

Abstract Submitted
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Aeroacoustic source localization and source level estimation during wind tunnel testing of a flat plate with and without a gap¹ ALEXANDER DOUGLASS, Mechanical Engineering, University of Michigan, NATASHA CHANG, Naval Surface Warfare Center Puget Sound Detachment, DAVID DOWLING, Mechanical Engineering, University of Michigan — Acoustic measurements in wind tunnels are notoriously difficult because of machinery noise from the tunnel, and aeroacoustic noise generated within the tunnel and by the test model; and because the potentially-weak signals of interest may share a common frequency range with these noise sources. Thus, when model changes are made, localizing any new aeroacoustic source(s) and determining their level(s) are challenging tasks. This presentation provides such experimental results for the aeroacoustic source associated with addition of a 6 mm gap in a 0.5-m-by-1.0-m flat plate aligned with the flow direction. When present, the gap was located 0.40-m from the plate's leading edge. The measurements were collected in the Anechoic Flow Facility of the Naval Surface Warfare Center – Carderock Division at nominal air speeds of 19 and 30 m/s using a ~0.6-m-diameter spiral microphone array with 24 elements placed 1.24 m from the plate and separated from the air flow by a thin barrier. Measurements in the 4-to-12 kHz frequency range were processed using conventional and high-resolution beam-forming methods with and without noise-reference subtraction. Source location and level estimation for the gap-induced aeroacoustic sound source was successful at nominal signal-to-noise ratios of -20 dB.

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David Dowling
University of Michigan

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