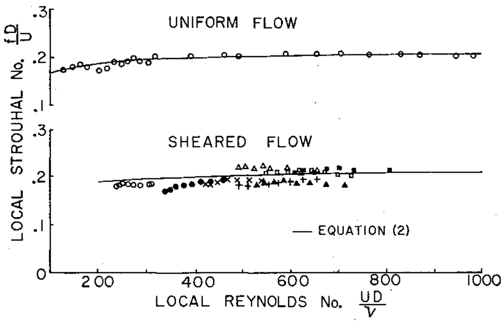

Fig. 1 Correlation of local Strouhal number with local Reynolds number for both uniform and sheared flows.

were reduced according to a local Strouhal and Reynolds number, in which the characteristic velocity is that of the local approaching stream, the results correlate much the same manner as those found for uniform flow as shown on the bottom of Fig. 1. The local velocity was obtained by using a quadratic fit to the calibration data of the sheared flow. The different symbols in Fig. 1 denote different tests runs; the triangles are for the 0.065-in.-diam cylinder, and all other symbols are for the 0.050-in.-diam cylinder. The considerable amount of scatter, approximately ±10%, may be attributed to the large turbulence intensity in the shear flow downstream of the grid. The turbulence level increased from about 0.5% without the grid to about 4% with the grid. It may be concluded from our results that a good estimate of the shedding frequency behind a circular cylinder in a shear flow may be obtained by using the correlation of Roshko with the local approaching velocity as the characteristic velocity in both the Strouhal and Reynolds numbers.

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Integration of Area and Volume Coordinates in the Finite-Element Method

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The purpose of this brief Note is to extend the area integration formula presented by Stricklin[1] to a volume integration expression. When working with displacement expansions in terms of the volume coordinates of a tetahedron, the following type of integral occurs frequently in the finite-element method:

$$I = \int_V L_1^i L_2^j L_3^k L_4^l dV \tag{1}$$

where L_1, L_2, L_3, and L_4 are the volume coordinates; i, j, k, and l are the indices of the powers to which they are raised, and V is the volume of the tetahedron.

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By inspection, the following solution was obtained:

$$I = [i!j!k!l!/(n+3)!]6V \tag{2}$$

where

$$n = i + j + k + l$$

Equation (2) is comparable to the Stricklin solution for the area integral, which occurs when the term L_4^l is made unity and V is replaced by the area A in Eq. (1), i.e.,

$$I = [i!j!k!/(n+2)!]2A \tag{3}$$

where

$$n = i + j + k$$

Equation (2) has been checked for all combinations of i, j, k, and l up to $n = 4$.

Reference

[1] Stricklin, J. A., "Integration of Area Coordinates in Mating Structural Analysis," *AIAA Journal*, Vol. 6, No. 10, Oct. 1968, p. 2023.

Dynamic Buckling of Clamped Spherical Caps under Step Pressure Loadings

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The purpose of this Technical Note is to present theoretical results for the axisymmetric buckling of shallow spherical caps under step pressure loading and limited results for asymmetrical buckling. The method of solution is an extension of the matrix displacement method of structural analysis for the nonlinear static analysis of shells of revolution[1] to include dynamical forces. The mass matrix is obtained from the kinetic energy expression and includes the effects of rotary

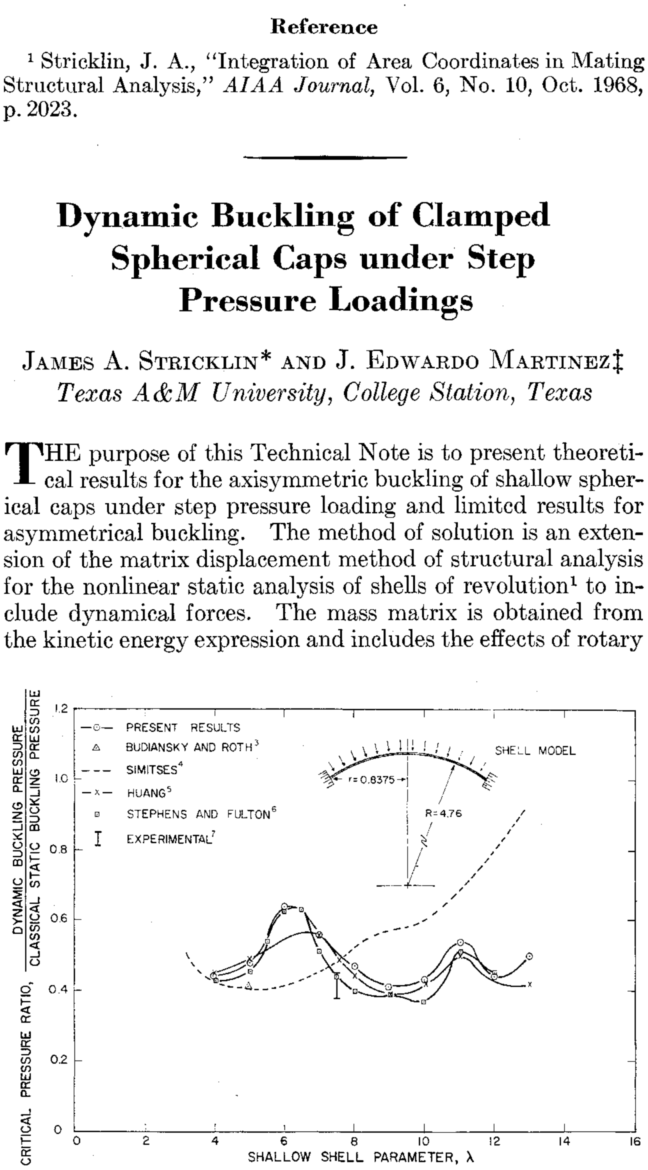

Fig. 1 Critical pressure ratio as a function of the shallow shell parameter.

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