

ROBERT T. BOCCHIERI
Principal Engineer**Specializations**

Solid mechanics, materials constitutive modeling; rate-dependent material behavior, fracture mechanics and failure analysis; mechanics of composite materials; nonlinear viscoelasticity; applied mechanics; finite element analysis; structural dynamics; crashworthiness and transportation safety; nondestructive evaluation of materials and structures.

Education

Ph.D. in Aerospace Engineering, The University of Texas at Austin, 2001
M.S. in Aerospace Engineering, The University of Texas at Austin, 1996
B.S. in Aerospace Engineering (Mathematics Minor), Syracuse University, 1993

Experience**2001 – Present: Principal Engineer,**

ARA Silicon Valley Office, Southwest Division

Responsible for managing and developing research projects in the field of solids and structural mechanics.

Manager of the Silicon Valley Office of ARA. Research topics include advanced materials testing and analysis, large-scale finite element simulations, nonlinear dynamic structural behavior, and fracture and failure of materials.

Current and past research includes large-scale simulations of geometric and material nonlinear dynamic behavior using the explicit finite element code LS-DYNA. Projects include aircraft impact modeling of the World Trade Center Towers, methods for dynamic characterization of composite materials, computational progressive damage and failure modeling of composite pressure vessels exposed to intense localized heating, highway barrier crashworthiness, earth-penetrating weapon systems, and the dynamic pulse-buckling of plates and shells exposed to impulsive blast loading.

1994 – 2001: Graduate Research Assistant,

Composite Materials Testing Laboratory, The University of Texas at Austin

Conducted mechanical, environmental, and non-destructive testing of composite materials to characterize their time-dependent constitutive and fracture behavior. Performed a study on the effects of nonlinear viscoelasticity and damage growth on the durability of polymeric composites. Developed an acoustic emission testing method for tracking viscoelastic fracture in unidirectional composites. Developed damage evolution equations based on viscoelastic fracture mechanics for rate-dependent microcracking.

**2000: Engineering Consultant,
The University of Texas at Austin**

Served as a consultant on several projects, including a disposable medical syringe study and failure analysis of a solid rocket. Tasks performed for the syringe study include mechanical testing and failure assessment including post-failure microscopy and fracture mode evaluation. Structural failure analysis of solid propellant in a VT-1 rocket was performed by constructing a finite element model to include thermal-stress damage effects on the propellant constitutive behavior.

**1993 – 1994: Spacecraft Design Improvement Engineer,
Martin Marietta Astro Space**

Responsible for the compilation of an advanced composite material database and managed a foam adhesive replacement study for flight hardware. Facilitated design process improvement studies on various spacecraft subsystems.

Honors and Recognitions

- Graduated Summa Cum Laude from Syracuse University and The University of Texas at Austin
- The University of Texas Tuition Fellowship, 9/00 & 1/01
- The University of Texas Continuing Fellowship, 9/99 & 1/00
- M.J. Thompson Endowed Presidential Scholarship in Eng., 9/99
- AIAA Foundation Graduate Award, 4/99
- AIAA Abe M. Zarem Award in Astronautics, 1/99
- Silver Medal in the International Astronautics Federation Paper Competition, Australia, 9/98
- 1st Place in the National AIAA Student Paper Competition, 1/98
- George W. Bean Presidential Scholarship in Engineering, 9/97

Affiliations (past and present)

Member American Institute of Aeronautics and Astronautics (AIAA)

Member American Society of Mechanical Engineers (ASME)

Member Society for Experimental Mechanics (SEM)

Selected Publications

S.W. Kirkpatrick, R.T. Bocchieri, R.A. MacNeill and F. Sadek, "Preliminary Analyses of Aircraft Impact into the WTC Towers," To be presented at the 2005 International Conference on Structural Safety and Reliability.

Bocchieri, R.T. and Schapery, R.A., "Time-dependent Deformation of a Nonlinear Viscoelastic Rubber-toughened Fiber Composite with Growing Damage," *Mechanics of Time-Dependent Materials*, Vol. 8, No. 2, June 2004, pp. 137-167.

Kirkpatrick, S.W., R.A. MacNeill, and R.T. Bocchieri, "Development of an LS- DYNA Occupant Model for use in Crash Analyses of Roadside Safety Features," *Transportation Review Board*, Paper No. TRB2003-0002450, Proc. of the 2003 TRB 82nd annual meeting, Washington D.C., Jan. 12-16, 2003.

Bocchieri, R.T., R.A. Schapery and M. Gorman, "Time-dependent Microcracking Detected in a Rubber-Toughened Carbon/Epoxy Composite by the Modal Acoustic Emission Method," *J. of Composite Materials*, Vol. 37, No. 5, 2003, pp. 421-451.

Bocchieri, R.T., "Time-Dependent Deformation of a Nonlinear Viscoelastic Rubber-toughen Fiber Composite with Growing Damage, Ph.D. Dissertation, Department of Aerospace Engineering and Engineering Mechanics, The University of Texas at Austin, 2001.

Bocchieri, R.T. and R.A. Schapery, "Nonlinear Viscoelastic Behavior of Rubber- Toughened Carbon and Glass/Epoxy Composites," *Time Dependent and Nonlinear Effects in Polymers and Composites*, ASTM STP 1357, 2000, pp. 238-265.

Bocchieri, R.T. and R.A. Schapery, "Experimental Methods for Characterizing the Time-dependent Behavior of Fiber Composites with Growing Damage", OTC- 12031, *Proceedings of the Offshore Technology Conference 2000*, Houston, TX, May 1-4.

Bocchieri, R.T. and Schapery, R.A., "Nonlinear Viscoelastic Constitutive Equations for Carbon/Epoxy and Glass/Epoxy Composites and Their Comparison through Micromechanics", *Proceedings of the Second International Conference on Composite Materials for Offshore Operations (CMOO-2)*, Houston, TX, Oct. 28-30, 1997.

Bocchieri, R.T., "A Baseline Nonlinear Material Characterization for Predicting the Long-term Durability of Composite Structures", *Proceedings of the 36th AIAA Aerospace Sciences Meeting*, Jan. 12-15, 1998.

Technical Reports

Kirkpatrick, S.W., R.T. Bocchieri, B. S. Holmes, R. MacNeill, B. Peterson. C. Navarro, "Analysis of Aircraft Impacts into the World Trade Center (WTC) Towers," Progress Report, NIST Special Publication 1000-X (NIST GCR 03-XXXX), (In Preparation), 2005.

Bocchieri, R.T., Constitutive Modeling of WSMR-5 and a 5 Ksi Target Concrete Applied to Simulation of High-Speed Penetration, ARA Progress Report, January, 2005.

Kirkpatrick, S. W., R. T. Bocchieri, and R. MacNeill, "Analysis of a High-Speed Penetrator Impacting a Concrete Target Using the LS-DYNA Finite Element Code," ARA Technical Report, Project 5707, May 2003.

Kirkpatrick, S. W., R. T. Bocchieri, "Finite Element Analysis of the LifeNet SoftWalls Barrier Concept," ARA Final Report, Project 5603 for McMurry & Talbott, Attorneys at Law, May 2003.

B. S. Holmes, R. T. Bocchieri and P. Dunn, "Development and Implementation of Non-linear Plate Response Algorithms into the BEAMS/ABLE Computer Code," ARA Technical Report, Project 0689 for the U.S. Army Research Laboratory, Contract DAAD13-01-D-0001, September 2002.

Holmes, B. S., S. W. Kirkpatrick, and R. MacNeill, R. T. Bocchieri, "Space Based Laser Lethality and Target Hardening Support for BMDO," ARA Technical Report, Project 0724 for BMDO/DE, September 2002.