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Vibroacoustic Modeling of an Elastic Beam in Low Subsonic Flows With Mean Velocities

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Abstract

The paper presents a vibroacoustic model of an elastic beam submerged in uniform low subsonic flows. The governing equations of the elastic beam and acoustic fields are reformulated by means of a coordinates transformation. The convective terms in boundary conditions of the model are considered to achieve the decoupled integral equations. The dynamic responses and radiated acoustic fields of the beam are computed numerically by using the collocation point method. In the numerical examples, the sound waves radiated from the beam are shifted to the moving direction of fluids. Meanwhile, new crests of sound waves are formed in the upstream direction of the sound source with the Mach number increasing. In addition, the numerical results are independently evaluated by power flows of the system.

Keywords: Vibration, Beam, Sound radiation, Subsonic flow

1. Introduction

Sound radiations from submerged structures are coupled physical phenomena because the sound pressures acted on structure surfaces and the dynamic responses of structures will impact on each other. When underwater vessels or aircraft are moving in some media, their dynamic responses and radiated sound

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