Characteristics of the Acoustic Resonance Induced by Jet Passing through Axisymmetric Cavities

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Abstract

The generation of acoustic resonance is investigated in the case of a smooth jet impinging on an axisymmetric cavity having a sharp edge and an abrupt change in the cavity cross-section. The shape of the spectrum and frequency of the generated acoustic wave are measured. The effect of the cavity size and the jet velocity on the acoustic resonance is also studied. The results show that the acoustic resonance is strongly affected by the cavity size and the jet velocity. The frequency of the generated acoustic wave is found to be inversely proportional to the cavity size and directly proportional to the jet velocity. The effect of the cavity size is more pronounced than that of the jet velocity. The results are compared with the theoretical predictions and good agreement is obtained.

Keywords: Acoustic resonance, jet flow, axisymmetric cavity, frequency, spectrum.

Figure 1: Sound pressure spectra

Figure 2: Tone frequency variations with jet velocity and cavity dimension

Figure 3: Dimensionless frequency of the radiated tones

Figure 4: Jet visualization

Table 1: Dimensionless frequency of vortical flow

Table 2: Critical values of the acoustic resonance

Figure 5: Tone generation mode

References


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