Optimal divergence-free inflow perturbations in flow over an airfoil[1] SEAN LOH, HUGH BLACKBURN, Monash University, XUERUI MAO, University of Durham — Linear transient growth analysis has identified various key mechanisms in transition due to free-stream turbulence in canonical flow open flow configurations (Durbin & Wu 2007). In the present work, the role of inflow disturbances in promoting transition for flow over airfoil type geometries is examined. Using an optimal control based methodology, optimal divergence-free inflow perturbations for linear transient energy growth are computed for a NACA 0012 airfoil at $4°$ angle of attack. At various low-to-moderate Reynolds numbers, the flow response to optimal two-dimensional inflow perturbations with varying streamwise length scale is analysed. The relationship between the flow physics induced by optimal inflow perturbations, optimal initial perturbations and leading linear instability modes is then examined. Durbin P & Wu X (2007), Transition beneath vortical disturbances, *Annu. Rev. Fluid Mech.* **39**: 107.

Hugh Blackburn
Monash University

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