behavior of the approximation in Ref. 1 is observed in the present results, namely $F_\eta(0)$ reaches a minimum and then increases with ξ. The minimum points shifts to smaller ξ values as ζ increases. The calculations of $G_\eta(0)$ by both approximate methods, and for all ζ values, even in the region where the approximate methods fail to predict flow reversal, again show good agreement.

Of the three approximations, that of Ref. 1 is in better agreement with the full three-dimensional calculations. The boundary-layer calculations for the problem in Ref. 1 should now be carried out in transformed streamline coordinates in order to complete the discussions of Wang's approximation.

References

[1] Fillo, J. A. and Burbank, R., "Calculation of Three-Dimensional Laminar Boundary-Layer Flows," *AIAA Journal*, Vol. 10, No. 3, March 1972, pp. 353–355.

[2] Wang, K. K., "An Effective Approximation for Computing the Three-Dimensional Laminar Boundary-Layer Flows," *AIAA Journal*, Vol. 9, No. 8, Aug. 1971, pp. 1645–1651.

Comment on "Wind-Tunnel Interference Reduction by Streamwise Porosity Distribution"

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FROM the theoretical point of view, the walls of constant porosity do not behave necessarily as bas as the recent paper[1] suggests. The comparison with the "optimum" porosity (closed walls in the two-dimensional case) which produces the lift interference factor of small absolute value, but of a large gradient at the model position, seems to be irrelevant in the context.

Using the notation of Ref. 1, and assuming $R(x) = R = \text{constant}$, we find the following closed-form solution for the lift interference factor along the wind-tunnel axis[2] $\delta(x) = 1/2\pi x - \exp[x \tan^{-1}(R/\beta)]/4 \sinh(\pi x/2)$, $0 \leqq R < \infty$. The singularity at $x = 0$ is removable;

$$\delta(0) = -\tan^{-1}(R/\beta)/2\pi$$

Letting

$$(d/dx)\delta(x)|_{x=0} = 0$$

we obtain

$$\beta/R = \cot[\pi(3)^{1/2}/6] \cong 0.782$$

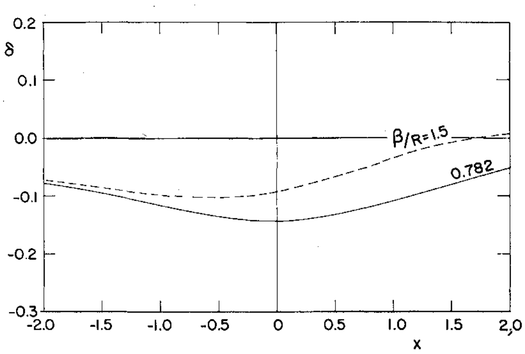

Fig. 1 Distribution of lift interference factor $\delta(x)$ along centerline.

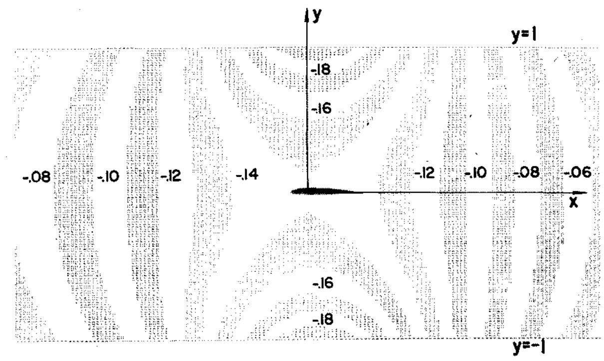

Fig. 2 Distribution of lift interference factor $\tilde{\delta}(x, y)$ for $\beta/R = 0.782$, coordinates $x = X/\beta h$, $y = Y/h$ in same scale.

For a given compressibility factor β, this gives the porosity parameter R about twice that selected in Ref. 1 ($\beta/R = 1.5$).

Figure 1 compares $\delta(x)$ for $\beta/R = 0.782$ and 1.5. The wall induced downwash corresponding to the average of δ over the model is certainly larger in the higher porosity case, but the variations in δ (streamline curvature) near $x = 0$ are roughly of the same magnitude as those obtained by the Gaussian distributions of lower porosity in Ref. 1.

For illustration, a two-dimensional distribution of the lift interference factor

$$\tilde{\delta}(x, y) = Re\{\delta(x + iy)\}$$

was printed in the form of fringes of equal $\tilde{\delta}$ in Fig. 2. In the considered case $\beta/R = 0.782$, a sufficiently small model is seen to lie in the neighborhood of the saddle point of the $\tilde{\delta}$ distribution, and hence in the region of nearly parallel flow. In general, this is a desirable test condition.

Nevertheless, the author Ref. 1 deserves credit for having been able to demonstrate that with the walls of variable porosity, a reasonably parallel flow at the model location can be achieved together with the reduction of the interference downwash.

References

[1] Lo, C. F., "Wind-Tunnel Wall Interference Reduction by Streamwise Porosity Distribution," *AIAA Journal*, Vol. 10, No. 4, April 1972, pp. 547–550.

[2] Mokry, M., "Higher-Order Theory of Two-Dimensional Subsonic Wall Interference in a Perforated Wall Wind Tunnel," LR-553, Oct. 1971, National Research Council of Canada, National Aeronautical Establishment, Ottawa, Ontario, Canada.

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Index categories: Aircraft and Component Wind Tunnel Testing; Subsonic and Transonic Flow.

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Reply by Author to M. Mokry

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THE evidence cited in Refs. 1, 5 and 6 of the Note[1] includes theoretical and experimental studies of three-dimensional tunnels in which it has been shown that it is difficult to eliminate pitching moment interference simultaneously with lift interference when using walls with uniformly distributed porosity. Some recent work in connection with the development of walls

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for V/STOL testing indicates[2] that by using a streamwise distributed porosity in a slotted tunnel it becomes possible to eliminate pitching moment interference simultaneously with lift interference. The motivation of the research is to search for an optimum porosity distribution for minimizing both pitching moment and lift interferences, and to assess wind-tunnel interference for a given wall porosity distribution.

The zero streamline curvature $(d/dx)\,\delta(x)|_{x=0} = 0$ is suggested by Mokry as the criterion to choose the optimum porosity. This criterion certainly gives a small variation in δ near $x = 0$, but the magnitude of δ is large. By using a streamwise distributed porosity such as the gaussian distribution given in the Note,[1] not only the zero streamline curvature condition is satisfied in the interval $-0.5 < x < 1.5$, but also the magnitude of δ is reduced to half of those obtained from uniformly distributed porosity at $\beta/R_0 = 0.782$.

Furthermore, the gaussian distribution is chosen in the study for its mathematical simplicity, and has already indicated a large reduction in the lift interference. It is not our intention to say that the gaussian distribution is the final optimum distribution. As a continuing effort, a numerical method[3] has been developed to optimize the porosity distribution. The preliminary result has shown that the streamwise porosity distribution does reduce pitching moment interference simultaneously with lift interference. The computation would certainly be useful in the development of a new generation wind-tunnel wall.

References

[1] Lo, C. F., "Wind-Tunnel Wall Interference Reduction by Streamwise Porosity Distribution," *AIAA Journal*, Vol. 10, No. 4, April 1972, pp. 547–550.

[2] Binion, T. W., Jr., "An Investigation of Several Slotted Wind Tunnel Wall Configurations with a High Disc Loading V/STOL Model," AEDC-TR-71-77, May 1971, Arnold Engineering Development Center, Arnold Air Force Station, Tenn.

[3] Glassman, H. N. "A Modification to the Method of Block Cyclic Reduction for Computing the Lift Interference in a Wind Tunnel with Perforated Walls," M.S. thesis, 1972, University of Tennessee, Knoxville, Tenn.

Errata

Errata: "Atmospheric Transport, Dispersion and Chemical Reactions in Air Pollution: A Review"

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[AIAA J. **10**, 377–387 (1972)]

THE following corrections should be made to the above article: Equation (13) should read

$$\bar{c}_i(x, y, z) = \frac{Q_i/\rho}{2\pi\sigma_y\sigma_z\bar{u}}\exp\left[-\frac{x}{\bar{u}\tau_c}\right]\exp\left[-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right] \times\left\{\exp\left[-\frac{1}{2}\left(\frac{z-h}{\sigma_z}\right)^2\right]+\exp\left[-\frac{1}{2}\left(\frac{z+h}{\sigma_z}\right)^2\right]\right\}$$

Equation (16) should read

$$\frac{d\bar{c}_{ik}}{dt} = -\frac{\bar{c}_{ik}}{\vartheta_k}\frac{d\vartheta_k}{dt} + \frac{1}{\vartheta_k}\sum_{j=0}^{L} q_{jk}\,\bar{c}_{ij} - \frac{\bar{c}_{ik}}{\vartheta_k}\sum_{j=0}^{L} q_{jk} + \frac{Q_{ik}}{\rho\vartheta_k} + \dot{c}_{ik}(\bar{c}_1,\ldots,\bar{c}_N, t)$$

The author regrets that these typographical errors were overlooked during proofreading.

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Index categories: Atmospheric, Space and Oceanographic Sciences; Boundary Layers and Convective Heat Transfer—Turbulent; Thermochemistry and Chemical Kinetics.

Errata: "Failure of Existing Theories to Correlate Experimental Nonacoustic Combustion Instability Data"

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MERRILL W. BECKSTEAD
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[AIAA J, **8**, 626–631 (1970)]

THE equations on p. 630 should read

$$f = 1/\tau' = \bar{r}/[\delta + (2/3)^{1/2}D] = \bar{r}/D[\delta/D + (2/3)^{1/2}]$$

so that

$$\delta/D = \{\pi/6[1 + (\rho_{ox}/\rho_f)((1-x)/x)]\}^{1/3} - (2/3)^{1/2}$$

for uniform-sized spherical oxidizer crystals.

$$K = \frac{1}{(\pi/6\{1 + (\rho_{ox}/\rho_f)[(1-x)/x]\})^{1/3}}$$

where $x = \%$ oxidizer.

A similar expression can be derived for bimodal propellants

$$K_1 = \left\{\frac{x_1}{\pi/6[x_T + (\rho_{ox}/\rho_f)(1-x_T)]}\right\}^{1/3}$$

Received July 20, 1972.
Index category: Combustion Stability, Ignition, and Detonation.

Announcement: 1972 Author and Subject Indexes

The indexes of the four AIAA archive journals *(AIAA Journal, Journal of Spacecraft and Rockets, Journal of Aircraft,* and *Journal of Hydronautics)* will be combined and mailed separately early in 1973. Subscribers are entitled to one copy of the index for each subscription which they had in 1972. Extra copies of the index may be obtained at $5 per copy. Please address your request for extra copies to the Circulation Department, AIAA, Room 280, 1290 Avenue of the Americas, New York, New York 10019. **Remittance must accompany the order.**

Ruth F. Bryans
Director, Scientific Publications