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Experimental investigation of sound from flow over a rough surface

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Measurements of radiated noise and unsteady surface pressures have been carried out in order to better understand the mechanism for sound production from flow over a rough surface. In order to investigate scaling relationships, the flow speed, roughness height, geometry and element distribution were varied systematically. When considered in total, previous investigations do not present a consistent picture of the scaling behavior of roughness noise, or the underlying physical mechanism. They have reported roughness noise levels that scale on flow velocity, roughness height, and fetch area and have indicated that the sound production may be dipole or quadrupole in nature. Prevailing analytical models assume that both dipole and quadrupole sources are present. The scaling of roughness noise for large roughness height has not been investigated previously and is part of the current study. A recent developed scattering model (dipole) developed by Glegg et al is interrogated using detailed measurements of the roughness element height distribution, turbulent boundary layer properties, and array-based radiated sound levels.