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Acoustic-structure interaction of a plate in a duct with flow[1] MAHESH SUCHEENDRAN, DANIEL BODONY, PHILIPPE GEUBELLE, UIUC — The interaction of sound in the presence of flow with a cavity-backed, clamped elastic plate in a duct is analyzed. The problem consists of an incoming plane wave at fixed frequency in a square duct with an elastic plate mounted flush on one wall of the duct. The fluid is inviscid and compressible. A loosely-coupled numerical simulation is carried out using a high-fidelity explicit finite difference fluid solver and a mixed-enhanced implicit finite element structural solver. Also a fully coupled, single frequency, theoretical model for the same system has been derived and is compared to the simulation results for a low-amplitude linear case. The conditions chosen correspond approximately to a 3mm thick, 1ft x 1ft Aluminum plate subjected to a 100 dB pressure load at the in vacuo fundamental frequency of the plate. The temporal displacement of the plate and duct pressure are calculated using the two methods. Comparison of the results suggests that the assumption of single frequency response made in the analytical solution is valid. Significant frequency-dependent changes in the plate response are observed for some of the peaks when a non-zero mean flow is present.

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