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Sound generated by a vortex convected past an elastic sheet AVSHALOM MANELA, Faculty of Aerospace Engineering, Technion, Israel — We study the motion and sound generated when a line vortex is convected in a uniform low-Mach stream parallel to a thin elastic sheet. The linearized sheet motion is analyzed under conditions where the unforced sheet (in absence of the line vortex) is stationary. It is found that the vortex-sheet interaction excites a resonance response in the sheet, where the sheet oscillates at its least stable eigenfrequency. The sources of sound in the acoustic problem include the sheet velocity and fluid vorticity. It is shown that the release of trailing-edge vortices, resulting from the satisfaction of the Kutta condition, has two opposite effects on sound radiation: while trailing-edge vortices act to reduce the pressure fluctuations occurring owing to the direct interaction of the line vortex with the unperturbed sheet, they amplify and extend the acoustic signal produced by the motion of the sheet. The sheet motion becomes an increasingly important source of sound as the system approaches its critical conditions for instability, where the effect of resonance becomes more pronounced.

Ehud Yariv
Faculty of Mathematics, Technion

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