# Dr. Martin M. Mikulas

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Martin Mikulas worked for NASA for 30 years, and developed theories for construting the shell material used on the Saturn V rocket and the Space Shuttle.

**Selected Publications:**

M. Mikulas, Jr., et al, “Buckling of a cylindrical shell loaded by a pre-tensioned filament winding”, NASA, 1964

McElman, J.A., Mikulas, M.M. and Stein, M., “Static and dynamic effects of eccentric stiffeneing of plates and cylindrical shells”, Presented at the 2nd AIAA Annual Meeting and Technical Display, San Francisco, July 26-29, 1965

Martin M. Mikulas, Jr. and John A. McElman, “On free vibrations of eccentrically stiffened cylindrical shells and flat plates”, NASA Technical Note, NASA TN D-3010, NASA Langley Research Center, September 1965
ABSTRACT: Dynamic equilibrium equations and boundary conditions are derived from energy principles for eccentrically stiffened cylinders and flat plates. In-plane inertias are neglected and frequency expressions are obtained for simple-support boundary conditions for both the cylinder and the plate. Results in the form of plots of frequencies as a function of mode shape illustrate the effects of eccentricities. It is found that these eccentricities can have a significant effect on natural frequencies and should be investigated in any dynamic analysis of stiffened structural members.

David L. Block, Michael F. Card and Martin M. Mikulas, Jr., “Buckling of eccentrically stiffened orthotropic cylinders”, NASA TN D-2960, NASA Langley Research Center, Hampton, Virginia, August, 1965,
proxy Url : http://handle.dtic.mil/100.2/ADA397543
ABSTRACT: A small-deflection theory for buckling of stiffened orthotropic cylinders which includes eccentricity (one-sided) effects in the stiffeners is derived from energy principles. Buckling solutions corresponding to classical simple- support boundary conditions are obtained for both orthotropic and isotropic stiffened cylinders subjected to any combination of axial and circumferential loading. Comparable solutions for stiffened flat plates are also given. Sample calculations of predicted compressive buckling loads obtained from the solutions are compared with existing solutions for ring-stiffened corrugated cylinders, ring-and-stringer-stiffened cylinders, and longitudinally (stringer) stiffened cylinders. The calculations demonstrate that eccentricity effects are large even with very large diameter cylinders of practical proportions and should be accounted for in any buckling analysis

Martin M. Mikulas, “Behavior of doubly curved partly wrinkled membrane structures formed from an initially flat membrane”, Ph.D. Thesis, Virginia Polytechnic Institute, 1970, Archive: OCLC's Experimental Thesis Catalog (United States)

Williams, J. G. and Mikulas, Jr., M. M., Analytical and Experimental Study of Structurally Efficient Composite Hat-Stiffened Panels Loaded in Axial Compression, AIAA/ASME/SAE 16th SDM Meeting, Denver, Colorado, May 1975.
Almroth’s comments: Tests were conducted on a number of hat-stiffened graphite-epoxy panels. The panel dimensions correspond to optimum weight configurations. A number of panels (23) of length 16 in. were critical in local buckling. In the experiments local buckling was observed by use of the Moire pattern and by the observation of strain reversal. These two methods agree with one another but the agreement with theory (BUCLASP) is not good. This is assumed to be due to large deviations from nominal thicknesses and to local initial stresses due to the curing process. The experiments were continued to ultimate failure which typically occurred at about 25% above the experimental buckling load. The authors conclude that "buckled skin concepts" might be possible (but that), the brittle nature of graphite-epoxy composites makes their practicality highly speculative at this time. In addition, six longer panels (60 in.) were tested. These were critical in Euler buckling. The test results in these cases fall between 64 and 90 percent of the critical load. This disagreement appears to be the result of transverse shear effects. The disagreement between experiment and theory reduces a potential 50% weight saving (in comparison to aluminum) to a 32% saving. This estimate does not account for the use of buckled skin concepts for aluminum panels.

Mikulas, Martin M., Bush, Harold G., and Card, Michael F., “Structural Stiffness, Strength and Dynamics Characteristics of Large Tetrahedral Space Truss Structures,” NASA TMX-74001, March, 1977.

Mikulas, M. M., “Structural Efficiency of Long Lightly Loaded Truss and Isogrid Columns for Space Applications,” NASA TM-78687, July 1978.

Rhodes, M.D., Mikulas, M.M., 1985. Deployable controllable geometry truss beam. NASA Langley Research Center Report, NASA TM-86366.

Noor, A. K. and Mikulas, M. M., “Continuum Modeling of Large Lattice Structures – Status and Projections,” NASA TP-2767, 1988.

Murphey, T. W. and Mikulas, M. M., “Nonlinear Effects of Material Wrinkles on the Stiffness of Thin Polymer Films,” Proceedings of the the 40th Structures, Structural Dynamics and Materials Conference, St. Louis, Missouri, April 1999.

Adler, A. L., Mikulas, M. M., and Hedgepeth, J. M., Static and Dynamic Analysis of Partially Wrinkled Membrane Structures, AIAA Paper No. 2000-1810, April 2000.