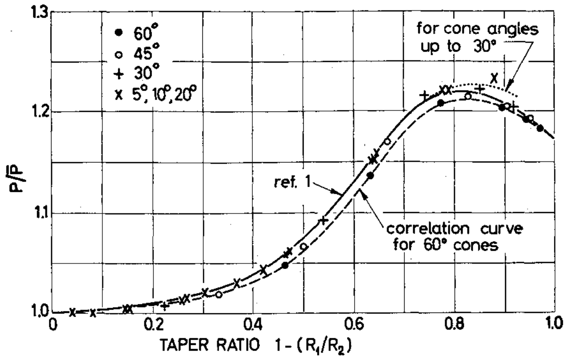

Fig. 1 Correlation between critical pressure of conical and equivalent cylindrical shells with re-emphasis on cone angle dependence (from Fig. 2 of Ref. 1).

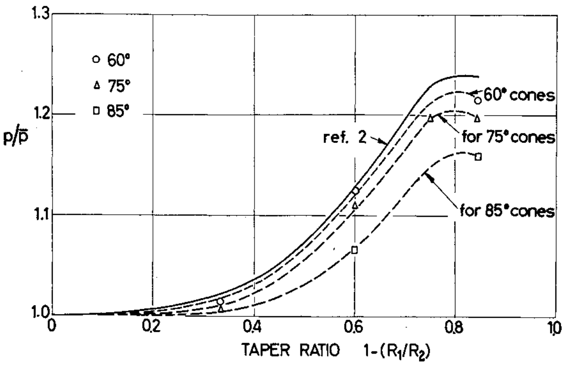

Fig. 2 Correlation curves for conical shells with large cone angles.

2 were based on typical shells of fairly high ratios of small radius to thickness (R_1/h), the range being 250–2000. If one now computes the ($p/\bar{p}$) ratio for a typical shell and then repeats the calculations for the same shell but with different thicknesses, a decrease in ($p/\bar{p}$) with increasing thickness is noted. This decrease is very small for large (a/h) ratios, where (a/h) is an alternative thickness ratio criterion, a being the distance along a generator of the small end of the conical frustrum from the vertex; but it becomes appreciable for thicker shells of (a/h) ratios below 300. For example, although for a typical shell a decrease of only 1.5% in ($p/\bar{p}$) was found when the (a/h) ratio was changed from 700 to 300, a 6% decrease resulted when the (a/h) ratio was changed from 300 to 50.

Since the calculations of Ref. 1 did not go below (a/h) = 290, it is not surprising that the decrease of ($p/\bar{p}$) with (a/h), or rather with (R_1/h), was found to be very small and was hence obliterated by averaging out. But, if one intends to apply the correlation curves of Ref. 1 or 2 to shells with (a/h) below 250, this effect may be significant.

It may be pointed out that both cone angle dependence and thickness ratio effects of the same order were found when a similar correlation with equivalent cylindrical shells was carried out for orthotropic shells.[3]

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Addendum: Dual Electric-Nuclear Engine

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In a recent paper,[1] comparison was made between all-nuclear rockets and dual electric-nuclear rockets for Mars trips. It was found that the dual electric-nuclear system reduced the gross weight of the vehicle in initial earth orbit to 0.4–0.6 of the gross weight of the all-nuclear vehicle. Comparison was not made, however, with an all-electric vehicle.

A recent parametric study by Moeckel[2] indicates that for a fast round trip comparable to that in Ref. 1. (347 days), and for a power plant specific weight equal to that for the present typical vehicle (8.3 lb/kw), all-electric engines will have about the same gross weight as an all-nuclear vehicle for equal payloads returned to earth. Although details of the mission profile in Moeckel's study are somewhat different, it is believed that the over-all comparisons in the two studies are consistent.

It is therefore possible to conclude that the dual electric-nuclear rocket system would reduce the gross weight of a comparable all-electric vehicle to approximately the same degree (~0.4–0.6) that it would reduce the gross weight of an all-nuclear vehicle.

References

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Comment on "Velocity Defect Law for a Transpired Turbulent Boundary Layer"

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The interesting note by Mickley and Smith[1] suggests that the hypothesis advanced by Clauser[2] for the turbulent boundary layer can be extended to the problem of the transpired boundary layer by a substitution of the friction velocity $U_\tau{}^*$ based on the maximum shear stress. It has been established that for the simple case of zero axial pressure gradient and for an impermeable plate, $U_\tau{}^*$ is a maximum at the wall. Where a disturbance exists at the wall due to a pressure gradient or indeed mass transport, a single solution of the velocity distribution function is no longer applicable. However, in the outer region of the boundary layer, the momentum equation for the flow is reduced to the Reynolds stress equations:

$$\bar{u}\frac{\partial \bar{u}}{\partial y} + \bar{v}\frac{\partial \bar{u}}{\partial x} = \epsilon\left(\frac{\partial^2 \bar{u}}{\partial y^2}\right) \qquad \text{etc.} \qquad (1)$$

This, in essence, suggests that the eddy diffusivity ϵ of the

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