relative to the three-dimensional windward streamline analysis. These results confirm the statement of Vaglio-Laurin[2] that "due to the larger shearing stresses, smaller three-dimensional effects can be expected for turbulent layers as compared with laminar layers subject to the same boundary conditions."

Summary

The effects of three-dimensional crossflow (outflow) along the windward streamline of a sharp cone at incidence under hypersonic flow conditions are shown to be significantly stronger in a laminar boundary layer relative to a turbulent boundary layer. This finding is used in conjunction with an "effective cone" concept to show that windward ray heat-transfer and skin-friction distributions for a turbulent boundary layer can be computed satisfactorily (for the geometry and flow conditions under present examination) using an "effective cone" of semivertex angle equal to the physical body semivertex angle plus the physical angle of attack in a two-dimensional zero angle-of-attack analysis. Application of this "effective cone" concept to the windward streamline laminar boundary layer resulted in a rather severe underprediction of heat transfer and skin friction relative to the windward plane-of-symmetry analysis. In general, smaller crossflow (outflow) effects on the windward streamline boundary layer can be expected for turbulent layers as compared with laminar layers subject to the same boundary conditions. It is important to realize and acknowledge that "effective cone" techniques do not yield uniformly valid approximations but may provide acceptable results in some cases (such as the present plane-of-symmetry turbulent boundary layer). Indiscriminate use of the "effective cone" approach, especially for laminar boundary layers, is not advised by the present author.

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Errata

Errata: "Thermodynamic Properties of Hydrogen-Helium Plasmas"

H. F. Nelson
University of Missouri—Rolla, Rolla, Mo.

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In the definition of the quantities $\bar{C}_p$, $\bar{C}_v$, $\bar{h}$, $\bar{s}$, and $\bar{u}$ in the Nomenclature the R should be replaced by R_0, where $R_0 = R_u/M_0$. Equations (35) and (36) should be

$$C_v = C_p - R[1 - T\sum_{i=1}^{6} M_i X_{i,\,T|P}/\bar{M}]^2/[1 + P\sum_{i=1}^{6} M_i X_{i,\,P|T}/\bar{M}] \tag{35}$$

$$a/a_0 = \left[\frac{Z\gamma T}{\gamma_0 T_0}\right]^{1/2}[1 + P\sum_{i=1}^{6} M_i X_{i,\,P|T}/\bar{M}] \tag{36}$$

Reference 6 should be Nelson, H. F., "Thermodynamic Properties of Hydrogen-Helium Plasmas," CR-1861, 1971, NASA.

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