

Abstract Submitted  
for the DFD16 Meeting of  
The American Physical Society

**Study of laminar boundary layer instability noise study on a controlled diffusion airfoil** PRATEEK JAISWAL, student, MARLENE SANJOSE, Researcher, STEPHANE MOREAU, Professor — Detailed experimental study has been carried out on a Controlled Diffusion (CD) airfoil at  $5^\circ$  angle of attack and at chord based Reynolds number of  $1.5 \times 10^5$ . All the measurements were done in an open-jet anechoic wind tunnel. The airfoil mock-up is held between two side plates, to keep the flow two-dimensional. PIV measurements have been performed in the wake and on the boundary layer of the airfoil. Pressure sensor probes on the airfoil were used to detect mean airfoil loading and remote microphone probes were used to measure unsteady pressure fluctuations on the surface of the airfoil. Furthermore the far field acoustic pressure was measured using an  $\frac{1}{2}$  inch ICP microphone. The results confirm very later transition of a laminar boundary layer to a turbulent boundary layer on the suction side of the airfoil. The process of transition of laminar to turbulent boundary layer comprises of turbulent reattachment of a separated shear layer. The pressure side of the boundary layer is found to be laminar and stable. Therefore tonal noise generated is attributed to events on suction side of the airfoil. The flow transition and emission of tones are further investigated in detail thanks to the complementary DNS study.

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Date submitted: 01 Aug 2016

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