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Reply by Authors to F. Aulehla and G. Besigk

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THE basic purpose of the investigations reported in Ref. 1 and our current paper appears to have been missed by Aulehla and Besigk. It was not to assess the accuracy of their model drag coefficients, since we are aware of the problem in using the trapezoidal method of integration with inadequate pressure orifices. The purpose was to determine if large incremental changes in afterbody drag due to afterbody configuration changes would be compensated by a change in forebody drag as has been stated. If so, the standard wind tunnel testing technique used during the configurational development phase of an aircraft development program would lead to erroneous conclusions. Again, the results presented in Figs. 11-13 of Ref. 1 and Figs. 16-18 of our paper provide a solid basis for the validity of the testing technique. However, as we have always noted, caution must be used in the selection of the metric portion of the model. We have also emphasized the well-known requirement for adequate instrumentation and low blockage models when assessing small but significant parameters on models tested in transonic wind tunnels.

We are somewhat confused by the data presented in Table 2 of the comment by Aulehla and Besigk. Using the data presented in Fig. 14 of Ref. 1, as is normally done, to obtain total aircraft drag from wind tunnel data; i.e., using the cylindrical configuration as the baseline and obtaining increments for the afterbody changes the following results are obtained. When the cylindrical afterbody is replaced by the contoured afterbody there is an 11 drag count change on the forebody compared with a total model drag of 218 counts. When the cylindrical afterbody is replaced by the 15-deg afterbody there is an 18 drag count change on the forebody compared with a total model drag of 381 counts. When these levels of change in forebody *pressure* drag are considered, 1) in light of typical data precision and uncertainty in making pressure drag measurements on complex aircraft configurations in transonic wind tunnels, and 2) in light of the fact that these levels of drag coefficients would be reduced by a factor of approximately 10 if a wing area were used rather than body cross-sectional area it is obvious there would be no impact on the selection of the best configuration. One should always examine the practicality of attaining the often stated requirement to measure to a one or two drag count accuracy in absolute drag for a complete aircraft.

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Reference

[1] Spratley, A.V., Thompson, E.R., and Kennedy, T.L., "Reynolds Number and Nozzle Afterbody Configuration Effects on Model Forebody and Afterbody Drag," AIAA Paper 77-103, Jan. 1977.