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Flow Separation Control for Low-Pressure Turbine Blade using Vortex Generator Jets[1] AMIT KASLIWAL, KARMAN GHIA, URMILA GHIA, University of Cincinnati — Numerical study of flow separation control is conducted employing Vortex-Generator Jets. This strategy is first tested for the flow past a cylinder at Reynolds number (Re) of 13,400, and then applied to flow in a low-pressure turbine (LPT) cascade for the PAK-B blade geometry at Re = 25,000. A fourth-order accurate compact-difference scheme is used along with sixth-order filtering (C4F6). FDL3DI, a research code developed at WPAFB, is used as the flow solver. A blowing ratio of 2.0 with a skew angle of 90° and a pitch angle of 30° is employed in the simulations for the aforementioned configurations. The control jets are pulsed with $F^+ = 1.0$ for the case of the cylinder, and with $F^+ = 2.33$ for the LPT case. The results show a significant decrease in drag on the cylinder after the jets are turned on. The total-pressure loss is calculated in the wake region, at x/D = 3.0, and a reduction of 10% is observed. For the LPT case, the implemented flow separation control strategy totally eliminates the separation and leads to 27.5% reduction in wake total-pressure loss.

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