Abstract Submitted
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Diffraction of an acoustic wave by a cavitating hydrofoil[1] YURI ANTIPOV, Louisiana State University — Diffraction of a plane acoustic wave from a curvilinear foil placed in an inviscid fluid is considered. The flow is irrotational and steady-state. The upper and lower boundaries of the foil, $h_+(x)$ and $h_-(x)$ satisfy the condition $h'_\pm(x) << 1$. Because of the hydrofoil profile, it may be partly cavitating or fully cavitating. The problem is linearized, and the boundaries of the foil are replaced by their projections on the real axis. It is found that at the fore point of a foil whose upper and lower boundaries are wet or at the rear point of the supercavity, the complex velocity $\overline{w'(z)}$ has a $-1/2$-singularity. At the fore point of a foil whose one side is wet and another one is cavitated, the function $\overline{w'(z)}$ has a $-1/4$-singularity. At the aft points of a wet foil, the function $\overline{w'(z)}$ is bounded. The problem is solved in a closed form in terms of singular integrals. The unknown boundary of the cavity is recovered. Since the boundary of the cavity is known, and the fluid mechanics problem is linearized, the diffraction problem reduces to a system of singular integral equations which are solved by the method of orthogonal polynomials. Generalizations to the case of the nonlinear Tulin single-spiral-vortex model and a system of hydrofoils are discussed.

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