Cheryl A. Rose

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Selected publications of Cheryl A. Rose:

Starnes, J. H., Jr., Britt, V. O., Rose, C. A., and Rankin, C. C., "Nonlinear Response and Residual strength of Damaged Stiffened panels subjected to Combined Loads," AIAA Paper No. 96-1555, April 1996.

Roberto Vitali (1), Oung Park (1), Raphael T. Haftka (1), Bhavani V. Sankar (1) and Cheryl A. Rose (2)
(1) University of Florida Department of Aerospace Engineering, Mechanics and Engineering Science 231 Aerospace Building, P.O. Box 116250 Gainesville, FL 32611-6250
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"Structural Optimization of a Hat Stiffened Panel By Response Surface Techniques", 38th AIAA Structures, Structural Dynamics and Materials Conference, 1997
ABSRACT: The paper describes a design study for the structural optimization of a typical bay of a blended wing body transport. A hat stiffened laminated composite shell concept is used in the design. The geometry of the design is determined with the PANDA2 program, but due to the presence of varying axial loads, more accurate analysis procedure is needed. This is obtained by combining the STAGS finite element analysis program with response surface approximations for the stresses and the buckling loads. The design procedure results in weight savings of more than 30 percent, albeit at the expense of a more complex design. The response surface approximations allow easy coupling of the structural analysis program to the optimization program in the widely available Microsoft EXCEL spreadsheet program. The response surface procedure also allows the optimization to be carried out with a reasonable number of analyses. In particular, it allows combining a large number of inexpensive beam-analysis stress calculations with a small number of the more accurate STAGS analyses.

Starnes, J. H., Jr., and Rose, C. A., "Nonlinear Response of Thin Cylindrical Shells with Longitudinal Cracks and Subjected to Internal Pressure and Axial Compression Loads," AIAA Paper No. 97-1144, April 1997.

Young, R. D., Rose, C. A., Dávila, C. G., Starnes, J. H., Jr., and Rankin, C. C., "Crack Growth and Residual Strength Characteristics of Selected Flat Stiffened Aluminum Panels," Proceedings of the First Joint DOD/FAA/NASA Conference on Aging Aircraft, Ogden, UT, July, 1997.

James H. Starnes, Jr., and Cheryl A. Rose (NASA Langley Research Center Hampton, VA 23681-0001)
Charles C. Rankin (Lockheed Palo Alto Research Laboratory Palo Alto, CA 94304-1191), "Effects of Combined Loads on the Nonlinear Response and Residual Strength of Damaged Stiffened Shells", pp. 183-xxx, in: Proceedings of the FAA-NASA Symposium on the Continued Airworthiness of Aircraft Structures, Atlanta, Georgia USA, August 28-30, 1997, Report DOT/FAA/AR-97/2,I, July 1997, Office of Aviation Research, Washington, D.C. 20591
ABSTRACT: The results of an analytical study of the nonlinear response of stiffened fuselage shells with long cracks are presented. The shells are modeled with a hierarchical modeling strategy and analyzed with a nonlinear shell analysis code that maintains the shell in a nonlinear equilibrium state while the crack is grown.

The analysis accurately accounts for global and local structural response phenomena. Results are presented for various combinations of internal pressure and mechanical loads, and the effects of crack orientation on the shell response are described. The effects of combined loading conditions and the effects of varying structural parameters on the stress-intensity factors associated with a crack are presented.

James H. Starnes, Jr. and Cheryl A. Rose (NASA Langley Research Center, Hampton, Virginia, USA), "Buckling and stable tearing responses of unstiffened aluminum shells with long cracks", AIAA-98-1991, 39th AIAA Structures, Structural Dynamics and Materials Conference, 1998
ABSTRACT: The results of an analytical and experimental study of the nonlinear response of thin, unstiffened, aluminum cylindrical shells with a long longitudinal crack are presented. The shells are analyzed with a nonlinear shell analysis code that accurately accounts for global and local structural response phenomena. Results are presented for internal pressure and for axial compression loads. The effect of initial crack length on the initiation of stable tearing and unstable crack growth in typical shells subjected to internal pressure loads is predicted using geometrically nonlinear elastic-plastic finite element analyses. The results of these analyses and of the experiments indicate that the pressure required to initiate stable tearing and unstable tearing in a shell subjected to internal pressure loads decreases as the crack length increases. The effects of crack length on the prebuckling, buckling and postbuckling responses of typical shells subjected to axial compression are also described. For this loading condition, the crack length is held constant. The results of the analyses illustrate the influence of crack length on shell buckling instabilities. The experimental and analytical results correlate well.

Young, R. D., Rose, C. A., and Starnes, J. H., Jr., "Nonlinear Local Bending Response and Bulging Factors for Longitudinal and Circumferential Cracks in Pressurized Shells," Proceedings of the 3rd Joint FAA/ DoD/NASA Conference on Aging Aircraft, Albuquerque, NM, September 20-23, 1999.

Dawicke, D. S., Newman, J. C., Jr., Starnes, J. H., Jr., Rose, C. A.; Young, R. D., and Seshadri, B. R., "Residual Strength Analysis Methodology: Laboratory Coupons to Structural Components," Proceedings of the Third Joint FAA/DOD/NASA Conference on Aging Aircraft, Albuquerque, NM, September 20-23, 1999.

Starnes, J. H., Jr., and Rose, C. A., "Stable Tearing and Buckling Response of Unstiffened Aluminum Shells with Long Cracks," Proceedings of the Second Joint NASA/FAA/DOD Conference on Aging Aircraft, Williamsburg, VA, August 31- September 3, 1998. NASA/CP-1999-208982/Part 1, January 1999, pp. 610-626.

Rose C. A., Young R. D., and Starnes J. H. Jr., (1999), Nonlinear Local Bending Response and Bulging Factors for Longitudinal Cracks in Pressurized Cylindrical Shells, AIAA/ASME/ASH/ASC 40th Stuctures, Structural Dynamics and Materials Conference, AIAA Paper No. 99-1412.

Young, R. D., Rose, C. A., and Starnes, J. H., Jr., "Nonlinear Bulging Factors for Longitudinal and Cicumferential Cracks in Cylindrical Shells Subjected to Combined Loads," AIAA Paper No. 2000-1514, April 2000.

Hilburger, M. W.; Rose, C. A.; and Starnes, J. H., Jr.: Nonlinear Analysis and Scaling Laws for Noncircular Composite Structures Subjected to Combined Loads. Proceedings of the AIAA/ASME/ASCE/AHS/ASC 42nd Structures, Structural Dynamics and Materials Conference, 2001, AIAA Paper No. 2001-1335.

Richard D. Young, Cheryl A. Rose, and James H. Starnes, Jr. (NASA Langley Research Center Hampton,Virginia 23681-2199), "Skin, Stringer, and Fastener Loads in Buckled Fuselage Panels", AIAA 42nd

Structures, Structural Dynamics and Materials Conference, AIAA-2001-1326, 2001
ABSTRACT: The results of a numerical study to assess the effect of skin buckling on the internal load distribution in a stiffened fuselage panel, with and without longitudinal cracks, are presented. In addition, the impact of changes in the internal loads on the fatigue life and residual strength of a fuselage panel is assessed. A generic narrow-body fuselage panel is considered. The entire panel is modeled using shell elements and considerable detail is included to represent the geometric-nonlinear response of the buckled skin, cross section deformation of the stiffening components, and details of the skin-stringer attachment with discrete fasteners. Results are presented for a fixed internal pressure and various combinations of axial tension or compression loads. Results illustrating the effect of skin buckling on the stress distribution in the skin and stringer, and fastener loads are presented. Results are presented for the pristine structure, and for cases where damage is introduced in the form of a longitudinal crack adjacent to the stringer, or failed fastener elements. The results indicate that axial compression loads and skin buckling can have a significant effect on the circumferential stress in the skin, and fastener loads, which will influence damage initiation, and a comparable effect on stress intensity factors for cases with cracks. The effects on stress intensity factors will influence damage propagation rates and the residual strength of the panel.

James H. Starnes, Jr., James C. Newman, Jr., Charles E. Harris, Robert S. Piascik, Richard D. Young and Cheryl A. Rose (NASA Langley Research Center Mail Stop 190 Hampton, VA 23681-2199, USA), "Advances in Structural Integrity Analysis Methods for Aging Metallic Airframe Structures with Local Damage", RTO AVT Specialists' Meeting on "Life Management Techniques for Ageing Air Vehicles", held in Manchester, United Kingdom, 8-11 October 2001, published in RTO-MP-079(II).
ABSTRACT: Analysis methodologies for predicting fatigue-crack growth from rivet holes in panels subjected to cyclic loads and for predicting the residual strength of aluminum fuselage structures with cracks and subjected to combined internal pressure and mechanical loads are described. The fatigue-crack growth analysis methodology is based on small-crack theory and a plasticity induced crack-closure model, and the effect of a corrosive environment on crack-growth rate is included. The residual strength analysis methodology is based on the critical crack-tip-opening-angle fracture criterion that characterizes the fracture behavior of a material of interest, and a geometric and material nonlinear finite element shell analysis code that performs the structural analysis of the fuselage structure of interest. The methodologies have been verified experimentally for structures ranging from laboratory coupons to full-scale structural components. Analytical and experimental results based on these methodologies are described and compared for laboratory coupons and flat panels, small-scale pressurized shells, and full-scale curved stiffened panels. The residual strength analysis methodology is sufficiently general to include the effects of multiple-site damage on structural behavior.

Cheryl A. Rose, Richard D. Young, and James H. Starnes, Jr. (NASA Langley Research Center Hampton, Virginia 23681-2199), "The Nonlinear Response of Cracked Aluminum Shells Subjected to Combined Loads", AIAA 42nd Structures, Structural Dynamics and Materials Conference, AIAA-2001-1395, 2001
ABSTRACT: The results of a numerical study of the nonlinear response of thin unstiffened aluminum cylindrical shells with a longitudinal crack are presented. The shells are analyzed with a nonlinear shell analysis code that accurately accounts for global and structural response phenomena. The effects of initial crack length on the prebuckling, buckling and postbuckling responses of a typical shell subjected to axial compression loads, and subjected to combined internal pressure and axial compression loads are described. Both elastic and elastic-plastic analyses are conducted. Numerical results for a fixed initial crack length indicate that the buckling load decreases as the crack length increases for a given pressure load, and that the buckling load increases as the internal pressure load increases for a given crack length. Furthermore, results indicate that predictions from an elastic analysis for the initial buckling load of a cracked shell subjected to combined axial compression and

internal pressure loads can be unconservative. In addition, the effect of crack extension on the initial buckling load is presented.

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"Finite Element Modeling of the Buckling Response of Sandwich Panels", AIAA 43rd Structures, Structural Dynamics and Materials Conference, AIAA-2002-1517, 2002
ABSTRACT: A comparative study of different modeling approaches for predicting sandwich panel buckling response is described. The study considers sandwich panels with anisotropic face sheets and a very thick core. Results from conventional analytical solutions for sandwich panel overall buckling and face-sheet-wrinkling type modes are compared with solutions obtained using different finite element modeling approaches. Finite element solutions are obtained using layered shell element models, with and without transverse shear flexibility, layered shell/solid element models, with shell elements for the face sheets and solid elements for the core, and sandwich models using a recently developed specialty sandwich element. Convergence characteristics of the shell/solid and sandwich element modeling approaches with respect to in-plane and through-the- thickness discretization, are demonstrated. Results of the study indicate that the specialty sandwich element provides an accurate and effective modeling approach for predicting both overall and localized sandwich panel buckling response. Furthermore, results indicate that anisotropy of the face sheets, along with the ratio of principle elastic moduli, affect the buckling response and these effects may not be represented accurately by analytical solutions. Modeling recommendations are also provided.

C. G. Dávila, P. P. Camanho, and C. A. Rose. Failure criteria for FRP laminates in plane stress. Journal of Composite Materials, 39:323–345, 2005.

Richard D. Young; Cheryl Rose, "STAGS Developments for Residual Strength Analysis Methods for Metallic Fuselage Structures", AIAA Paper AIAA 2014-0848, 55th AIAA Structures Conference, January 13-17, 2014