electrode characteristics and is more complicated than the high-frequency breakdown calculation. Nevertheless the arguments presented here show that Gardner's results, surprising as they initially appear, are quite plausible.

References

[1] Gardner, J. A., "Effects of a Dynamic Gas on Breakdown Potential," *AIAA Journal*, Vol. 6, No. 7, July 1968, pp. 1414–1415.

[2] Covert, E. E., "An Estimate of the Effects of Forced Convection on Antenna Breakdown of Slot Antennas," Rept. 154, August 1968, M.I.T. Aerophysics Laboratory.

Errata and Addenda: "Theoretical Considerations of Panel Flutter at High Supersonic Mach Numbers"

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[AIAA J. 4, 1257–1266 (1966)]

An error in the article has been pointed out by Ellen.[1] Equation (50) should obviously read,

$$f = g_{T2}/g_{T1} = [1 + \psi(g_{S1}/g_A)]/[1 + (g_{S1}/g_A)] \quad (50)$$

In Fig. 16, the ordinates f should be relabelled as $1/f$. It is to be noted that this error would not have any effect on the λ_F for small g_T since the factor $2[f]^{1/2}/(1+f)$ equals $2[1/f]^{1/2}/(1 + 1/f)$, but it may have an effect for large g_T, as can be seen from Eq. (48). Accordingly, the results in Fig. 17 for $g_A = 0.1$ are correct, whereas those for $g_A = 1.0$ may be in error.

In the discussion of the effects of arbitrary structural damping in Sec. 5, the damping in the structure was assumed to come from the general form, $G\partial^{n+1}w/\partial t\partial x^n$ and not from the $(1 + ig)Kw$ form used in conventional V-g modal analyses of panel and aircraft flutter. Thus, the g_i there actually represent critical damping ratios $2\zeta_i$ and *not* the "structural" damping values g_i of the V-g analyses. This has led to some confusion in the article. A brief review of the relationship between the structural damping g_i and the critical damping ratio ζ_i is presented below in hopes of clarifying this Sec. 5.

For the structural damping as used in conventional analyses, one assumes,

$$\rho_M h\partial^2 w/\partial t^2 + D(1 + ig)\partial^4 w/\partial x^4 = 0 \quad (1)$$

for a two-dimensional panel with no air forces acting. Setting $w = q_n(t)\sin n\pi x/a$, one obtains

$$d^2q_n/dt^2 + \omega_n^2(1 + ig)q_n = 0 \quad (2)$$

where the natural frequency ω_n of the nth mode is

$$\omega_n = (n\pi)^2[D/\rho_M ha^4]^{1/2} \quad (3)$$

In complete sinusoidal form, Eq. (2) becomes

$$[-\omega^2 + \omega_n^2(1 + ig)]q_n = 0 \quad (4)$$

One sees from Eq. (4) that the structural damping g_n of each mode ω_n is the same, i.e., $g_n = g$, for the damping approximation assumed in Eq. (1).

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For damping type A, one assumes

$$\rho_M h\partial^2 w/\partial t^2 + G_A\partial w/\partial t + D\partial^4 w/\partial x^4 = 0 \quad (5)$$

Setting $w = q_n(t)\sin n\pi x/a$, one obtains

$$d^2q_n/dt^2 + 2\zeta_n\omega_n dq_n/dt + \omega_n^2 q_n = 0 \quad (6)$$

where ω_n is as before and the critical damping ratio ζ_n is given as

$$\zeta_n = G_A/2\rho_M h\omega_n \quad (7)$$

Since G_A is assumed constant in Eq. (5), one finds from Eq. (7) that

$$\zeta_n = \zeta_1\omega_1/\omega_n \quad (8)$$

for the damping type A approximation given in Eq. (5). In sinusoidal form, Eq. (6) becomes

$$[-\omega^2 + \omega_n^2(1 + i2\zeta_n\omega/\omega_n)]q_n = 0 \quad (9)$$

Comparing this with Eq. (4) and using Eq. (8), the equivalent structural damping for this damping type A case would be

$$g_n = 2\zeta_n\omega/\omega_n = 2\zeta_1(\omega_1\omega/\omega_n^2) \quad (10)$$

During flutter, ω = const for all modes; hence $g_2/g_1 = \frac{1}{16}$. Thus a conventional $V - g$ modal analysis with $g_2/g_1 = \frac{1}{16}$ would be equivalent to the damping type A presented here.

For damping type B, one assumes

$$\rho_M h\partial^2 w/\partial t^2 - G_B\partial^3 w/\partial t\partial x^2 + D\partial^4 w/\partial x^4 = 0 \quad (11)$$

Proceeding as in the damping type A case gives

$$\zeta_n = \zeta_1 \quad (12)$$

for the damping type B approximation given in Eq. (11). The equivalent structural damping for this case would be

$$g_n = 2\zeta_n\omega/\omega_n = 2\zeta_1\omega/\omega_n \quad (13)$$

During flutter, ω = const for all modes; hence $g_2/g_1 = \frac{1}{4}$.

For damping type C, one assumes

$$\rho_M h\partial^2 w/\partial t^2 + G_c\partial^5 w/\partial t\partial x^4 + D\partial^4 w/\partial x^4 = 0 \quad (14)$$

Proceeding as in the damping type A case gives

$$\zeta_n = \zeta_1\omega_n/\omega_1 \quad (15)$$

for the damping type C approximation given by Eq. (14). The equivalent structural damping for this case would be

$$g_n = 2\zeta_n\omega/\omega_n = 2\zeta_1\omega/\omega_1 \quad (16)$$

During flutter, ω = const for all modes; hence $g_2/g_1 = 1$.

From this brief review, the following observations can be made:

1) Damping type C is equivalent to structural damping for two-dimensional panels without midplane forces. For this type damping, the ζ_n's of each mode are related by $\zeta_n = \zeta_1\omega_n/\omega_1$. Then, $g = 2\zeta_1\omega_{FLUT}/\omega_1$. For three-dimensional panels, these relations are somewhat altered.

2) In Sec. 5 of the article, the so-called $g_2 = g_1/4$ and $g_2 = g_1$ cases are actually the $\zeta_2 = \zeta_1/4$ and $\zeta_2 = \zeta_1$ cases. These correspond to damping types A and B, respectively. This was pointed out to the author by Jordan.[2] Damping type C would show even greater destabilization in Fig. 17 than damping type B.

3) The footnote on p. 1264 of the article is in error. The $g_2 = g_1$ case of the conventional $V - g$ modal analysis is equivalent to damping type C, and *not* type B. This applies only for two-dimensional panels with no midplane forces.

4) Which of the various types damping to use for such continuous structures depends on experimental measurements of the damping behavior of the various modes ω_n.

References

[1] Ellen, C. H., "Influence of Structural Damping on Panel Flutter," *AIAA Journal*, Vol. 6, No. 11, Nov. 1968, pp. 2169–2174.

[2] Jordan, P. F., private communication.

Errata: "Analysis of the Optimum Two-Impulse Orbital Transfer under Arbitrary Terminal Conditions"

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[AIAA J. **6,** 2145–2153 (1968)]

THROUGH my recent correspondence with R. A. Bass and E. A. McGinness of Bellcomm, Inc., Washington, D. C., an error was found in the coefficients C_3 and C_5 of the octic equation on p. 2147. The corrected coefficients should read:

$$C_3 = 4K^3(M_{02} - M_{01}) + 4K^2M_{01}M_{02}(N_{01} - N_{02}) + 2K^2(N_{01}P_{02} - N_{02}P_{01} + N_{01}M_{02}^2 - N_{02}M_{01}^2)$$

$$C_5 = 4K^2(N_{02} - N_{01}) + 4KN_{01}N_{02}(M_{01} - M_{02}) + 2K(M_{01}P_{02} - M_{02}P_{01} + M_{01}N_{02}^2 - M_{02}N_{01}^2)$$

Also a typographical error appears in Eq. (20), where the angle $\psi + \varphi_1$ should read $\psi + \varphi_i$.

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Erratum: "Axisymmetric Dynamic Snap-Through of Elastic Clamped Shallow Spherical Shells"

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RECENTLY more data about the critical load for dynamic snap-through of a clamped shallow spherical shell with $\lambda = 6$ under step loading have been obtained. It is found that Table 2 and Fig. 7 should be revised as follows:

Table 2 Snap-through loads p_c for various values of λ

λ	4.0	5.0	6.0	7.0	7.5	8.0	9.0	10.0	11.0	13.0
p_c	0.45	0.49	0.61	0.56	0.50	0.44	0.39	0.42	0.50	0.42

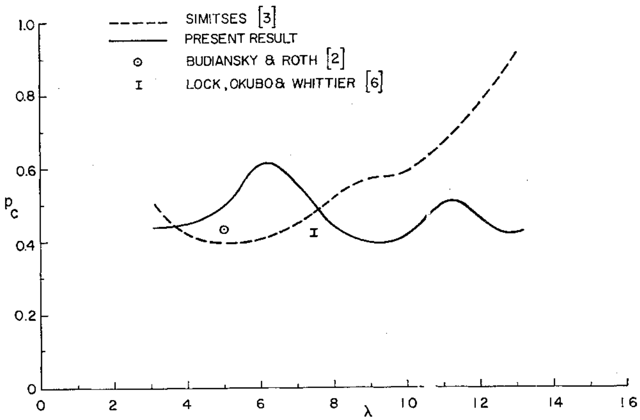

Fig. 1 Comparison of present values of P_c with the previous results.

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