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On the Static Aeroelasticity Instability of an Inverted Cantilever Plate with a Crack Under Steady Axial Airflow

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ABSTRACT

This study investigates the static instability of a cracked plate in subsonic airflow. The plate model is an inverted cantilever plate, where its leading edge is free and the trailing edge the clamped. A mathematical model of the crack is developed using the Dirac function, while Theodorsen aerodynamic mode is applied for the fluid force. To account for angle discontinuity caused by cracks, Fourier expansion is employed to transform the form corresponding to the angle into a continuous model. The critical divergent dynamic pressure and mode of an inverted cantilever plate with a crack are calculated using the Galerkin method. Results show that the closer the crack is close to the clamped, the lower the instability boundary flow rate of the plate. Additionally, for a given crack location, the larger the crack damage parameter, the lower the instability boundary flow rate of the plate.

KEYWORDS

Crack; divergence; inverted cantilever plate

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