Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Tollmien-Schlichting Wave Cancellation by Feedback Control[1] SH SANKARASARMA VEMURI, JONATHAN MORRISON, ERIC KERRIGAN, Imperial College London — Tollmien-Schlichting (TS) waves are primary instabilities in the boundary layer and by actively interfering with these naturally occurring waves, the transition could be delayed. The present active cancellation scheme involves a feedback control loop between an array of sensors and actuators to generate the desired actuation to attenuate the growth of these spatially evolving unstable waves. Experimental results of growing TS-waves from a point source on a flat-plate model will be presented. Numerical calculations based on linear stability theory have been carried out to predict the evolution of TS waves downstream to model the control system. We will present the spatial transfer functions between the excitation source and sensors and those between the actuators and sensors for various sensor-actuator configurations. A H_∞ optimal controller is designed for each of these configurations to obtain an optimal sensor-actuator configuration and the controller will be implemented to attempt real-time cancellation of TS waves on a flat-plate model using these optimal configurations.

[1]This work is supported by Airbus

SH Sankarasarma Vemuri
Imperial College London

Date submitted: 31 Jul 2014 Electronic form version 1.4