

Technical Comments

Comment on "Induced Drag and Lift of Wing by the Piecewise Continuous Kernel Function Method"

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IN a recent paper, Lottati¹ presented results from applications of the piecewise continuous kernel function method to four wings with constant chord and the same aspect ratio. One of the wings was a swept forward wing, one a swept back wing, one a swept forward-back wing (M wing), and one a swept back-forward wing (W wing). The values given for C_{L_α} were 3.481, 3.470, 3.817, and 3.817, respectively.

The paper gives the impression that the results presented possess high accuracy. Although this may be an appropriate general description, it should be mentioned that at least one of the values given for C_{L_α} cannot possess three-decimal accuracy. The reason is that C_{L_α} , according to the reverse flow theorem,² has the same value for opposite free-stream direction.

References

¹Lottati, I., "Induced Drag and Lift of Wing by the Piecewise Continuous Kernel Function Method," *Journal of Aircraft*, Vol. 21, Nov. 1984, pp. 833-834.

²Flax, A. H., "General Reverse Flow and Variational Theorems in Lifting-surface Theory," *Journal of Aeronautical Sciences*, Vol. 19, June 1952, pp. 361-374.

Reply by Author to V.J.E. Stark

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I WOULD like to acknowledge the interest that V.J.E. Stark has shown in my recent synoptic.¹ As was mentioned by Stark, sweeping a rectangular wing forward or backward has no influence on the total lift coefficient of the wing. This well known fact is backed by the reverse flow theorem² and is mentioned in the full paper¹ (top of page 14). The reason the C_{L_α} is stated with three-decimal accuracy is to emphasize the accuracy of the method. The difference between the forward and backward total coefficient lift C_{L_α} is about 0.3% and this figure may indicate the accuracy of the numerical method. Due to the fact that the forward and backward swept wings possess a totally different pressure distribution, I would suggest that one of the ways to test the accuracy of the numerical code is by comparing the C_{L_α} of the two configurations.

References

¹Lottati, I., "Induced Drag and Lift of Wing by the Piecewise Continuous Kernel Function Method," *Journal of Aircraft*, Vol. 21, Nov. 1984, pp. 833-834. Full paper available on request from National Technical Information Service.

²Flax, A. H., "Reverse-Flow and Variational Theorems for Lifting Surfaces in Nonstationary Compressible Flow," *Journal of Aeronautical Sciences*, Vol. 20, Feb. 1953, pp. 120-126.