Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Fluidic Control of Flexible Structures Embedded in a Turbulent Boundary Layer ORI FRIEDLAND[1], VICTOR TROSHIN, TAU, AVI SEIFERT, School of mech. Eng., Tel Aviv University — We investigate experimentally the flow around a flexible rectangular thin plate positioned normal to the wind direction and embedded in a thick turbulent boundary layer. The purpose of the study is to reduce the plate oscillations caused by unsteady wind loads. Two methods were tested. First, by mechanical Piezo-electric actuators attached to the plate. Second, by three mass-less Piezo-electric fluidic actuators. The two methods were applied with similar closed-loop control principles: Strain Gauge (SG) sensors captured the plate oscillations and a simple phase-lag and gain was used to attenuate the oscillations. The results show a 20-30% reduction of the plate oscillations by mechanical control and a 30%-40% attenuation of the plate oscillation, compared to the uncontrolled case, using fluidic actuators positioned around the free-end flow separation points. The fluidic control was found to be superior to the mechanical control for the current application and conditions. We Hypothesize flow physics mechanism that link the unsteady pressures created on the plate by actuation to its oscillations.

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Date submitted: 26 Jul 2014 Electronic form version 1.4