

BRUCE D. KOTHMANN

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EXPERIENCE**Engineer, Handling Qualities**

Boeing Rotorcraft Division

1996 - Present

Philadelphia, Pennsylvania

1996-2004: Supported all aspects of RAH-66 *Comanche* handling qualities design and analysis; improved fidelity of linear and real-time nonlinear flight dynamics models, including formulation of rigorous coupled engine-drive system description, original representation of ducted tail rotor dynamic thrust response, and application of modern main rotor inflow models; supported flight test in West Palm Beach, Florida; performed feedback stability analysis to establish allowable gain ranges; pioneered novel test technique to validate stability robustness in flight; developed new control law algorithms, including automatic turn coordination for full-envelope operation, off-axis compensation to reduce coupling, and command-model changes to reduce rotor-hub and gearbox loads; implemented configuration control systems to manage simulation software development; managed handling qualities flight test planning and priorities.

1999: Supported CH-47 *Chinook* flight test at Fort Rucker in Dothan, Alabama.

2003: Developed and presented lecture series on rotorcraft flight dynamics for colleagues.

2004: Developed novel simulation model concept using Kane's equations and modern programming practices.

2005-Present: Supporting all aspects of V-22 *Osprey* handling qualities design and analysis; conducted trade study, including rapid prototyping of control law design, demonstrating benefits of significant changes to lateral trim management; performed detailed control law design; developed pilot briefings and flight test evaluation matrix.

Adjunct Lecturer

University of Pennsylvania

Spring 2004

Philadelphia, Pennsylvania

Taught senior-level undergraduate course in aerodynamics; developed original lectures, homework and exams covering ideal flow theory, compressible flow, and viscous flow.

Adjunct Associate Professor

Drexel University

Spring 2001

Philadelphia, Pennsylvania

Taught senior-level undergraduate course in flight dynamics and automatic control; developed original lectures covering applied aerodynamics, equations of motion, time and frequency response analysis and autopilot design.

Teaching Assistant

Princeton University

1993 - 1995

Princeton, New Jersey

Delivered original lectures, developed innovative discussion-oriented homework sets, supervised precepts, and prepared and proctored examinations in undergraduate courses in dynamics, automatic controls, and applied aerodynamics.

Software Engineer

Northern Research and Engineering Corporation

1991 - 1992

Woburn, Massachusetts

Developed and upgraded software for the design and analysis of centrifugal compressors and pumps. Responsible for customer training and support for a variety of design and analysis software products.

EDUCATION

Doctor of Philosophy, Aerospace Engineering May 2000 (*in residence* 1992 - 1996)
Princeton University Princeton, New Jersey

Dissertation: “High-Frequency Directional-Axis Dynamics of Helicopters with Ducted Tail Rotors”

GPA: 4.0 (of 4)

Honors: **Harold W. Dodds Honorific Fellowship**
Luigi Crocco Teaching Prize
Engineering Council Excellence in Teaching Award
Sayre Graduate Prize

Activities: Graduate Student Committee, *Chairperson*, 1995-1996

Master of Science, Aerospace Engineering May 1992 (*in residence* 1989 - 1991)
Pennsylvania State University State College, Pennsylvania

Thesis: “Experimental Investigation of the Interaction of Unsteady, Turbulent, Vortical Structures with a Turbulent Boundary Layer”

GPA: 4.0 (of 4)

Honors: **National Science Foundation Fellowship**

Bachelor of Science with Highest Distinction, Aerospace Engineering 1985 - 1989
University of Virginia Charlottesville, Virginia

Thesis: “The Effects of Trailing Edge Plates on the Performance of a Low Reynolds Number Airfoil”

GPA: 3.93 (of 4); Class Rank 6 of 481

Honors: **Rodman Scholar**
Tau Beta Pi
Raven Society

Activities: Virginia Men’s Glee Club, *President*, 1988-1989
Virginia Gentlemen

CONTINUING EDUCATION

The Dale Carnegie Course Spring, 2004
Randy Harms Philadelphia, Pennsylvania

Pilot-Induced Oscillations (Short Course) March 23-24, 2004
David G. Mitchell & David H. Klyde Philadelphia, Pennsylvania

Helicopter Handling Qualities (Workshop) May 2001
Gareth D. Padfield Washington, District of Columbia

Frequency-Domain Modeling and Testing (Workshop) June 2000
Mark B. Tischler Virginia Beach, Virginia

Helicopter Aerodynamics (Workshop) June 1999
Raymond W. Prouty Montreal, Quebec, Canada

JOURNAL ARTICLES

- Alpman, E., L.N. Long, B.D. Kothmann, "Steady Fan-in-Fin Simulations. Part 1," *Journal of Aircraft*, 41:5, 2004.
- Alpman, E., L.N. Long, B.D. Kothmann, "Unsteady Fan-in-Fin Simulations. Part 2," *Journal of Aircraft*, 41:6, 2004.

PAPERS

- Stiles, L.R., J. Mayo, A.L. Freisner, K.H. Landis, B.D. Kothmann, "Impossible to Resist: The Development of Rotorcraft Fly-by-Wire Technology," *60th Forum of the American Helicopter Society, Inaugural History Session*, Baltimore, Maryland, June 2004.
- Panda, B., E. Mychalowycz, B.D. Kothmann, "Active Controller For Comanche Air Resonance Stability Augmentation," *60th Forum of the American Helicopter Society*, Baltimore, Maryland, June 2004. (Award: **Best Dynamics Paper**)
- Kothmann, B.D., Y. Lu, E. DeBrun, J. Horn, "Perspectives on Rotorcraft Aerodynamic Modeling for Flight Dynamics Applications," *Fourth Decennial Specialists' Conference on Aeromechanics*, San Francisco, California, January 21-23, 2004.
- Johnson, C.K., B.D. Kothmann, "RAH-66 Comanche Flight Test Correlation with Model Predictions: Velocity Stabilization and Altitude Hold Modes," *Fourth Decennial Specialists' Conference on Aeromechanics*, San Francisco, California, January 21-23, 2004.
- Alpman, E., L.N. Long, B.D. Kothmann, "Toward a Better Understanding of Ducted Rotor Antitorque and Directional Control in Forward Flight" *59th Forum of the American Helicopter Society*, Phoenix, Arizona, May 2003.
- Kothmann, B.D., J. Armbrust, "RAH-66 Comanche Control Law Development: DEMVAL to EMD" *58th Forum of the American Helicopter Society*, Montreal, Canada, June 2002. (Award: **Best Handling Qualities Paper**)
- Kothmann, B.D., "RAH-66 Comanche Tethered Hover," *56th Forum of the American Helicopter Society*, Virginia Beach, Virginia, June 2000.
- Dryfoos, J.B., B.D. Kothmann, J.R. Mayo, "An Approach to Reducing Rotor-Body Coupled Roll Oscillations on the RAH-66 Comanche Using Modified Roll Rate Feedback," *55th Forum of the American Helicopter Society*, Montreal, Canada, May 1999.
- Kothmann, B.D., S.J. Ingle, "RAH-66 Comanche Linear Aeroservoelastic Stability Analysis: Model Improvements and Flight Test Correlation" *54th Forum of the American Helicopter Society*, Washington, DC, May 1998. (Award: **Best Paper at Forum**—invited to present as special guest at the *24th European Rotorcraft Forum*, Marseilles, France, September 1998)
- Kothmann, B.D., J.F. Keller, H.C. Curtiss, Jr., "On Aerodynamic Modelling for Flight Dynamics Applications," *22nd European Rotorcraft Forum*, Brighton, England, September 1996.
- Kothmann, B.D., H.C. Curtiss, Jr., "The Effects of Blade Flexibility on the Control Response of Articulated Rotor Helicopters in Hover," *21st European Rotorcraft Forum*, St. Petersburg, Russia, August 1995.
- Kothmann, B.D., W.R. Pauley, "Interaction of Unsteady, Turbulent Vortical Structures with a Turbulent Boundary Layer," paper AIAA 92-0060, *AIAA Aerospace Sciences Meeting*, Reno, Nevada, January 1992.