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Asymptotic analysis of aircraft wing model in subsonic air flow. (English) Zbl 1053.76034

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The article is devoted to detailed asymptotic and spectral analysis of the model of an aircraft wing in a subsonic air flow suggested by *A. Balakrishnan* [Aeroelastic control with self-straining actuators: continuum models, in: Varadan, V. (ed.), Smart Structures and Materials; Math. and Control in Smart Struct. Proc. SPIE 3323-08, 44–54 (1998)]. This model is governed by two coupled linear partial differential equations of hyperbolic type containing integral convolutions terms, together with two-parameter family of boundary conditions modelling the action of self-straining actuators. The unknown functions – the bending and the torsion angle – depend on time and one spatial variable. This system is equivalent to a single evolution-convolution type operator equation in the state space equipped with energy metric. The Laplace transform of this equation can be represented in terms of generalized resolvent operator-valued finite meromorphic functions of spectral parameters. The generalized resolvent influences the aeroelastic modes, and the residues at poles are the projectors on generalized eigenspaces.

The main purpose of the article in a rigorous derivation of spectral asymptotics for the dynamics generator of the differential part of the system. It is shown that the aeroelastic modes form a countable set of complex numbers, located in a strip parallel to the imaginary axis, with points of accumulation only at infinity.

Reviewer: Peter A. Velmisov (Ul'yanovsk)

MSC:

76G25	General aerodynamics and subsonic flows	Cited in **1** Review
76M45	Asymptotic methods, singular perturbations applied to problems in fluid mechanics	Cited in **4** Documents
35P20	Asymptotic distributions of eigenvalues in context of PDEs	

Keywords:

non-selfadjoint differential operator; convolution integral operator; spectrum

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