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Readers' Forum

Comment on "New Approach to Solution of the Falkner–Skan Equation"

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THE Technical Note by Sher and Yakhot[1] is the most recent contribution[2–4] that has dealt with the numerical solution of the Falkner–Skan similarity equation for an incompressible boundary layer or the more general similarity equations for a compressible boundary layer.[5,6] (This list of references is far from comprehensive.) The purpose of this Comment is to point out that the direct numerical method of Bae and Emanuel[5] used a fourth-order Runge–Kutta routine with quasilinearization for the compressible case but with unity values for the Prandtl number and Chapman–Rubesin parameter. (A copy of the full-length version of Ref. 5, which details the numerical method, can be obtained by writing to the author.) Convergence was quite rapid and, in contrast to the comment made in Ref. 1, no difficulty occurs as the similarity variable η becomes quite large. Accurate, comprehensive tables, using this method, can be found in Ref. 7, Sec. 21.8. These tables provide data for the wall shear stress and heat transfer as well as for five different boundary-layer thicknesses. These parameters are a function of the pressure gradient parameter β (21 values ranging from separation to 100) and the standard temperature ratio g_w (11 values), where a unity value yields Falkner–Skan results. A Runge–Kutta scheme in conjunction with a modified Newton–Raphson method can be found in Ref. 8 (see also Sec. 21.10 of Ref. 7) for the compressible, similar equations with the Prandtl number a constant, not necessarily unity, and the viscosity proportional to the temperature with an arbitrary exponent.

References

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