Rienstra, Sjoerd W.
A classification of duct modes based on surface waves. (English) | Zbl 1163.74431 |
Wave Motion 37, No. 2, 119-135 (2003).

Summary: For the relatively high frequencies relevant in a turbofan engine duct, the modes of a lined section may be classified in two categories: genuine acoustic 3D duct modes resulting from the finiteness of the duct geometry, and 2D surface waves that exist only near the wall surface in a way essentially independent of the rest of the duct. Per frequency and circumferential order there are at most four surface waves. They occur in two kinds: two acoustic surface waves that exist with and without mean flow, and two hydrodynamic surface waves that exist only with mean flow. The number and location of the surface waves depends on the wall impedance Z and mean flow Mach number. When Z is varied, an acoustic mode may change via small transition zones into a surface waves and vice versa.

Compared to the acoustic modes, the surface waves behave – for example as a function of the wall impedance – rather differently as they have their own dynamics. They are therefore more difficult to find. A method is described to trace all modes by continuation in Z from the hard-wall values, by starting in an area of the complex Z-plane without surface waves.

MSC:

76Q05	Hydro- and aero-acoustics
76B99	Incompressible inviscid fluids

Cited in **2** Reviews
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Full Text: DOI

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