were reproduced in Ref. 2: The model is locked to the balance by means of a set screw. The principal objection to using zero-spin data as a tare is that a nonspinning body develops a side force and yawing moment which is roll-angle-dependent.[4] I would suggest rather that the wind-tunnel balance, with spinning model mounted, serve as a flow angularity probe [viz Eq. (7)] to obtain $\{\alpha_0, \beta_0\}$. It should also be pointed out in Platou's correction equations that the use of the Magnus coefficient, C_{N_p}, with its implied linearity of force with spin rate is probably inappropriate for fin-stabilized configurations. Although bodies of revolution may evidence linearity of load with spin rate over a broad range of interest, finned bodies, in general, do not. Even if linearity were justified, the derivative, C_{Y_p}, would be required for consistency with his implied Y-axis direction.

References

[1] Platou, A. S., "Wind-Tunnel Magnus Testing of a Canted Fin or Self-Rotating Configuration," *AIAA Journal*, Vol. 10, No. 7, July 1972, pp. 965–967.

[2] Regan, F. J., "Magnus Measurements on a Free-Spinning Stabilizer," AIAA Paper 70-559, Tullahoma, Tenn., 1970.

[3] Benton, E. R., "Supersonic Magnus Effect on a Finned Missile," *AIAA Journal*, Vol. 2, No. 1, July 1964, pp. 153–155.

[4] Regan, F. J., "Roll Induced Force and Moment Measurements of the M823 Research Store," NOLTR 68-195, Nov. 1968, Naval Ordnance Laboratory, White Oak, Md.

Reply by Author to F. J. Regan

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I WISH to thank F. J. Regan for his comments on my paper.[1] I feel that Regan agrees with my main finding that there is a normal force interaction term in the Magnus data presented in Ref. 2. The main disagreement appears to be in how to eliminate the interaction from the data. I still feel that the most accurate way to do this is to subtract the zero spin measurement from the spin measurement at the same angle of attack. This is difficult or impossible to do when the zero spin data are roll dependent. The zero spin data measurement is not impossible if it is not roll dependent.

In the case where one wishes to or is forced to correct spin data for a normal force interaction then one has the choice of my technique or Regan's technique—both have their difficulties.

In my technique one must estimate the Magnus force center of pressure or in the case of a finned body where both fin and body are rotating one must also contend with the produced Magnus couple. However, my technique does take into account the variation of average flow inclination over the body at each angle of attack.

Regan's technique eliminates the need to estimate the Magnus center of pressure, but it does assume that the flow inclination is constant in the wind-tunnel flow region traversed by the model. Since the normal force interaction in the Magnus measuring direction is very sensitive to the exact flow inclination one must be very careful in evaluating the results of this corrective technique. I would suggest that anyone evaluating wind-tunnel Magnus data where normal force interactions are suspected should attempt correction of the data using both techniques.

In closing, I would like to say that my main reason for publishing Ref. 1 was to make the reader aware that Magnus data on a self-rotating configuration can contain a normal force interaction and that a careful study of the data is necessary before one can use these data as free flight Magnus data.

The other points of disagreement are minor and need only a short comment. My sentence referred to in Regan's third paragraph should be changed to read, "The existence of a moment at zero force is indicative of a couple and in this case (Ref. 2) is due to the normal force interaction term ($N \sin \varepsilon$) acting opposite to the fin Magnus force." Also, Eq. (8) in Regan's comment is correct rather than my Eq. (2).

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[1] Platou, A. S., "Wind-Tunnel Magnus Testing of a Canted Fin or Self-Rotating Configuration," *AIAA Journal*, Vol. 10, No. 7, July 1972, pp. 965–967.

[2] Regan, F. J., "Magnus Measurements on a Free-Spinning Stabilizer," AIAA Paper 70-559, Tullahoma, Tenn., 1970.

Reply by Authors to A. G. Kurn

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IN the comments (see Ref. 1) on the authors' paper entitled, "Reduction of Noise from Supersonic Jet Flows,"[2] Kurn has drawn attention to his interesting experimental results on pressure fluctuations at the base of a bluff afterbody containing a sonic nozzle with the jet flow submerged in an external free-stream of a transonic wind tunnel.[3] He points out that at certain ratios of the total head of the jet flow to that of the surrounding uniform flow, a sudden reduction of discrete spectral components of the base-pressure fluctuations was observed. Based on schlieren photographs of the flow, he attributes this behavior of the base-pressure fluctuations to the modification or elimination of the periodic shedding of vortices from the bluff base of the afterbody. Since no direct noise measurements were undertaken by Kurn, the deductions about any possible changes in the radiated "far-field" noise from this flow configuration are based entirely on the corresponding behavior of the measured base-pressure fluctuations. Since the periodic vortex shedding observed by Kurn[3] and also by many others in supersonic free jet flows[4–6] has often been shown to generate discrete sound emissions, it therefore seems to be a reasonable deduction that either the disappearance or the modification in strength or periodicity of the vortex shedding in Kurn's experiments may lead to an elimination, modification, or reduction of discrete component of the related noise emission. Kurn, however, assumes similarities between his experiments and those described by the authors.[2] He then advances an alternate hypothesis that the elimination of the vortex shedding at the interface (mixing region; Fig. 7b; Ref. 2) of the inner and outer coaxial jets may be responsible for the observed noise reductions reported in Ref. 2.

The authors submit that the flow characteristics of a sonic jet exhausting into a bluff base submerged in a much larger uniform

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