

Abstract Submitted  
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**Mitigation of Tollmien Schlichting waves over a laminar airfoil<sup>1</sup>**

JOHN WYLIE, MICHAEL AMITAY, Rensselaer Polytechnic Institute — Mitigation of Tollmien Schlichting (T-S) waves on an unswept natural laminar flow airfoil at a chord-based Reynolds number of 990,000 was explored experimentally. The T-S wave control is facilitated by Piezoelectrically Driven Oscillating Surface actuators located at three streamwise locations on the airfoil. The technique used includes introducing well-defined waves at the upstream location to phase-lock the T-S waves and then mitigating them using the two downstream actuators. Two scenarios were explored: (1) introduction of a disturbance that is a pure sine wave (to introduce a single frequency disturbance into the flow), and (2) introduction of a bandwidth of frequencies to better simulate naturally growing T-S waves. For both scenarios, the active wave cancellation technique was very effective in mitigating the T-S waves. In addition, for the single frequency signal, open-loop flow field measurements were conducted with 2D particle image velocimetry while closed-loop mitigation was tested using a surface-mounted hot film sensor. For the bandwidth of frequencies, only open-loop experiments were conducted, and the feasibility of the mitigation was demonstrated using the same hot film sensor that was used for the single frequency excitation.

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