tion of a panel system in discrete modal form. Their results, established initially for two- and three-degree-of-freedom systems, were extended to any finite number of degrees of freedom by Fonda.[4] A much more direct and simple approach based on small-perturbation theory can be applied directly to the partial-differential equation [Eq. (1) of Ref. 1] for plate aeroelastic stability. The criterion for instability at infinitesimal values of the viscoelastic damping coefficient that is found is identical to the result of Zisfein and Frueh for "structural" damping, namely, that instability occurs when

$$\frac{\partial \omega}{\partial v} > \frac{1}{2} \frac{\omega}{v}$$

where the frequency ω and velocity v refer to the curve of frequency vs velocity for the undamped system. A simple geometric construction on Lottati's Fig. 1 suffices to demonstrate this point.

The stabilizing effect of uniform viscous damping (i.e., force proportional to plate transverse velocity) is also well known, having been expounded by Movchan,[5] Bolotin,[6] and others. For small values of combined viscous and viscoelastic damping, the real parts of the root of the stability equation are algebraically additive.

In Lottati's Note, viscoelastic damping was shown to be destabilizing for all values of the viscoelastic damping coefficient for which data were given, and this effect was also specifically noted in the text. In fact, in exact analogy to Parks'[7] determination of values of viscous damping sufficient to stabilize against panel flutter at any velocity using Liapounov's direct method, it can be shown that a panel becomes aeroelastically stable for any velocity with sufficiently large viscoelastic damping. This phenomenon also occurs in many nonconservative systems with unequal modal damping, as demonstrated by Bolotin[6] for two degrees of freedom.

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Reply by Author to A. H. Flax

I. Lottati*
Technion—Israel Institute of Technology
Haifa, Israel

I WOULD like to acknowledge the interest that Prof. A.H. Flax has shown in my recent Note.[1] The effect of damping on the stability of systems has been the subject of many previous published works, some of which are referred to by Flax and Ref. 1. It is a well-known fact[2,3] that the stability determinants obtained for the undamped system and the very lightly damped one are not compatible and thus it is not surprising that a light damping may change the flutter speed of the system remarkably. Nevertheless, most of the results referred to by Flax were obtained by applying the modal analysis assuming a finite number of degrees of freedom to simulate the infinite number of degrees of freedom of the continuous structure. The results reported in Ref. 1 were obtained by solving exactly the differential equation of the supersonic panel with the associated boundary conditions, obtaining the critical speed at which the panel will undergo flutter, subjected to different types of damping. It is satisfactory to observe that the results of Ref. 1 are in very good agreement with the results obtained by other researchers applying different methods of solution for dynamic systems that are not specifically related to supersonic panel flutter.

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*Senior Lecturer, Department of Aeronautical Engineering.