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Selected Publications:

E.A. Witmer, et.al. (Aeroelastic and Structures Research Laboratory, MIT, Cambridge, Massachusetts), SABOR 4: An improved discrete-element analysis and program for the linear-elastic static analysis of meridionally-curved, variable-thickness, branched, thin shells of revolution subjected to general external and thermal loads", MIT Aerospace Report 146-4 (no date given)

E. A. Witmer, E. N. Clark and H. A. Balmer (Dept. of Aeronautics and Astroautics, MIT, Cambridge, MA), "Experimental and theoretical studies of explosive-induced large dynamic and permanent deformations of simple structures", (Paper presents the results of a coordinated experimental-theoretical research program designed to develop methods for predicting large elastic-plastic dynamic and permanent deformations of shells under dynamic-loading conditions), Experimental Mechanics, Vol. 7, No. 2, 1967. pp. 56-66, doi: 10.1007/BF02326708
ABSTRACT: Explosive-loading and structural-response measurement techniques are described for obtaining definitive large dynamic and permanent-deformation data on simple structures which undergo (a) two-dimensional deformations, or (b) general three-dimensional deformations. In the former category, explosively loaded structures discussed include freely suspended single-layer circular rings, freely suspended unbonded concentric rings, and flat circular plates with clamped edges. Representing category (b) is an explosively loaded cylindrical panel with clamped edges. To define the impulse which was imparted explosively to these structures, appropriate impulse-calibration tests were performed on high-explosive-loaded single-layer and unbonded double-layer specimens; these testing techniques and the results obtained are discussed. General numerical methods for predicting large elasticplastic dynamic and permanent deformations of structures which undergo either two-dimensional or general three-dimensional deformations are described briefly. Dynamic responses and permanent deformations predicted with these methods are compared with data from the present experiments. Certain problems, both experimental and theoretical, requiring further investigation are indicated.

J.W. Leech, E.A. Witmer and T.H.H. Pian, "Numerical calculation technique for large elastic-plastic transient deformation of thin shells", AIAA Journal, Vol. 6, 1968, pp. 2352-2359

Witmer, E. A., Leech, J. W., Morino, L., "PETROS2," BRL Contract Report 12, 1969.

Witmer, E. A., Leech, J. W., Morino, L., "An Improved Numerical Calculation Technique for Large Elastic-Plastic Transient Deformations of Thin Shells," Journal of Applied Mechanics, Vol. 38, June, 1971, pp. 423-436.

R.W.-H. Wu and E.A. Witmer, "Finite element analysis of large elastic-plastic transient deformations of simple structures", AIAA Journal, Vol. 9, 1971, pp. 1719-1724

Wu, R. W. H., Witmer, E. A., "Nonlinear Transient Responses of Structures by Spatial Finite-Element

Method," AIAA Journal, Vol. 11, August 1973 , pp. 1110-1116,

R. W.-H. Wu and E. A. Witmer, “The dynamic responses of cylindrical shells including geometric and material nonlinearities”, Int. J. Solids Structures, Vol. 10, 1974, pp. 243-260

José J.A. Rodal and Emmett A. Witmer (MIT Energy Lab), “Finite element nonlinear transient response analysis of simple 2-d structures subjected to impulse or impact loads”, Report MIT-EL, 76-004, 1976, http://hdl.handle.net/1721.1/27252
ABSTRACT: This study was intended to contribute to the development of more rational practical methods for predicting the transient responses of structures which are subjected to transient and impact loads. Attention is restricted to the global structural response; local (or stress-wave- induced) response is not included. The use of higher-order assumed- displacement finite elements (FE) is investigated to seek more efficient and accurate strain predictions; these studies were carried out for 2-d structural deformations typical of beams and curved rings to minimize cost and labor. These studies were done in conjunction with the use of various approximations to the nonlinear strain-displacement relations since large deflections and rotations need to be taken into account. Transient large-deflection elastic-plastic structural response predictions are made for these various FE models for impulsively-loaded beams and a free initially-circular ring, for which high quality experimental measurements of strains and deflections are available. From comparisons of (a) predictions with each other for the various FE models investigated and (b) predictions vs. experimental data, it appears to be more efficient for the same number of degree-of-freedom (DOF) unknowns to use the simple 4 DOF/node elements rather than fewer of the more sophisticated 8 DOF/node elements although the latter provide a physically superior and more realistic distribution of strain along the structural span at any given time instant compared with the use of the 4 DOF/N elements. Comparisons of measured with predicted transient strain and final deformation of a thin aluminum beam with both ends clamped and impacted at midspan by a 1-inch diameter steel sphere show very good agreement. Extensions to the present analysis to accommodate more general types of fragments and fragment-impacted structures are discussed briefly.