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Effect of wakes from moving upstream rods on boundary layer separation from a high lift airfoil[1] RALPH J. VOLINO, U. S. Naval Academy — Highly loaded airfoils in turbines allow power generation using fewer airfoils. High loading, however, can cause boundary layer separation, resulting in reduced lift and increased aerodynamic loss. Separation is affected by the interaction between rotating blades and stationary vanes. Wakes from upstream vanes periodically impinge on downstream blades, and can reduce separation. The wakes include elevated turbulence, which can induce transition, and a velocity deficit, which results in an impinging flow on the blade surface known as a "negative jet." In the present study, flow through a linear cascade of very high lift airfoils is studied experimentally. Wakes are produced with moving rods which cut through the flow upstream of the airfoils, simulating the effect of upstream vanes. Pressure and velocity fields are documented. Wake spacing and velocity are varied. At low Reynolds numbers without wakes, the boundary layer separates and does not reattach. At high wake passing frequencies separation is largely suppressed. At lower frequencies, ensemble averaged velocity results show intermittent separation and reattachment during the wake passing cycle.

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