

**EFFECT OF JET PULSING ON FILM COOLING NEAR THE LEADING EDGE OF A
MODEL AEROFOIL BY LES**

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ABSTRACT

Large Eddy Simulation of a pulsed film cooling is presented to understand the effect of external modulation on vortex dynamics and heat transfer near the semi-circular leading-edge of a constant thickness aerofoil. A normal jet, pulsed at Strouhal number of 0.37 and blowing ratio of unity, is injected in an inflectional flow and results are compared with the corresponding steady system. Three-dimensional, unsteady, filtered mass, momentum and energy equations are solved for Newtonian incompressible flow on a Cartesian grid. The Immersed Boundary method is used to resolve the leading edge, details of film cooling hole and the plenum chamber. Pulsed jet illustrates enhanced vortex dynamics and appearance of larger coherent structures that result in high jet *lift-off*, enhanced mixing with the crossflow and diluted coolant layer. In brief, the modulation of coolant jet is not preferred near the leading edge for the combination of blowing ratio and pulsating frequency considered.