 25 cm with 0.254 cm thickness. Previous investigations have shown flow separation at approximately 85% chord length at moderate angles of attack. Thus the rotary cylinder with a 0.254 cm diameter was placed slightly downstream of the location of flow separation. The free stream mean velocity was 10 m/sec. and investigations have been performed at different cylinder's rotations with corresponding tangential velocities higher than, equal to and less than the free stream velocity. Results have shown more than 10% improvement in lift to drag ratio when the tangential velocity is near the free stream mean velocity.

[1]Graduate Assistant, Center for Energy and Environmental Research and Services (CEERS), College of Engineering, California State University, Long Beach
[2]Professor and Director

Hamid Rahai
CEERS/COE/CSULB

Date submitted: 02 Aug 2015 Electronic form version 1.4