Reply by Authors to P.R. Payne

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Introduction

As suggested by Payne in his Comment, we have checked our analysis for Fig. 13 in Ref. 1 and found no error.

The correctness of that analysis may be checked by examining a special case of $\theta = 30$ deg, in which the cross section becomes an equilateral triangle whose apparent mass coefficient $m_{\parallel}$ can be found in Ref. 2, which reads

$$m_{\parallel} = 0.654\pi\rho a^2 \tag{1}$$

where a is the radius of the circumscribed circle of that triangle. Since the height of the triangle is $h = 1.5a$, Eq. (1) can be rewritten as

$$\frac{m_{\parallel}}{\rho\pi(h/2)^2} = 1.1627 \tag{2}$$

which agrees with our curve shown in Fig. 1 of Payne's Comment. Note that this value is not below 1, as expected by Payne based on his assumption that the curve for an isosceles triangle is similar to Taylor's curve for a rhomboid. Nevertheless, these two curves do agree at $\theta = 0$ deg when both bodies reduce to a flat plate.

Although additional published results cannot be found by us to check the validity of our curve at other θ values, we believe that the agreement at $\theta = 30$ deg with the formula in Ref. 2 is not a coincidence, and the analysis based on which our curve was plotted is not in error. Analyses reveal that the added mass of an isosceles triangle behaves differently from that of a rhomboid, which is in contradiction to intuition.

Figure 3 in Payne's Comment shows the behavior of a cavitating flat plate and a penetrating wedge having one and two wetted surfaces, respectively. Flows around them are not similar in nature to those around a triangle or a rhomboid having wetted surfaces all around. The close agreement of the two curves shown in Payne's Fig. 3 does not necessarily mean that the two curves in his Fig. 1 should also be in close agreement.

We would like to thank Payne for his interest in our paper and his thorough review of literature concerning added mass theory, which corrects and complements our sketchy historical description on the related literature in aerodynamics only.

References

[1]Huang, M-K. and Chow, C-Y., "Apparent-Mass Coefficients for Isosceles Triangles and Cross Sections Formed by Two Circles," *Journal of Aircraft*, Vol. 20, Sept. 1983, pp. 810-816.

[2]Nielsen, J.N., *Missile Aerodynamics*, McGraw-Hill Book Co., New York, 1960, p. 373.

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Comment on "Application of Computational Aerodynamics to Airplane Design"

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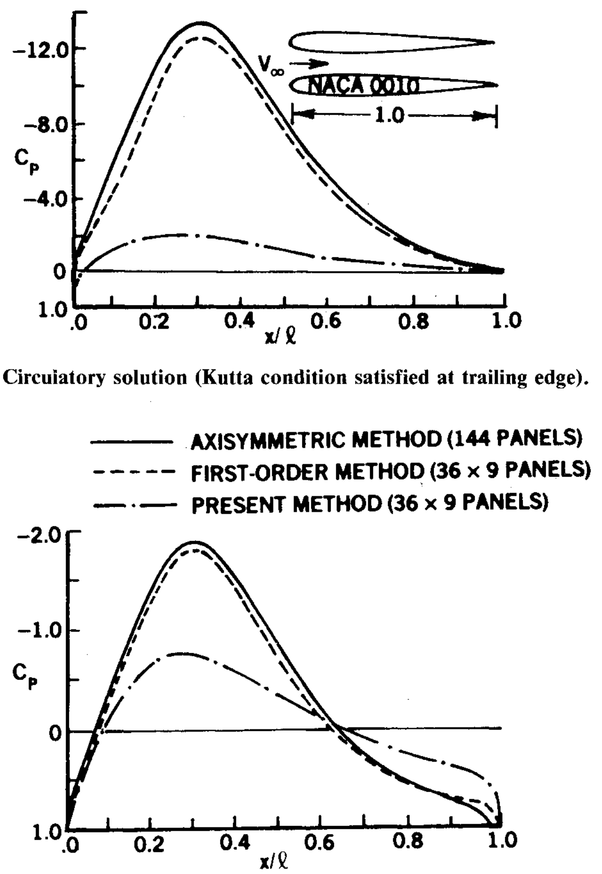
In the June 1984 issue of the *Journal of Aircraft*, Mr. Miranda published a review article on computational aerodynamics.[1] In Fig. 14 of that article, he presents some highly unsatisfactory calculational results, which he erroneously states were produced by Hess' higher order three-dimensional panel method. In fact, the results in question were produced by a first-order panel method[2] more than a dozen years old, which is known to be inaccurate for internal flows. The higher order method[3] has been applied to Miranda's case in Ref. 4. The results are shown in Fig. 1, which was taken from Ref. 4. As a standard of comparison, a graphically exact solution was obtained by using an axisymmetric method[5] with successively larger number of panels until the results stopped changing. This is also the source of Miranda's exact solution. It is evident from Fig. 1 that, in contrast to the first-order method, the higher order method gives a very satisfactory solution with a moderate number of panels.



a) Circulatory solution (Kutta condition satisfied at trailing edge).

b) Noncirculatory solution.

Fig. 1 Calculated pressure distributions in the interior of a ring wing.

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