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Active control of flow-induced vibrations of a cylinder using piezo actuators[1] JASON DAHL, ERSEGUN DENIZ GEDIKLI, University of Rhode Island — The flow-induced vibration of continuous structures typically finds compatible conditions where the wake of the structure produces forces such that the coupled excitation of the structure follows large amplitude, figure eight motions, which can contribute to fatigue damage. In the present study, piezo actuators are embedded in a cylinder, with the actuators oriented to apply a force in-line with the flow. The cylinder is placed in a uniform free stream, which excites vibrations of the structure. The piezo actuators were applied to excite the second structural mode frequency in the in-line direction. This excitation produces an incompatible excitation of the structure between the in-line and cross-flow directions, leading to vibration suppression. The piezo actuators were also actuated at a flow speed just before a jump in the response branch of the cylinder, which was observed to cause a premature jump in amplitude, resulting in increased motion. The piezo actuators are also observed to be ineffective at altering the response when the cross-flow motion is very large. The present study demonstrates control of vortex-induced vibrations using purely in-line excitation of the structure, indicating the strong coupling between these directions in vortex-induced vibrations.

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