

Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

In-Flight Infrared Measurements for Quantification of Transition Delay with DBD Plasma Actuators¹ BERNHARD SIMON, SVEN GRUND-MANN, CSI, TU Darmstadt — Active flow control with a single DBD plasma actuator is performed in flight on wing of a motorized in order to delay laminar-turbulent transition at $Re_c = 3 \cdot 10^6$. While earlier experiments measured transition delay with point wise sensors such as microphones or surface hot wires, these dynamic sensors are now simultaneously applied with the infrared measurement technique. This allows a more accurate spatial quantification of the flow control impact. The miniature high resolution IR camera is mounted below the wing as the experiments are conducted on the pressure side. Two control strategies, boundary layer stabilization and active wave cancelation of Tollmien Schlichting (TS) waves, are performed in flight experiments, showing significant advantages of the IR measurement technique. Spanwise and streamwise effects on the transition delay are measured and evaluated with novel post processing strategies. This allows a detailed view on the correlation of TS wave damping and transition delay for different plasma actuator operation modes and flight conditions.

¹This project is funded by the German Research Foundation DFG (GR 3524/4-1)

Bernhard Simon
CSI, TU Darmstadt

Date submitted: 29 Jul 2014

Electronic form version 1.4