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Measurement techniques for airframe noise source identification

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Despite the significant progress achieved over the last three decades, noise pollution generated by aircraft around airports is still an obstacle to the further growth of the aviation industry. The engines and airframe constitute the main sources of the overall aircraft noise. Airframe noise is as important as the engine noise on approach due to the engines operating at low thrust. High-lift devices and landing gears are the dominant airframe noise components. Many efforts have recently been devoted to accurately locate and control the specific components of the airframe noise. Experimental studies on airframe noise include full-scale flight tests, and tests conducted on isolated small-scale models in both hard-walled and anechoic wind tunnels. These experimental efforts on airframe noise have been greatly helped by the advent of the microphone phased array technology. This presentation will focus on microphone phased array measurement techniques, in particular for model scale testing in wind tunnels. Issues such as beamforming algorithms, data corrections, effect of flow and acoustic environment on the measurements (hard-wall vs anechoic tunnels), etc. will be discussed. Illustrative results from experimental measurements of landing gear and high lift devices performed at the Virginia Tech wind tunnel will also be presented.