Title: Sound from high-Reynolds number flow over bluff bodies

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Abstract: Purpose - This paper aims to investigate the aerodynamic sound generated from flow over bluff bodies at a high Reynolds number. By taking circular and square cylinders as two representative geometries for the cross-section of bluff bodies, this study aims to clarify the difference in flow formation and sound generation between the two types of bluff bodies. Furthermore, the possibility for a downstream flat plate to be used as sound cancellation passive mechanism is also discussed in this study. Design/methodology/approach - Sound source from the near field is numerically solved by using the Unsteady Reynolds-Averaged Navier Stokes equations. While for the sound at far-field, the compact sound theory of Curle's analogy is used. Findings - Magnitude of the generated sound is dominant by the aerodynamic forcer fluctuations, i.e. lift and drag, where the lift fluctuation gives the strongest influence on the sound generation. The square cylinder emits 4.7 dB higher than the sound emitted from flow over the circular cylinder. This relates to the longer vortex formation length for the case of square cylinder that provides space for more vortex to dissipate. It is suggested that downstream flat plate is possible to be applied for a sound cancellation mechanism for the case of circular cylinder, but it would be more challenging for the case of square cylinder. Practical implications - This study include implications for the development of noise reduction study especially in high-speed vehicles such as the aircrafts and high-speed trains. Originality/value - This study identified that there is possible method for sound cancellation in flow over bluff body cases by using passive control method, even in flow at high Reynolds number.