Abstract Submitted
for the GEC10 Meeting of
The American Physical Society

Flow Separation Control on Airfoil With Pulsed Nanosecond Discharge Actuator ILYA POPOV, GIUSEPPE CORREALE, NEQLab Research BV, Delft Univercity of Technology, ALEKSANDR RAKITIN, NEQLab Research BV, ANDREY STARIKOVSKII, NEQLab Research BV, the Hague, The Netherlands, Drexel Plasma Institute, Drexel University, Philadelphia, PA, LEO VELDHUIS, STEVEN HULSHOFF, Delft University of Technology, Delft, The Netherlands — An experimental study of flow separation control with a nanosecond pulse plasma actuator was performed in two windtunnels of TU Delft. The first series of experiments was carried out with a NACA-0015 airfoil with a chord of 20 cm. A linear actuator of different geometries was attached to the airfoil at different positions. The discharge used had a pulse width of 20 ns and a rising time of 2 ns, and with voltage up to 12 kV. Varied parameters included discharge frequency, actuator geometry (insulator thickness, gap width, and the number of electrodes) and the position on the wing. Separation elimination was shown at velocities up to 40 m/s with a lift increase up to 20% and an increase of the separation angle of attack of several degrees. The second series of experiments was carried out with a laminar airfoil NLF–MOD22A with a chord of 60 cm. Separation elimination and L/D improvement was shown at velocities up to 80 m/s. The experiments are supported by numerical simulation of the interaction of the shock wave produced by the discharge with the boundary layer.

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Date submitted: 11 Jun 2010 Electronic form version 1.4