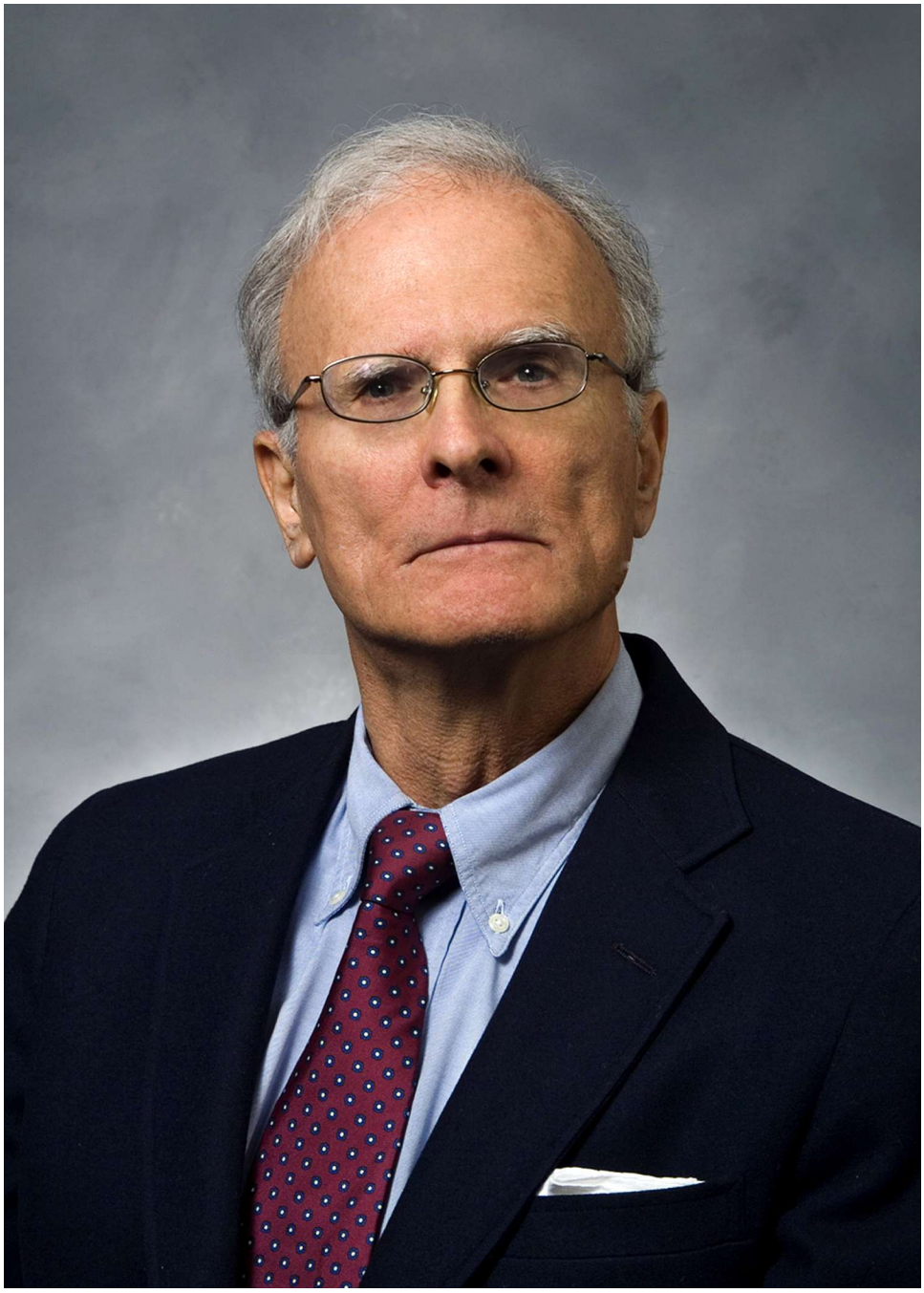
David Bushnell



Born Greenwich, Connecticut, October 23, 1938

Education:

Graduated from MIT, June 1961 with BS and MS in Aero and Astro

Obtained PhD at Stanford University (Lockheed's Graduate Study Program) in June 1965
PhD thesis: "Some problems in thin shells", Advisor: Nicholas Hoff

Worked for:

Worked at Lockheed (now Lockheed Martin) from Sept. 1961 to April 1994.
Last position at Lockheed Martin = Senior Consulting Scientist.

Since retirement in April 1994, I have maintained an office at Lockheed Martin where I do research on optimization of imperfect stiffened composite panels and shells and occasionally help on projects that involve thin shells, especially complex shells of revolution.

While at Lockheed/Lockheed Martin I developed, completed, and applied the following computer programs:

BOSOR4 (buckling, stress, vibration of complex elastic shells of revolution)
BOSOR5 (buckling and stress of complex elastic-plastic shells of revolution)
PANDA2 (minimum-weight design of stiffened, composite flat and cylindrical imperfect panels and shells under multiple sets of combined loads for service in their locally postbuckled states)
GENOPT (program that writes user-friendly optimization code)
DEWAR (program for optimum design of spacecraft supports for thermal isolation of payload)
ACTUATOR (program for optimum locations of actuators on the back surface of a mirror for minimization of optical error)

While at Lockheed/Lockheed Martin and in retirement I have written 95 papers, all having something to do with thin shells, most on buckling and optimization of thin shells.

I wrote a book:

Computerized Buckling Analysis of Shells, Kluwer Academic Press, The Netherlands (1985)

Honors and activities:

Fellow, American Society of Mechanical Engineers (ASME)

Fellow, American Institute of Aeronautics and Astronautics (AIAA)
1985 – Best paper PVP division of ASME: J. Pressure Vessel Tech., Vol. 106, Feb. 1984
1984-85 – Invited Speaker: Midwest Mechanics Seminar Series (gave seminars on shell buckling at eight Midwestern universities)
1980 – AIAA/ASME SDM (Structures, Dynamics, Materials) keynote speaker at the 21st Structures, Dynamics, and Materials meeting, Seattle; Subject: "Buckling of shells, pitfall for designers", published in AIAA Journal, Vol. 14, pp 1183-1226, Sept. 1981
1978 – Outstanding Engineer of the Year, AIAA San Francisco chapter
1975 – Recipient of the ONR/AIAA Structural Mechanics Research Award. Topic of study: "Stress, buckling and vibration of hybrid bodies of revolution", published in Computers & Structures, Vol. 7, pp. 517-537, 1977
1979-1980 Associate Editor, AIAA Journal
1979-1980 Member of AIAA Structures Technical Committee
1976-1984 Member of Pressure Vessel Research Council Subcommittee on shell analysis
1993-1995 Member of AIAA Fellow Selection Committee

List of publications (except for book mentioned above):

1. Bushnell, D.: "Influence coefficients of a circular cylindrical shell with rapidly varying parabolic wall thickness", AIAA J., Vol. 2, No. 12, pp. 2167-2173, Dec. 1964

2. Bushnell, D.: "Dynamic Response of Two-Layered Cylindrical Shells to Time-Dependent Loads," AIAA Journal, Vol. 3, No. 9, pp. 1698-1703, September 1965.

3. Bushnell, D.: "Influence coefficients for externally pressurized spherical shells", AIAA J., Vol, 4 No. 8, pp. 1472-1474, August 1966

4. Bushnell, D.: "Axisymmetric Dynamic Response of a Ring-Supported Cylinder to Time-Dependent Loads," Journal of Spacecraft, Vol. 3, No. 9, pp. 1369-1376, September 1966

5. Bushnell, D. and Madsen, W. A.: "Machine Computation of Trigonometric Functions," Journal of the Engineering Mechanics Division (Proceedings of the American Society off Civil Engineers), EM 6, pp 157-174, December 1966

6. Bushnell, D.: "Nonlinear axisymmetric behavior of shells of revolution", AIAA J., Vol. 5, No. 3, pp. 432-439, March 1967

7. Bushnell, D.: "Symmetric and Nonsymmetric Buckling of Finitely Deformed Eccentrically Stiffened Shells of Revolution," AIAA Journal, Vol. 5, No. 8, pp. 1455-

1462, August 1967

8. Bushnell, D.: "Bifurcation Phenomena in Spherical Shells under Concentrated and Ring Loads," AIAA Journal, Vol. 5, No. 11, pp. 2034-2040, November 1967

9. Bushnell, D.: "Buckling of Spherical Shells Ring-Supported at the Edges," AIAA Journal, Vol. 5, No. 11, pp. 2041-2046, November 1967

10. Bushnell, D.: "Inextensional Buckling of Spherical Shells with Edge Rings," AIAA Journal, Vol. 6, No. 2, pp. 361-364, February 1968

11. Bushnell, D. and Almroth, B. O.: "Computer Analysis of Various Shells of Revolution," AIAA Journal, Vol. 6, No. 10, pp. 1848-1855, October 1968

12. Bushnell, D. and Batterman, S.C. "Asymptotic analysis for axisymmetric buckling of axially compressed short cylinders with free edges", Journal of Applied Mechanics, pp ?, June 1969

13. Bushnell, D., "Nonlinear analysis for axisymmetric elastic stresses in ring-stiffened, segmented shells of revolution", AIAA 7th Structures, Structural Dynamics, and Materials Conference, New Orleans, LA, April 14-16, 1969

14. Bushnell, D., "Buckling and vibration of ring-stiffened, segmented shells of revolution: Numerical results", ASME Pressure vessel technology, pp. 255-268, Vol. 1, Design and Analysis, from Proceedings of the first international conference, Delft, September 1969

15. Almroth, B. O., Bushnell, D., and Sobel, L. H.: "Buckling of Shells of Revolution with Various Wall Constructions, Volume 1 – Numerical Results," NASA CR-1049, May 1968.

16. Almroth, B. O., Bushnell, D., and Sobel, L. H.: "Buckling of Shells of Revolution with Various Wall Constructions, Volume 2 – Basic Equations and Method of Solution," NASA CR-1050, May 1968

17. Almroth, B. O., Bushnell, D., and Sobel, L. H.: "Buckling of Shells of Revolution with Various Wall Constructions, Volume 3 – User's Manual for BOSOR," NASA CR-1051, May 1968

18. Bushnell, D.: "Computer Analysis of Shell Structures, ASME Paper No. 69-WA/PVP-13, American Society of Mechanical Engineers, New York, NY, 1969.

19. Bushnell, D.: "Analysis of buckling and vibration of ring-stiffened, segmented shells

of revolution", International Journal of Solids and Structures, Vol. 6, pp. 157-181, 1970

20. Bushnell, D.: "Computer Analysis of Complex Shell Structures," Journal of Spacecraft, Vol. 7, No. 4, pp. 439-445, April 1970.

21. Bushnell, D.: "Analysis of Ring Stiffened Shells of Revolution under Combined Thermal and Mechanical Loading," AIAA Journal, Vol. 9, No. 3, pp. 401-410, March 1971

22. Bushnell, D.: "Effect of Ring Out-of-Plane Bending Stiffness on Thermal Buckling Prediction for Ring-Stiffened Cylinders," AIAA Journal, Vol. 9, No. 8, pp. 1653-1654, August 1971

23. Bushnell, D.: "Stress, Buckling, and Vibration of Prismatic Shells," AIAA Journal, Vol. 9, No. 10, pp. 2004-2013, October 1971.

24. Bushnell, D., Almroth, B.O., and Brogan, F., "Finite-difference energy method for nonlinear shell analysis, Computers & Structures, Vol. 1, pp. 361-387, 1971

25. Bushnell, D. and Smith, S.: "Stress and Buckling of Nonuniformly Heated Cylindrical and Conical Shells," AIAA Journal, Vol. 9, No. 12, pp. 2314-2321, December 1971.

26. Bushnell, D.: "Crippling and Buckling of Corrugated Ring-Stiffened Cylinders," Journal of Spacecraft, Vol. 9, No. 5, pp. 357-363, May 1972. (Also see AIAA Paper 72-138, AIAA 10th Aerospace Sciences Meeting, San Diego, CA, January 17-19, 1972).

27. Bushnell, D.: "Stress, Stability and Vibration of Complex Branched Shells of Revolution," NASA CR-2116, October 1972

28. Bushnell, D.: "Evaluation of Various Analytical Models for Buckling and Vibration of Stiffened Shells," AIAA Journal, Vol. 11, No. 9, pp. 1283-1291, September 1973.

29. Bushnell, D.: "Nonsymmetric Buckling of Cylinders with Axisymmetric Thermal Discontinuities," AIAA Journal, Vol. 11, No. 9, pp. 1292-1295, September 1973.

30. Bushnell, D.: "Finite-Difference Energy Models versus Finite-Element Models: Two Variational Approaches in One Computer Program," Numerical and Computer Methods in Structural Mechanics," edited by Fenves, S. J., Perrone, N., Robinson, A. R., and Schnobrich, W. C., pp. 291-336, Academic Press, Inc., 1973

31. Bushnell, D.: "Large deflection elastic-plastic creep analysis of axisymmetric shells", Presented at 1973 Winter Annual Meeting of the ASME, Published in AMD-

Vol. 6, Numerical solution of nonlinear structureal problems, November 1973, ASME Applied Mechanics Division, pp. 103-138

32. Bushnell, D. and Galletly, G.: "Comparisons of Test and Theory for Nonsymmetric Elastic-Plastic Buckling of Shells of Revolution," International Journal of Solids and Structures, Vol. 10, pp. 1271-1286, Pergamon Press, 1974

33. Galletly , G.D., Aylward, R. W., and Bushnell, D., "An experimental and theoretical investigantion of elastic and elastic-plastic asymmetric buckling of cylinder-cone combinations subjected to uniform external pressure", Ingenieur-Archiv, Vol. 43, pp. 345-358, Springer-Verlag, 1974

34. Bushnell, D.: "Stress, Stability and Vibration of Complex, Branched Shells of Revolution," Computers and Structures. Vol. 4, pp. 399-435, Pergamon Press, 1974.

35. Bushnell, D.: "Thin Shells," ONR/NSF 1974 Symposium, Structural Mechanics Computer Programs; Surveys, Assessments, And Availability, Pilkey, W. D., Saczalski, K., and Schaeffer, H.G., editors, University Press of Virginia, Charlottesville, VA, 1974, pp. 277-358

36. Bushnell, D.: "A computerized information retrieval system", in "Structural Mechanics Computer Programs", W. Pilkey, K. Saczalski, and H. Schaeffer, editors, pp. 735-804, University of Virginia Press, 1974

37. Bushnell, D.: "Bifurcation Buckling Of Shells Of Revolution Including Large Deflections, Plasticity And Creep," International Journal of Solids and Structures, Vol. 10, pp. 1287-1305, Pergamon Press, 1974

38. Bushnell, D.: "Buckling Of Elastic-Plastic Shells Of Revolution With Discrete Elastic-Plastic Ring Stiffeners," International Journal of Solids and Structures, Vol. 12, pp. 51-66, Pergamon Press, 1976

39. Bushnell, D.: "BOSOR5-Program For Buckling Of Elastic-Plastic Complex Shells Of Revolution Including Large Deflections And Creep," Computers and Structures, Vol. 6, pp. 221-239. Pergamon Press, 1976

40. Bushnell, D.: "A subincremental strategy for solving problems involving large defections, plasticity, and creep", in CONSTITUTIVE EQUATIONS IN VISCOPLASTICITY computational and engineering aspects, AMD-Vol. 20, J. A. Stricklin and K. J. Saczalski, editors, Winter Annual Meeting of the ASME, New York, NY, December 5, 1976, pp. 171-200

41. Bushnell, D and Galletly, G. D., "Stress and buckling of internally pressurized

elastic-plastic torispherical vessel heads – Comparisons of test and theory", ASME Journal of Pressure Vessel Technology, Vol. 99, pp. 39-53, February 1977

42. Bushnell, D.: "Nonsymmetric buckling of internally pressurized ellipsoidal and torispherical elastic-plastic pressure vessel heads", ASME Journal of Pressure Vessel Technology, Vol. 99, pp. 54-63, February 1977

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44. Bushnell, D.: "A strategy for the solution of problems involving large deflections, plasticity and creep", International Journal for Numerical Methods in Engineering, Vol. 11, pp. 683-708, 1977

45. Bushnell, D.: "BOSOR4: Program for Stress, Buckling, and Vibration of Complex Shells of Revolution," Structural Mechanics Software Series – Volume 1, Edited by N. Perrone and W. Pilkey, University of Virginia Press, Charlottesville, VA, 1977, pp. 11 – 143

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47. Bushnell, D.: "Control of surface configuration by application of concentrated loads", AIAA Journal, Vol. 17, No. 1, pp. 71-77, January 1979

48. Bushnell, D.: "Control of Surface Configuration of Nonuniformly Heated Shells," AIAA Journal, Vol. 17, No. 1, pp. 78-84, January 1979.

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50. Bushnell, D.: "Aiming an electromagnetic beam by bending segments of a large reflecting surface, AIAA Journal, Vol. 17, No. 4, April 1979, pp. 413-423

51. Bushnell, D.: "Aiming an electromagnetic beam by bending the segments of a large reflecting surface: a parameter study", in MECHANICS TODAY, S. Nemat-Nasser, editor, Pergamon Press, 1980, pp. 15-36

52. Bushnell, D.: Prediction of loads on antenna ribs due to mesh deployment", Journal of Spacecraft and Rockets, Vol. 17, No. 4, July-August 1980, pp. 290-302

53. Bushnell, D., Holmes, A. M C., and Loss, E. J.: "Failure Of Axially Compressed Frangible Joints In Cylindrical Shells," Computers and Structures, Vol. 12, pp. 193-210. Pergamon Press, 1980

54. Bushnell, D.: "Effect of cold bending and welding on buckling of ring-stiffened cylinders", Computers & Structures, Vol. 12, pp. 291-307, 1980

55. Bushnell, D.: "Elastic-plastic buckling of internally pressurized ellipsoidal pressure vessel heads", Welding Research Council Bulletin 267, May 1981

56. Bushnell, D.: "Elastic-Plastic Bending And Buckling Of Pipes And Elbows," Computers and Structures, Vol. 13, pp. 241-248. Pergamon Press, 1981

57. Bushnell, D.: "Buckling of Shells—Pitfall for Designers," AIAA Paper No. 80-0665R, AIAA Journal, Vol. 19, No. 9, pp. 1183-1226, September 1981

58. Bushnell, D.: "Plastic buckling of various shells", Journal of Pressure Vessel Technology, Vol. 104, pp. 51-72, May 1982

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60. Bushnell, D.: "Elastic-plastic buckling of axially compressed ring stiffened cylinders – test vs theory", Welding Research Council Bulletin 282, November 1982

61. Bushnell, D.: "PANDA - Interactive Program For Minimum Weight Design Of Stiffened Cylindrical Panels And Shells," Computers and Structures, Vol. 16, No. 1 – 4, pp. 167-185. Pergamon Press, 1983

62. Bushnell, D. and Meller, E., "Elastic-plastic collapse of axially compressed cylindrical shells: A brief survey with particular application to ring-stiffened cylindrical shells with reinforced openings", ASME Journal of Pressure Vessel Technology, Vol. 106, pp. 2-16, February 1984

63. Bushnell, D.: "Computerized Analysis Of Shells-Governing Equations," Computers and Structures, Vol. 18, No. 3, pp. 471-536. Pergamon Press, 1984

64. Bushnell, D.: Obituary: IN MEMORIAM BO OSTEN ALMROTH, International Journal of Numerical Methods in Engineering, Vol. 20, No. 12, pp. 2326-2329, December 1984

65. Bushnell, D.: "Static collapse: a survey of methods and modes of behavior," Finite

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66. Bushnell, D.: "Optimum design of dewar supports", Journal of Spacecraft and Rockets, Vol. 22, No. 4, pp. 432-441, July-August, 1985

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69. Bushnell, D.: "PANDA: Interactive program for minimum weight design of composite and elastic-plastic stiffened cylindrical panels and shells", in STRUCTURAL ANALYSIS SYSTEMS, A. Niku-Lari, editor, Vol. 1, pp. 171-201, Pergamon Press, 1986

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72. Bushnell, D.: "Use of PANDA2 to Optimize Composite, Imperfect, Stiffened, Locally Buckled Panels Under Combined In Plane Loads, and Normal Pressure," Presented at the 5th National Conference on Pressure Vessels and Piping, San Diego, June 1987

73. Bushnell, D.: "Nonlinear Equilibrium Of Imperfect, Locally Deformed Stringer-Stiffened Panels Under Combined In-Plane Loads," Computers and Structures, Vol. 27, No. 4, pp. 519-539. Pergamon Press, 1987

74. Bushnell, D.: "Improved optimum design of dewar supports", Computers & Structures, Vol. 29, No. 1, pp. 1-56, 1988

75. Bushnell, D.: Comments on the paper by Md. W. Uddin: "Buckling of general spherical shells under external pressure", International Journal of Mechanical Sciences, Vol. 30, No. 2, pp. 145-147, 1988

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loaded in axial compression", in BUCKLING OF STRUCTURES, I. Elishakoff, et al, editors, Elsevier Science Publishers, pp. 61-131, 1988

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80. Bushnell, D.: "Optimization Of Composite, Stiffened, Imperfect Panels Under Combined Loads For Service In The Postbuckling Regime," Computer Methods in Applied Mechanics and Engineering, Vol. 103, 43-114, North Holland, 1993

81. Bushnell, D. and Bushnell, W. D.: "Minimum-Weight Design Of A Stiffened Panel Via PANDA2 And Evaluation Of The Optimized Panel Via STAGS," Computers & Structures, Vol. 50. No. 4, pp. 569-602, Elsevier Science Ltd., 1994

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83. Bushnell, D. and Bushnell, W. D.: "Approximate Method for the Optimum Design of Ring and Stringer Stiffened Cylindrical Panels and Shells with Local, Inter-Ring, and General Buckling Modal Imperfections," Computers & Structures, Vol. 59. No. 3, pp. 489-527, Elsevier Science Ltd., 1996

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