Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Aeroelastic Flutter Behavior of a Cantilever and Elastically Mounted Plate within a Nozzle-Diffuser Geometry LUIS PHILLIPE TOSI, TIM COLONIUS, California Institute of Technology, HYEONG JAE LEE, STEWART SHERRIT, Jet Propulsion Laboratory, California Institute of Technology, JET PROPULSION LABORATORY COLLABORATION, CALIFORNIA INSTITUTE OF TECHNOLOGY COLLABORATION — Aeroelastic flutter arises when the motion of a structure and its surrounding flowing fluid are coupled in a constructive manner, causing large amplitudes of vibration in the immersed solid. A cantilevered beam in axial flow within a nozzle-diffuser geometry exhibits interesting resonance behavior that presents good prospects for internal flow energy harvesting. Different modes can be excited as a function of throat velocity, nozzle geometry, fluid and cantilever material parameters. Similar behavior has been also observed in elastically mounted rigid plates, enabling new designs for such devices. This work explores the relationship between the aeroelastic flutter instability boundaries and relevant non-dimensional parameters via experiments, numerical, and stability analyses. Parameters explored consist of a non-dimensional stiffness, a non-dimensional mass, non-dimensional throat size, and Reynolds number. A map of the system response in this parameter space may serve as a guide to future work concerning possible electrical output and failure prediction in harvesting devices.

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Date submitted: 01 Aug 2016

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