a combination of these. The nature of the solution will depend strongly on these boundary conditions.

Goodman introduces the similarity parameter G which is defined for two-dimensional [Eq. (8)] and axisymmetric [Eq. (14)] flow. These parameters are well known[2,3] and may be derived from the governing equations and boundary conditions without resorting to the local linearization approximation. The paradox which Goodman discusses has been explained by Berndt.[3] Goodman's definition of G for axisymmetric flow, Eq. (14), incorrectly contains a logrithmic term $(\ln [\tau^2(\gamma + 1)])^{1/2}$. The logrithmic factor in Eq. (11) enters only for values of U near the body due to the inner solution of slender body theory.[4] In the outer flow, which is where the transonic effects enter, the logrithmic term is inapplicable and should be dropped from Eq. (14).[3]

From a physical point of view it seems quite plausible that "the larger the value of G the less the wall interference will be." However, the statement that "For those tests for which G become of order one or greater, the interference may be presumed to be negligible" is unreasonable. For example, consider a sonic flow in a solid wall wind tunnel with no body present. The introduction of any body will choke the tunnel and reduce the freestream Mach number. The interference is far from negligible and the results must be interpreted carefully.[2] The experiments Goodman considers were all performed in transonic wind tunnels with ventilated test section walls that, presumably, were carefully developed with minimized wall interference in mind.

In conclusion, we feel that Goodman's analysis is oversimplified and that the conclusion that $G \geq 0(1)$ for negligible wall interference is misleading. The better conclusion is that in the limit $G \to \infty$, the wall interference goes to zero. Much of the previous work both on transonic scaling laws and development of transonic tunnel wall properties for minimizing interference effects is not recognized by the author. This work shows that the interference effects at Mach one are severe and complicated.

References

[1]Goodman, T. R., "A Criterion for Assessing Wind-Tunnel Wall Interference at Mach 1," *Journal of Aircraft*, Vol. 10, No. 11, Nov. 1973. pp. 695–697.

[2]Spreiter, J. R., Smith, D. W., and Hyett, B. J., "A study of the Simulation of Flow with Freestream Mach Number 1 in a Choked Wind Tunnel," TR R-73, 1960, NASA.

[3]Berndt, S. B., "Theory of Wall Interference in Transonic Wind-Tunnels," *Symposium Transsonicum*, Springer-Verlag, pp. 288–309, 1964.

[4]Ashley, H. and Landahl, M. T., *Aerodynamics of Wings and Bodies*, Addison-Wesley Publishing Company, 1965.

Reply by Author to E. M. Murman and F. W. Steinle Jr.

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THE preceding Comment actually consists of several comments, and I should like to take them up one at a time.

It is true that the acceleration λ is assumed to be positive in deriving the criterion. However, for sonic flow there are many situations for which λ is positive in the field at stations near the foil, and for those cases for which λ reverses sign the heat conduction analog is still valid provided x is measured forward from the trailing edge. Since x is of the order of the airfoil chord in either case, the parameter G still falls out as the one by which wall interference should be judged.

With regard to the boundary condition at the wall, since the field equation is likened to the heat conduction equation, with x the time-like variable, it is appropriate to use an integral method to solve it,[1] in which case the boundary condition at the wall only comes into play when the penetration depth reaches the wall. If this should occur downstream of the trailing edge, the wall boundary condition will have little or no affect on the flow at the foil. Indeed, the criterion $G \geq 0(1)$ can be derived from just such considerations, and has been in Ref. 6 of the Note.

References 2 and 3 of the Comment were unfamiliar to me, but the fact that the similarity parameter G has been derived previously, without resort to the method of local linearization, lends support to the validity of this parameter and also to the method of local linearization.

I agree that the logarithmic term should be dropped from Eq. (14) and apologize for this error. Clearly the qualitative differences between two-dimensional and axially symmetric flow, as pointed out in the Note, are even greater without the logarithmic term.

With regard to choked flow, I was very careful to point out that the freestream Mach number must be unity so that ventilated walls were implied. In Ref. 6 of the Note closed walls are specifically excluded, but I believe that as long as the tunnel walls are ventilated in order to achieve a free stream Mach number of unity, and as long as the condition $G > G_{crit}$ is satisfied, the wall interference will be small.

Although it is ture that mathematically the interference goes to zero as $G \to \infty$, from the physical point of view $G \geq 0(1)$ is correct. The situation is similar to one encountered in boundary-layer theory. Strictly speaking the boundary condition in the freestream is to be applied at infinity in boundary-layer coordinates, but practically speaking little error is encountered if, instead, a momentum integral approach is used and the free-stream boundary condition is applied at the edge of the boundary layer. In Ref. 6 of the Note the integral approach leads to the condition $G > G_{crit}$ and also to numerical values of G_{crit} for several configurations.

Although Refs. 2 and 3 of the Comment were unfamiliar to me, as I have said, work on the development of transonic wall properties is certainly not. Indeed, I was the first to present the appropriate boundary condition for perforated walls and to derive a condition for zero blockage interference at subsonic speeds in a perforated wall tunnel.[2] This work has never been published in the open literature, but results contained in it are quoted in Ref. 3. The reason this work (and other work on slotted walls) was not "recognized" is because it is my belief that the wall boundary condition is irrevelant provided the walls are ventilated in order to achieve Mach one, and provided $G > G_{crit}$.

Finally, I should like to take this opportunity to add that it can be shown that the same condition as derived in the Note is applicable for thickness-dominated lifting configurations.

References

[1]Goodman, T. R., "Application of Integral Methods to Transient Nonlinear Heat Transfer," *Advances in Heat Transfer I*, edited by Irvine and Hartnett, Academic Press, New York, 1964.

[2]Goodman, T. R., "The Porous Wall Wind Tunnel Part II. Interference Effect on a Cylindrical Body in a Two-Dimensional Tunnel at Subsonic Speed," Rept. AD-594-A-3, Nov. 1950. Cornell Aeronautical Laboratory, Inc., Ithaca, N.Y.

Received July 19, 1974.
Index categories: Aircraft Testing (Including Component Wind Tunnel Testing); Subsonic and Transonic Flow.

*Vice President.

[3]Maeder, P. F. and Carroll, J. B., "On the Boundary Condition for the Flow Along a Perforated Wall," Journal of Aerospace Sciences, Vol. 22, No. 3, March 1955, pp. 203–205.

Errata

Influence of Static Aeroelasticity on Oblique Winged Aircraft

Terrence A. Weisshaar
Virginia Polytechnic Institute and State University, Blacksburg, Va.

[J. Aircraft 11, 247–249 (1974)]

THE definition of β should read

$$\beta = qcc_{\ell_\delta}L^3\cos^2\Lambda/EI$$

The definition of f should read

$$f = a(3^{1/2}/2)$$

Equation (7b) should read

$$T_L = \frac{e^{-3a/2} - \cos f + 3^{1/2}\sin f}{a^2(e^{-3a/2} + 2\cos f)}$$

Equation (7c) should read

$$T_R = \frac{e^{3a/2} - \cos f - 3^{1/2}\sin f}{a^2(e^{3a/2} + 2\cos f)}$$

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