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Measurement of entropy generation within bypass transitional flow[1] RICHARD SKIFTON[2], RALPH BUDWIG[3], DONALD MCELIGOT, JOHN CREPEAU, University of Idaho — A flat plate made from quartz was submersed in the Idaho National Laboratory's Matched Index of Refraction flow facility. Particle Image Velocimetry and Particle Tracking Velocimetry were utilized to capture spatial vector maps at near wall locations *within a transitional boundary layer*. Entropy generation was then calculated directly from measured velocity vector fields using an integral approach. Two flows were studied: a Zero Pressure Gradient (ZPG) and an Adverse Pressure Gradient (APG), with $\beta \approx$ -0.039. Near the leading edge of the plate, the free stream turbulence intensity (FSTI) to drive bypass transition was 7.5% and 4.25% for the ZPG and APG, respectively. Towards the downstream side of the plate, the FSTI was 2.5% and 3% for ZPG and APG, respectively. The integral approach for entropy generation rate, within the transitional region of flow, will be utilized as a design parameter to systematically reduce losses. As a second observation, the entropy generation can be shown to predict the onset of transitional flow.

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