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Sound transmission in slowly varying circular and annular lined ducts with flow. (English)

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Summary: Sound transmission through straight circular ducts with a uniform inviscid mean flow and a constant acoustic lining (impedance wall) is classically described by a modal expansion. A natural extension for ducts with axially slowly varying properties (diameter and mean flow, wall impedance) is a multiple-scale solution. In the present paper we show that a consistent approximation of boundary condition and isentropic mean flow allows the multiple-scale problem to have an exact solution. Since the calculational complexities are no greater than for the classical straight duct model, the present solution provides an attractive alternative to a full numerical solution if diameter variation is relevant. A unique feature of the present solution is that it provides a systematic approximation to the hollow-to-annular cylinder transition problem in the turbofan engine inlet duct.

MSC:

76Q05 Hydro- and aero-acoustics

Cited in **13** Documents

Keywords:

multiple-scale solution; isentropic mean flow; exact solution; hollow-to-annular cylinder transition; turbofan engine inlet duct

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