Authors' Closure

We are indebted to Professor Hirsch for the time and effort that he spent in examining our work, particularly in light of his considerable background in this area.

From Prof. Hirsch's equations (2), (3), (4a), and (5), one can arrive at equations (6) and (7). He is correct in pointing out that "if all the $K_y$ coefficients are equal" the equations are greatly simplified. However, the data presented by Hirsch and Dring (1987) in their Figs. 6(a–c) showed that while the $K_y$ terms that only involved the axial and tangential components of velocity were relatively uniform, the $K_y$ terms involving the radial component of velocity varied very widely and erratically. This variation in the $K_y$ terms suggests, as Prof. Hirsch pointed out, that the assumption of equality "might be too severe."

Some of Prof. Hirsch's more specific questions are addressed as follows:

(i) The mass-averaged rotthalpy is not related to the static variables through the mass-averaged velocities. The relationship between the stagnation and static variables is established through equations (14), (24), and (28a) in Part I of Dring and Oates (1990) and in equations (10), (11), (17) and (18) in Part II. The issue of how the static pressure is determined is discussed in Part I following equation (24). The only mass-averaged velocity component in the analysis is in the absolute angular momentum ($r \cdot C^\theta$), which is conserved along stream surfaces (Part I, equation (21)).

(ii) Yes. Both of these effects are accounted for rigorously.

(iii) I agree with Prof. Hirsch that the validity of applying potential flow to estimate the $\bar{W}^\theta \bar{W}^\theta$ term in the highly three-dimensional and viscous endwall flow within the airfoil rows is certainly threadbare. However, given the fact that the contribution of this term in the present assessment was very small (see Part I, Sensitivity Analysis, Case A: Neglecting $H_c$), this very simple approach was deemed to be sufficiently accurate.