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Turbine Blade Tip-Gap Flow Physics and Control[1] TRAVIS DOUVILLE, JULIA STEPHENS, THOMAS CORKE, SCOTT MORRIS, University of Notre Dame — A linear cascade that is designed to simulate the flow around blades in the low-pressure turbine stage of turbo-jet engines is used to study the physics of the tip-gap flow and vortex. The cascade consists of three Pratt & Whitney "PakB" blades. The experiment investigated gap sizes of 0.5 to 5.0 percent of the blade axial chord, and Reynolds numbers from 100K to 500K that correspond to tip relative Mach numbers of 0.04 to 0.21. Static pressure ports at mid and tip spanwise locations recorded blade pressure distributions. Static end wall taps recorded pressures in the gap region. A five-hole Pitot probe that was traversed in the blade wakes was used to determine total pressure loss coefficients and local velocity vectors. Baseline measurements were analyzed across the range of Reynolds numbers and gap sizes to categorize their effects. These were then compared to flow changes produced by a passive flow control device placed at the end of a blade to locally reduce the gap height. Its effect on the tip-gap flow is presented.

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