the cost associated with the DLS method (without extra computational modes) is approximately double. Two iterations of an IV method could be performed for about the same computer cost as the DLS method (without extra computational DOF), and experience has shown that, in general, IV methods converge in only a few iterations. The cost of oversized LS and DLS methods increases exponentially as the number of computational modes increases. The relative computer cost between an iterative IV method and an oversized LS or DLS method depends upon the application. Reference 3 indicates the advantages of the DLS method over IV and Maximum Likelihood methods for applications with a large number of DOF.

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Reader's Forum

Brief discussion of previous investigations in the aerospace sciences and technical comments on papers published in the AIAA Journal *are presented in this special department. Entries must be restricted to a maximum of 1000 words, or the equivalent of one* Journal *page including formulas and figures. A discussion will be published as quickly as possible after receipt of the manuscript. Neither the AIAA nor its editors are responsible for the opinions expressed by the correspondents. Authors will be invited to reply promptly.*

Comment on "Solutions of One-Dimensional Steady Nozzle Flow Revisited"

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REFERENCE 1 discusses a number of topics dealing with one-dimensional nozzle flow. Two of these topics are also discusssed in Refs. 2 and 3 and may well be found in other compressible flow textbooks. These topics are a simple procedure for finding the nozzle solution when there is an internal shock wave, and the criteria for distinguishing different regimes for the flow in a converging/diverging nozzle.

References

[1]Liou, M.-S., "Solutions of One-Dimensional Steady Nozzle Flow Revisited," *AIAA Journal,* Vol. 26, May 1988, pp. 625-628.

[2]Zucker, R. D., *Fundamentals of Gas Dynamics,* Matrix Pub., Beaverton, OR, 1977, Sec. 6.6.

[3]Emanuel, G., *Gasdynamics: Theory and Applications,* AIAA Education Series, AIAA, Washington, DC, 1986, Sec. 7.1 and App. H.

Received Sept. 12, 1988.

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Reply by Author to G. Emanuel

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REGARDING two of many topics discussed in Ref. 1, I wish to thank G. Emanuel for bringing Refs. 2 and 3 to my attention. Indeed, an identical procedure for solving the exit Mach number with a normal shock in a nozzle appears not only in Refs. 1 (Remark 5) and 3 [p. 96, Eq. (7.7)] but also in Ref. 4 [p. 168, Eq. (5.12)]. As demonstrated in Ref. 1 (Remark 1), solution of the total pressure loss across the shock wave is equivalent and straightforward, yielding immediately the shock Mach number. As expressed in Eq. (14) of Ref. 1, the three critical points (called in Refs. 2 and 4) now can be described by the only two solutions of Eq. (13). Consequently, these two solutions completely delineate the seven regimes/points (e.g., see Refs. 2–4) associated with the convergent-divergent nozzle flows.

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Submitted Oct. 11, 1988.

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Comment on "Influence of Initial and Boundary Conditions on Vortex Ring Development"

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IRDMUSA and Garris[1] found that vortex rings ejected from a circular hole (air in air) entrained less fluid than