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Comment on "Numerical Lifting-Surface Theory—Problems and Progress"

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IN a recent paper, Landahl and Stark[1] present a progress report on the status of numerical approaches to nonsteady lifting-surface theory for planar and nonplanar configurations as applied to the linearized thin-wing problem, with particular stress on the subsonic case.

Over the past few years, in the course of studies adapting unsteady lifting-surface theory to marine propellers,[2–4] Davidson Laboratory has developed a new method for the solution of the downwash surface integral equation. By proper expansion of the kernel function and introduction of the so-called "generalized lift operator," the chordwise integration is performed analytically with the additional advantage that the numerical solution is greatly simplified. These studies indicate that use of the generalized lift operator, which is in fact dictated by the nature of the integral equation itself, is a more accurate and rapid procedure than the "usual" numerical approaches for evaluating the steady and unsteady pressure distributions on lifting surfaces and resultant hydrodynamic forces.

This technique has been used in Ref. 5, where the lifting surfaces are the blades of a marine propeller operating in nonuniform inflow, and in Ref. 6 for the case of a deeply submerged, flat, rectangular hydrofoil in steady flow. In Ref. 7, this new approach has been applied to several two-dimensional, unsteady airfoil problems and has yielded results identical to the known explicit solutions.

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WE are grateful to S. Tsakonas for having drawn our attention to the interesting developments in lifting-surface theory at Davidson Laboratory. The successful application of the generalized lift operator, a simplified version of the variational method,[1] seems very valuable. Such an analytic chordwise integration is of course desirable also in the case of oscillating aircraft wings. Therefore, it should be valuable to know whether a similar quadrature process could be developed for compressible flow as well. There is one apparently unsettled question, however, namely that of the poor convergence of the lift distributions shown in Ref. 2.

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Comment on "Transonic Flow in Unconventional Nozzles"

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AN effort to derive the equations published in an analysis by Hopkins and Hill[1] pertaining to the transonic flow regime in annular and other unconventional nozzles has yielded some discrepancies. We believe the equations are correct as written in the following. The numbering and the nomenclature of the equations correspond to the numbering and nomenclature of the equations in the original paper.

$$(H/H_R)^2 = 1 + (M_R{}^2q_1 - q_1)\Delta\eta + [q_1{}^2 - q_2 + (M_R{}^2/2)(2q_2 - q_1{}^2) + (\gamma/2)M_R{}^4q_1{}^2]\Delta\eta^2 + [2q_1q_2 - q_1{}^3 + (M_R{}^2/2)(q_1{}^3 - 2q_1q_2 + 2q_3) + \gamma M_R{}^4q_1q_2]\Delta\eta^3 \quad (18)$$

$$x = \xi - \frac{H_R{}^2\eta_R{}^2}{2Y_R{}^3}(2H_RH_R{}'Y_R - H_R{}^2\sin\omega)\Delta\eta^2 + \left[\frac{H_R{}^4\eta_R{}^3}{3Y_R{}^5}\cos\omega\left(4H_RH_R{}'Y_R - \frac{5}{2}H_R{}^2\sin\omega\right) - \frac{H_R{}^3H_R{}'\eta_R}{Y_R{}^2} + \frac{H_R{}^4\eta_R\sin\omega}{2Y_R{}^3}\right]\Delta\eta^3 \quad (20)$$

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