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Dynamical behaviors of a thin plate under bypassing flow ANGXIU NI, QIQI WANG, Massachusetts Inst of Tech-MIT — The interaction of air flow and flexible structure could lead to complex dynamic behaviors. Here the motion of a thin plate under a bypassing air flow is numerically investigated. Dimensional analysis is carried out and all pertinent dimensionless parameters are found. The appropriate levels of fidelity needed for modeling the structural and aerodynamic behaviors are studied. The effect of ratios between aerodynamic force, bending force and external compression force on the plate are investigated. In general, the aerodynamic force causes the plate to oscillate, the external compression causes it to buckle, while the bending force tries to keep the plate flat. When the bending force is relatively small and the other two forces are comparable, the airflow strongly couples with the nonlinear feedback of the structure, and the system undergoes chaotic motion. We compare this complex motion at different Mach numbers against the classic high-Mach number result by Dowell.

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