were calculated using the computer program of Ref. 1) Figure 2 shows the contours and internal shockwave structure for two similar known inlets[2,3] designed for Mach 2.5 and 3.0, respectively. Also shown are the resulting contours and shockwave structure for an interpolated inlet with a design Mach number of 2.65. Note that the bow shockwave from the 11.65° half-angle cone of the interpolated inlet falls on the cowl lip as it does for the known inlets. In addition, the interpolated inlet has a shockwave structure with the final shockwave impingement at the throat station on the centerbody similar to the known inlets.

With a similar shockwave structure, the interpolated inlet can be expected to have pressure distribution characteristics intermediate to the characteristics of the known inlets. This is shown in Fig. 3, where the pressure distributions on the cowl and centerbody are plotted for the three inlets shown in Fig. 2. Note that the distributions for the interpolated inlet are generally as smooth as for the known inlets and that the sudden pressure rises from the shockwave impingements are intermediate to the known inlets.

Finally, Fig. 4, the validity of the interpolation is shown by comparing the plots of the flowfield properties across the throat station of the interpolated inlet with the known inlets. The known inlets were iteratively designed with the goal of nearly isentropic pressure recovery, uniform flow angle, and a uniform Mach number of approximately 1.25 in the throat. Even though this goal was not ideally achieved for the known inlets, the interpolated inlet achieved similar shaped plots of these properties with an average pressure recovery of approximately 98.8%, an average Mach number of approximately 1.25, and a flow angle diverging from −5.5° on the cowl to −6.8° on the centerbody. Even the divergence in angle is favorable. This is because the flow must diverge in the throat to mate with a typical subsonic diffuser for further compression of the flow in an actual inlet system designed for a jet engine.

Conclusions

It now seems possible to write a computer program so that a matrix of known inlet contours can be interpolated. The only inputs needed would be the selection of two known similar inlets in the matrix and the desired design and throat Mach numbers for the third inlet. With such a program, it seems reasonably certain that many useful supersonic inlet contours could be generated and investigated very simply and in a relatively short time. Even if the desired compression and throat properties were not achieved, the interpolation should provide a good start for further iterative adjustments to the contours and, at least, reduce the design time. Further, it may be possible to apply interpolation methods to other types of contours such as subsonic inlets and diffusers, nozzles, etc.

References

[1] Sorensen, V. L., "Computer Program for Calculating Flow Fields in Supersonic Inlets," TN D-2897, July 1965, NASA.

[2] Cubbison, R. W., Meleason, E. T., and Johnson, D. F., "Effects of Porous Bleed in a High Performance Axisymmetric, Mixed-Compression Inlet at Mach 2.50," TM X-1692, Nov. 1968, NASA.

[3] Smeltzer, D. B. and Sorensen, N. E., "Investigation of a Nearly Isentropic Mixed-Compression Axisymmetric Inlet System at Mach Numbers 0.6 to 3.2," TN D-4557, May 1968, NASA.

Errata

Approximate Solution for Minimum Induced Drag of Wings with Given Structural Weight

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[J. Aircraft **12**, 124-126 (1975)]

EQUATIONS (12) and (13) of the subject paper should read as follows:

1) Line 2 of Eq. (12) must read

$$\frac{C_2}{\pi}\eta^2 \mathcal{L}n\{[1-(1-\eta^2)^{1/2}]/[1+(1-\eta^2)^{1/2}]\}-$$

i.e. square brackets and brackets shaped like this { } have to be included, and also the exponent ½ in the first term should be within round brackets.

2) In Eq. (13), γRe must read γ_{Re}, i.e. *Re* has to be a subscript.

Received June 19, 1975.

Index category: Aircraft Aerodynamics (Including Component Aerodynamics).