optimization algorithm is unreliable and therefore unsuitable, and 2) various aspects of the dynamical analysis are not applicable to the study of submerged, ring-stiffened cylinders.

With regard to the first point, studies of the type performed by Eason and Fenton[2] (to which Pappas refers) show that the possibility of algorithm failure is always present, and that "reliable" algorithms are those with an acceptable success/failure ratio when applied to test problems. Pappas has recognized this situation[3] noting that the DSDA algorithm which he used in his studies can fail. He indicates that repeated computer runs using different starting designs will help to resolve this difficulty. Eason and Fenton also note that although they experienced problems with the SUMT-Davidon-Fletcher-Powell algorithm of the type used in Ref. 1, other researchers gave it a high rating.

User preference of one design algorithm over another depends, in addition to its "reliability", upon its efficiency and versatility in application to different design problems. The SUMT-Davidon-Fletcher-Powell algorithm was chosen for use in Ref. 1 because it was general enough to be used in three different types of design problems without having to be "tuned" for any specific case. The 5% difference between minimum-weight designs reported in Ref. 1 and those claimed by Pappas are viewed by the authors as being in close agreement and not an adequate basis for raising questions concerning algorithmic capabilities. It should be noted that in Ref. 1 a Flugge-Lure-Byrne shell theory is used in a dynamic shell buckling analysis, while in Ref. 3 a static analysis is used based on a Donnell theory.

In either study, the primary objective must be to determine the impact that formal design procedures can have on practical design problems. Results of the type in Refs. 1 and 3 can serve as guidelines for designers who must consider, in addition to the well-defined constraints on structural behavior, nonbehavioral complications such as economics, ease of fabrication and nonstructural requirements.

The second point raised by Pappas concerned the suitability of the dynamic analysis used in the design studies. He points out that for certain cases more longitudinal bending modes should be considered in the dynamic buckling analysis. As was noted in Ref. 1, the use of more than approximately six longitudinal half-waves would be in conflict with the "smearing" of the frame stiffnesses along the length of the shell, since the additional modes have buckling wave lengths which are typically less than twice the frame spacing.

Pappas suggests that inter-ring panel stability should be treated in a dynamical analysis by using the shell model in Ref. 1 for each panel. This would be valid only if the panels were simply supported, but clearly, T-ring motion will interact with the panel through interface conditions more complex than the simple support type. Thus, the proposed shell panel model could not accurately represent the system behavior.

Although the authors agree that the influence of immersion is important, the complete fluid-structure interaction analysis is a complex numerical problem which is currently too expensive for inclusion in an optimization algorithm. The natural modes of in vacuo vibrations are an important tool in simplifying this problem[4] and can be used as an initial basis for investigating the degree to which optimization algorithms can change the response characteristics of a structure. Design problems 2 and 3 (Ref. 1) are both exploratory studies of this type, problem 2 dealing with frequency separation and problem 3 dealing with the separation of axial frequencies. For each design problem, important information was obtained: in problem 2 the lowest two frequencies could be separated with the result that higher frequencies became nearly coincident, while in problem 3 axial frequencies could be separated with the result that "axial" and "radial"-type structural motions became more nearly alike.

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Errata

Experimental Investigation of Underexpanded Exhaust Plumes

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THE upper bound of the integral appearing in Eq. (2) should be θ_∞ instead of θ_0. Thus Eq. (2) should read

$$A = R_e^2\left[\frac{1}{1+\cos\alpha_e} - \frac{\delta_1}{R_e} + \left(\frac{\delta_1}{R_e}\right)^2 \frac{\cos\alpha_e}{2}\right] \Big/ \int_0^{\theta_\infty} \left[\cos\left(\frac{\pi}{2}\frac{\theta}{\theta_\infty}\right)\right]^{2/(\gamma-1)} \sin\theta \, d\theta$$

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