ACOUSTICS2008/220
A design-oriented approach to landing gear noise prediction

Philip Morris, Kenneth Brentner and Leonard Lopes
Penn State University, 233C Hammond Building, University Park, PA 16802, USA

Landing gear noise is one of the most important sources of airframe noise. But it is the most difficult to predict. The difficulty is that the landing gear is made up of components of substantially different scales. The small-scale features such as tubes and hoses are known to contribute to the landing gear noise, especially in the mid to high frequency range. Existing semi-empirical models are only reliable for the range of landing gear geometries for which test data are available. The present paper describes a component-based landing gear noise prediction model. The method uses an application of simple, fast, and scalable models called acoustic elements that are used to represent the complex landing gear geometry with a high level of geometric detail. Extensions to an earlier model developed by the authors is described, including the replacement of the original time domain approach with a frequency domain method. The local mean flow is also taken into account through the use of low-fidelity computational fluid dynamics simulations. Estimates of the effects of acoustic shielding are also described. Comparisons are made with available experimental data to demonstrate the capabilities of the method. Future improvements are also described.