

## *Farhan Gandhi*

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### **RESEARCH EXPERIENCE AND INTERESTS**

**Rotorcraft Dynamics and Aeroelasticity** – Conventional helicopters, compound helicopters, tiltrotor aircraft, and swashplateless rotors. Passive design optimization, active and semi-active controls; for helicopter vibration reduction, aeroelastic and aeromechanical stability augmentation, and blade-vortex interaction alleviation. **Smart Materials and Structures** – Shape Memory Alloys and polymers, Electrorheological and Magnetorheological Fluids, Piezoelectric actuators and Active Constrained Layer Treatments; for structural vibration reduction and damping augmentation. Variable Stiffness Structures, Cellular Structures and Bi-Stable Structures. **Morphing aircraft/rotorcraft systems** – Variable camber, span, twist, chord, flexible skin design.

### **EDUCATION**

**Doctor of Philosophy in Aerospace Engineering, August 1995**

University of Maryland, College Park, Alfred Gessow Rotorcraft Center  
Modeling of Nonlinear Elastomeric Dampers and Effects on Bearingless Rotor Aeroelasticity  
(Thesis Advisor: Inderjit Chopra)

**Master of Science in Aerospace Engineering, May 1992**

University of Maryland, College Park, Alfred Gessow Rotorcraft Center

**Bachelor of Science in Aeronautical Engineering, July 1989**

Indian Institute of Technology, Bombay

### **EMPLOYMENT**

**Professor of Aerospace Engineering, May 2006 – onward**

The Pennsylvania State University

**Associate Professor of Aerospace Engineering, May 2001 – May 2006**

The Pennsylvania State University

**Assistant Professor of Aerospace Engineering, October 1995 – May 2001**

The Pennsylvania State University

**Graduate Research Assistant, January 1990 – August 1995**

University of Maryland, College Park, Alfred Gessow Rotorcraft Center

**Graduate Teaching Assistant, September 1989 – December 1989**

University of Maryland, College Park, Alfred Gessow Rotorcraft Center

## ***PUBLICATIONS IN ARCHIVAL JOURNALS***

1. Gandhi, F., and Lee, S. W., "A Composite Beam Finite Element Method with  $p$ -Version Assumed Warping Displacement," *Journal of Composite Engineering*, Vol. 2, Nos. 5-7, 1992, pp. 329-345.
2. Gandhi, F., and Chopra, I., "An Analytical Model for a Nonlinear Elastomeric Lag Damper and its Effects on Aeromechanical Stability in Hover," *Journal of the American Helicopter Society*, Vol. 39, No. 4, Oct. 1994, pp. 59-69.
3. Gandhi, F., and Chopra, I., "A Time-Domain Nonlinear Viscoelastic Damper Model," *Smart Materials and Structures*, 5 (1996), pp. 517-528.
4. Gandhi, F., and Chopra, I., "Analysis of Bearingless Main Rotor Aeroelasticity Using an Improved Time-Domain Nonlinear Elastomeric Damper Model," *Journal of the American Helicopter Society*, Vol. 41, No. 3, July 1996, pp. 267-277.
5. Gandhi, F., and Chopra, I., "An Aeroelastic Analysis Methodology for Bearingless Main Rotor Helicopters," *Journal of the American Helicopter Society*, Vol. 43, No. 1, Jan. 1998, pp. 66-75.
6. Wolons, D., Gandhi, F., and Malovrh, B., "Experimental Investigation of the Pseudoelastic Hysteresis Damping Characteristics of Shape Memory Alloy Wires," *Journal of Intelligent Material Systems and Structures*, Vol. 9, No. 2, Feb. 1998, pp. 116-126.
7. Marathe, S., Gandhi, F., and Wang, K. W., "Helicopter Blade Response and Aeromechanical Stability with a Magnetorheological Fluid Based Lag Damper," *Journal of Intelligent Material Systems and Structures*, Vol. 9, No. 4, April 1998, pp. 272-282.
8. Gandhi, F., and Hathaway, E., "Optimized Aeroelastic Couplings for Alleviation of Helicopter Ground Resonance," *Journal of Aircraft*, Vol. 35, No. 4, July-August 1998, pp. 582-590.
9. Gandhi, F., and Wolons, D., "Characterization of the Pseudoelastic Damping Behavior of Shape Memory Alloy Wires Using Complex Modulus," *Smart Materials and Structures*, 8 (1999), pp. 49-56.
10. Badre-Alam, A., Wang, K. W., and Gandhi, F., "Optimization of Enhanced Active Constrained Layer (EACL) Treatment on Helicopter Flexbeams for Aeromechanical Stability Augmentation," *Smart Materials and Structures*, 8 (1999), pp. 182-196.
11. Gandhi, F., and Malovrh, B., "Influence of Balanced Rotor Anisotropy in the Design of Aeromechanically Stable Helicopters," *AIAA Journal*, Vol. 37, No. 10, October 1999, pp. 1152-1160.
12. Anusonthi-Inthra, P., and Gandhi, F., "Helicopter Vibration Reduction through Cyclic Variations in Rotor Blade Root Stiffness," *Journal of Intelligent Material Systems and Structures*, Vol. 11, No. 2, Feb. 2000, pp. 153-166.
13. Gandhi, F., and Tauszig, L., "A Critical Evaluation of Various Approaches for the Numerical Detection of Helicopter Blade-Vortex Interactions," *Journal of the American Helicopter Society*, Vol. 45, No. 3, July 2000, pp. 179-190.
14. Anusonthi-Inthra, P., and Gandhi, F., "Optimal Control of Helicopter Vibration through Cyclic Variations in Blade Root Stiffness," *Smart Materials and Structures*, Vol. 10(1), Feb. 2001, pp. 86-95.
15. Gandhi, F., Wang, K. W., and Xia, L., "Magnetorheological Fluid Damper Feedback Linearization Control for Helicopter Rotor Application," *Smart Materials and Structures*, Vol. 10, No. 1, Feb. 2001, pp. 96-103.

### ***PUBLICATIONS IN ARCHIVAL JOURNALS, CONTD.***

16. Hathaway, E., and Gandhi, F., "Concurrent Optimization of Aeroelastic Couplings and Rotor Stiffness for the Alleviation of Helicopter Aeromechanical Instability," *Journal of Aircraft*, Vol. 38, No. 1, Jan.-Feb. 2001, pp. 69-80.
17. Gandhi, F., "Influence of Nonlinear Viscoelastic Material Characterization on Performance of Constrained Layer Damping Treatment," *AIAA Journal*, Vol. 39, No. 5, May 2001, pp. 924-931.
18. Tauszig, L., and Gandhi, F., "Influence of Blade-To-Blade Dissimilarity on Alleviation of Helicopter Blade-Vortex Interactions," *Mathematical and Computer Modelling*, Vol. 33, Nos. 10-11, May-Jun. 2001, pp. 1139-1154.
19. Malovrh, B., and Gandhi, F., "Mechanism Based Phenomenological Models for the Pseudoelastic Hysteresis Behavior of Shape Memory Alloys," *Journal of Intelligent Material Systems and Structures*, Vol. 12, No. 1, Jan. 2001, pp. 21-30.
20. Gandhi, F., and Chapuis, G., "Passive Damping Augmentation of a Vibrating Beam using Pseudoelastic Shape Memory Alloy Wires," *Journal of Sound and Vibration*, (2002) **250**(3), 519-539.
21. Gandhi, F., and Munsky, B., "Effectiveness of Active Constrained Layer Damping Treatments in Attenuating Resonant Oscillations," *Journal of Vibration and Control*, Vol. 8, No. 6, 2002, pp.747-775.
22. Gandhi, F., and Anusonthi-Inthra, P., "Helicopter Vibration Reduction using Discrete Controllable-Stiffness Devices at the Rotor Hub," *Journal of Aircraft*, Vol. 39, No. 4, Jul.-Aug. 2002, pp. 668-677.
23. Gandhi, F., and Munsky, B., "Comparison of Damping Augmentation Mechanisms with Position and Velocity Feedback in Active Constrained Layer Treatments," *Journal of Intelligent Material Systems and Structures*, Vol. 13, No. 5, May 2002, pp. 259-326.
24. Gandhi, F., and Anusonti-Inthra, P., "Adaptive Control of Semi-Active Variable Stiffness Devices for Narrow-Band Disturbance Rejection," *Journal of Intelligent Material Systems and Structures*, Vol. 14, No. 3, March 2003, pp. 191-201.
25. Hathaway, E., and Gandhi, F., "Modeling Refinements in Simple Tiltrotor Aeroelastic Stability Analyses," *Journal of the American Helicopter Society*, Vol. 48, No. 3, July 2003, pp. 186-198.
26. Gandhi, F., and Tauszig, L., "A Method to Evaluate the Contributions of Individual Interactions to Helicopter Blade-Vortex Interaction Noise," *Journal of the American Helicopter Society*, Vol. 48, No. 4, Oct. 2003, pp. 287-299.
27. Anusonthi-Inthra, P., Gandhi, F., and Miller, L., "Reduction of Helicopter Vibration through Cyclic Control of Variable Orifice Dampers," *The Aeronautical Journal*, The Royal Aeronautical Society, Vol. 107, No. 1077, Nov. 2003, pp. 657-672.
28. Badre-Alam, A., Wang, K. W., and Gandhi, F., "An Analysis of Interlaminar Stresses in Active Constrained Layer Damping Treatments," *Journal of Sound and Vibration*, 269 (2004) 965 –990.
29. Anusonti-Inthra, P., and Gandhi, F., "Cyclic Modulation of Semi-Active Controllable Dampers for Tonal Vibration Isolation," *Journal of Sound and Vibration*, 275 (2004) 107 –126.
30. Sekula, M. K., and Gandhi, F., "Effects of Auxiliary Lift and Propulsion on Helicopter Vibration Reduction and Trim," *Journal of Aircraft*, Vol. 41, No. 3, May 2004, pp. 645-656.

### ***PUBLICATIONS IN ARCHIVAL JOURNALS, CONTD.***

31. Gandhi, F., and Sekula, M. K., "Helicopter Vibration Reduction using Fixed-System Auxiliary Moments," *AIAA Journal*, Vol. 42, No. 3, March 2004, pp. 501-512.
32. Marathe, S., Wang, K. W., and Gandhi, F., "Feedback linearization control of magnetorheological fluid damper based systems with model uncertainty," *Smart Mater. Struct.* **13** (2004) 1006–1016.
33. Gandhi, F., and Bullough, W., "On the Phenomenological Modelling of Electrorheological and Magnetorheological Fluid Pre-Yield Behavior," *Journal of Intelligent Material Systems and Structures*, Vol. 16, No.3, March 2005, pp. 237-248.
34. Munsky, B., and Gandhi, F., "An Analysis of Helicopter Blade-Vortex Interaction Noise with Flight Path or Attitude Modification," *Journal of the American Helicopter Society*, Vol. 50, No. 2, April 2005, pp. 123-137.
35. Malovrh, B., and Gandhi, F., "Sensitivity of Helicopter Blade-Vortex-Interaction Noise and Vibration to Interaction Parameters," *Journal of Aircraft*, Vol. 42, No. 3, May-June 2005, pp. 685-697.
36. Anusonti-Inthra, P., Sarjeant, R., Frecker, M., and Gandhi, F., "Design of a Conformable Rotor Airfoil Using Distributed Piezoelectric Actuators," *AIAA Journal*, Vol. 43, No. 8, Aug. 2005, pp. 1684-1695.
37. Fei, S-T., Phelps, M., Wang, Y., Barrett, E., Gandhi, F., and Allcock, H., "A Redox Responsive Polymeric Gel Based on Ionic Crosslinking," *Soft Matter*, 2006, **2**, 397 – 401.
38. Malovrh, B., and Gandhi, F., "Partial Hyperbolic-Tangent Friction Element Based Phenomenological Models for Shape Memory Alloy Pseudoelastic Hysteresis," *ASME Journal of Engineering Materials and Technology*, Vol. 128, No. 3, July 2006, pp. 346-355.
39. Hathaway, E., and Gandhi, F., "Tiltrotor Whirl Flutter Alleviation Using Actively Controlled Wing Flaperons," *AIAA Journal*, Vol. 44, No. 11, Nov. 2006, pp. 2524 – 2534.
40. Hathaway, E., and Gandhi, F., "Design Optimization for Improved Tiltrotor Whirl Flutter Stability," *Journal of the American Helicopter Society*, Vol. 52 No. 2, April 2007 pp. 79-89.
41. Gandhi, F., Remillat, C., Tomlinson, G., and Austruy, J., "Constrained Layer Damping Treatment with Gradient Viscoelastic Polymers for Effectiveness over Broad Temperature Range," *AIAA Journal*, Vol. 45, No. 8, Aug. 2007, pp. 1885-1893.
42. Gandhi, F., and Kang, S.-G., "Beams with Controllable Flexural Stiffness," *Smart Materials and Structures*, Vol. 16, No. 4, Aug. 2007, pp. 1179-1184.
43. Paik, J., Singh, R., Gandhi, F., and Hathaway, E., "Active Tiltrotor Whirl-Flutter Stability Augmentation using Wing-Flaperon and Swashplate Actuation," *Journal of Aircraft*, Vol. 44, No. 5, September-October 2007, pp. 1439-1446.
44. Gandhi, F., Frecker, M., and Nissly, A., "Design Optimization of a Controllable Camber Rotor Airfoil," accepted for publication, *AIAA Journal*.
45. Mehta, V., Brennan, S., and Gandhi, F., "Rigid-Link Snake Robot Dynamics and Optimally-Efficient Gait Confirmed by Experimentation," accepted for publication, *IEEE Transactions on Robotics*.
46. Atli, B., Gandhi, F., and Krast, G., "Thermomechanical Characterization of Shape Memory Polymers," accepted for publication, *Journal of Intelligent Material Systems and Structures*.

### ***PUBLICATIONS IN ARCHIVAL JOURNALS, CONTD.***

47. Gandhi, F., and Anusonti-Inthra, P., "Skin Design Studies for Variable Camber Morphing Airfoils," *Smart Materials and Structures*, July 2007.

### ***JOURNAL PAPERS UNDER REVISION***

48. Malovrh, B., and Gandhi, F., "Localized Individual Blade Root Pitch Control for Helicopter Blade-Vortex Interaction Noise Reduction," *Journal of the American Helicopter Society*.
49. Byers, L., and Gandhi, F., "Helicopter Rotor Lag Damping Augmentation Based on a Radial Absorber and Coriolis Coupling," *Journal of the American Helicopter Society*.
50. Byers, L., and Gandhi, F., "Embedded Absorbers for Helicopter rotor lag damping," *Journal of Sound and Vibration*.
51. Gandhi, F., and Sekula, M., "Helicopter Horizontal Tail Incidence Control to Reduce Rotor Cyclic Pitch and Blade Flapping," *Journal of the American Helicopter Society*.

## **PUBLICATIONS IN CONFERENCE PROCEEDINGS (1997 – ONWARDS)**

1. Gandhi, F., and Hathaway, E., “Optimized Aeroelastic Couplings for Alleviation of Helicopter Ground Resonance,” *Proceedings of the 38th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference*, Kissimmee, Florida, April 1997, pp. 860 - 875, AIAA Paper No. 97-1282.
2. Gandhi, F., and Weller, W., “Active Aeromechanical Stability Augmentation using Fuselage State Feedback,” *Proceedings of the 53rd Annual Forum of the American Helicopter Society*, Virginia Beach, Virginia, April 1997, pp. 1350 - 1362.
3. Gandhi, F., and Malovrh, B., “Influence of Balanced Rotor Anisotropy in the Design of Aeromechanically Stable Helicopters,” *Proceedings of the 53rd Annual Forum of the American Helicopter Society*, Virginia Beach, Virginia, April 1997, pp. 783 - 796.
4. Gandhi, F., “Concepts for Damperless Aeromechanically Stable Rotors,” *Proceedings of the Royal Aeronautical Society Innovation in Rotorcraft Technology Conference*, London, United Kingdom, June 1997, pp. 14.1 - 14.31.
5. Marathe, S., Gandhi, F., and Wang, K. W., “Helicopter Blade Response and Aeromechanical Stability with a Magnetorheological Fluid Based Lag Damper,” *Proceedings of the 1998 SPIE Conference on Smart Structures and Materials*, March 1998, SPIE Vol. 3329, pp. 390 – 401.
6. Badre-Alam, A., Wang, K. W., and Gandhi, F., “Aeromechanical Stability Augmentation of Helicopters using Enhanced Active Constrained Layer (EACL) Treatment on Flex Beams,” *Proceedings of the 1998 SPIE Conference on Smart Structures and Materials*, March 1998, SPIE Vol. 3327, pp. 73 - 85.
7. Wolons, D., Gandhi, F., and Malovrh, B., “An Experimental Investigation of the Pseudoelastic Hysteresis Damping Characteristics of Nickel-Titanium Shape Memory Alloy Wires,” *Proceedings of the 39th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference*, Long Beach, California, April 1998, pp. 2821 - 2833, AIAA Paper No. 98-2036.
8. Hathaway, E., and Gandhi, F., “Individual Blade Control for Alleviation of Helicopter Ground Resonance,” *Proceedings of the 39th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference*, Long Beach, California, April 1998, pp. 2507 - 2517, AIAA Paper No. 98-2006.
9. Tauszig, L., and Gandhi, F., “Numerical Detection of Blade-Vortex Interactions Using a Free Wake Analysis - A Comparison of Various Approaches,” *Proceedings of the 24th European Rotorcraft Forum*, Marseilles, France, Sept. 1998, pp. AE 10-1 - 10-24.
10. Marathe, S., Wang, K. W., and Gandhi, F., “The Effect of Model Uncertainty on Magnetorheological Fluid Damper Based Systems Under Feedback Linearization Control,” *Proceedings of the ASME International Mechanical Engineering Congress and Exposition (Adaptive Structures and Material Systems)*, Anaheim, California, Nov. 1998, AD-57, pp. 129-140.
11. Malovrh, B., and Gandhi, F., “Mechanism Based Phenomenological Models for Pseudoelastic Damping Behavior of Shape Memory Alloys,” *Proceedings of the 40th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference*, St. Louis, Missouri, April 1999, pp. 2723-2733.
12. Sekula, M., and Gandhi, F., “Influence of Controlled Blade Lead-Lag Motions on Helicopter Vibration,” *Proceedings of the 40th AIAA/ASME/ASCE/AHS/ASC Structures, Structural, Dynamics and Materials Conference*, St. Louis, Missouri, April 1999, pp. 172-182, AIAA Paper No. 99-1223.

***PUBLICATIONS IN CONFERENCE PROCEEDINGS (1997 – ONWARDS), CONTD.***

13. Anusonthi-Inthra, P., and Gandhi, F., “Helicopter Vibration Reduction through Cyclic Variations in Rotor Blade Root Stiffness,” *Proceedings of the 55th Annual Forum of the American Helicopter Society*, Montreal Canada, May 1999, pp. 209-225.
14. Hathaway, E., and Gandhi, F., “Concurrent Optimization of Aeroelastic Couplings and Rotor Stiffness for the Alleviation of Helicopter Aeromechanical Instability,” *Proceedings of the 55th Annual Forum of the American Helicopter Society*, Montreal Canada, May 1999, pp. 2212-2227.
15. Tauszig, L., and Gandhi, F., “Influence of Blade-to-Blade Dissimilarities on the Alleviation of Blade-Vortex Interactions,” in Addendum to the *Proceedings of the 55th Annual Forum of the American Helicopter Society*, Montreal, Canada, May 1999, 16 pages.
16. Gandhi, F., “Influence of Nonlinear Viscoelastic Material Characterization on Performance of Constrained Layer Damping Treatment,” *Proceedings of the Tenth International Conference on Adaptive Structures and Technologies (ICAST '99)*, Paris, France, Oct. 1999, pp. 269-279.
17. Gandhi, F., and Munsky, B., “Comparison of the Mechanism and Effectiveness of Position and Velocity Feedback in Active Constrained Layer Damping Treatments,” *Proceedings of the 2000 SPIE Conference on Smart Structures and Materials*, March 2000, SPIE Vol. 3989, pp. 61-72.
18. Malovrh, B., and Gandhi, F., “Time Domain Mechanical Models for SMA Pseudoelastic Damping Behavior,” *Proceedings of the 2000 SPIE Conference on Smart Structures and Materials*, March 2000, SPIE Vol. 3989, pp. 324-335.
19. Badre-Alam, A., Gandhi, F., and Wang, K. W., “An Improved Constrained Layer Damping Treatment Design for High Damping and Low Interlaminar Stresses,” *Proceedings of the 2000 SPIE Conference on Smart Structures and Materials*, March 2000, SPIE Vol. 3989, pp. 2-13.
20. Anusonthi-Inthra, P., and Gandhi, F., “Optimal Control of Helicopter Vibration through Cyclic Variations in Rotor Blade Root Stiffness,” *Proceedings of the 26th European Rotorcraft Forum*, The Hague, The Netherlands, Sept. 2000, pp. 32.1-32.11.
21. Gandhi, F., and Tauszig, L., “Influence of Individual Interactions on Helicopter Blade-Vortex Interaction Noise,” *Proceedings of the 26th European Rotorcraft Forum*, The Hague, The Netherlands, Sept. 2000, pp. 54.1-54.13.
22. Gandhi, F., and Chapuis, G., “Passive Damping Augmentation of a Vibrating Beam using Shape Memory Alloy Wires,” *Proceedings of the Eleventh International Conference on Adaptive Structures and Technologies (ICAST '00)*, Nagoya, Japan, Oct. 2000.
23. Gandhi, F., and Munsky, B., “Effectiveness of Active Constrained Layer Damping Treatments in Attenuating Resonant Oscillations,” *Proceedings of the 42<sup>nd</sup> AIAA/ASME/ASCE/AHS Structures, Structural Dynamics and Materials Conference and AIAA/ASME/AHS Adaptive Structures Forum*, Seattle, Washington, April 2001.
24. Gandhi, F., and Anusonthi-Inthra, P., “Helicopter Vibration Reduction using Discrete Controllable-Stiffness Devices at the Rotor Hub,” *Proceedings of the 42<sup>nd</sup> AIAA/ASME/ASCE/ AHS Structures, Structural Dynamics and Materials Conference and AIAA/ASME/AHS Adaptive Structures Forum*, Seattle, Washington, April 2001.

***PUBLICATIONS IN CONFERENCE PROCEEDINGS (1997 – ONWARDS), CONTD.***

25. Malovrh, B., Gandhi, F., and Tauszig, L., “Sensitivity of Helicopter BVI-Induced Noise and Vibration to Variations in Individual Interaction-Parameters,” *Proceedings of the 57th Annual Forum of the American Helicopter Society*, Washington DC, May 2001.
26. Sekula, M., and Gandhi, F., “Evaluation of Vibration Reductions and Changes in Trim due to Helicopter Compounding,” *Proceedings of the 57th Annual Forum of the American Helicopter Society*, Washington DC, May 2001.
27. Gandhi, F., and Anusonti-Inthra, P., “Adaptive Control of Semi-Active Variable Stiffness Devices for Narrow-Band Disturbance Rejection,” *Proceedings of the Twelfth International Conference on Adaptive Structures and Technologies (ICAST '01)*, College Park, Maryland, Oct. 2001.
28. Anusonti-Inthra, P., and Gandhi, F., “Narrow-Band Disturbance Rejection using Semi-Active Control,” *Proceedings of the 2001 ASME Winter Annual Meeting*, New York, New York, Nov. 2001.
29. Hathaway, E., and Gandhi, F., “Modeling Refinements in Simple Tiltrotor Aeroelastic Stability Analyses,” *Proc. of the 43<sup>rd</sup> AIAA/ASME/ASCE/AHS Structures, Structural Dynamics and Materials Conference and AIAA/ASME/AHS Adaptive Structures Forum*, Denver, Colorado, April 2002.
30. Anusonti-Inthra, P., Gandhi, F., and Miller, L., “Reduction of Helicopter Vibration through Cyclic Control of Variable Orifice Dampers,” *Proceedings of the 58<sup>th</sup> Annual Forum of the American Helicopter Society*, Montreal, Canada, June 2002.
31. Munsy, B., Gandhi, F., and Tauszig, L., “An Analysis of Helicopter Blade-Vortex Interaction Noise with Flight Path or Attitude Modification,” *Proceedings of the 58<sup>th</sup> Annual Forum of the American Helicopter Society*, Montreal, Canada, June 2002.
32. Gandhi, F., and Sekula, M., “Helicopter Vibration Reduction using Fixed-System Auxiliary Moments,” *Proc. of the 58<sup>th</sup> Annual Forum of the American Helicopter Society*, Montreal, Canada, June 2002.
33. Malovrh, B., and Gandhi, F., “Localized Individual Blade Pitch Control for Reduction of Helicopter Blade-Vortex Interaction Noise,” *Proc. of the 28<sup>th</sup> European Rotorcraft Forum*, Bristol, England, September 2002.
34. Sarjeant, R., Frecker, M., and Gandhi, F., “Optimal Design of a Smart Conformable Rotor Airfoil,” *Proc. of IMECE'02: 2002 ASME International Mechanical Congress & Exposition*, New Orleans, Louisiana, Nov. 17-22, 2002, Paper No. IMECE2002-34030.
35. Hathaway, E., and Gandhi, F., “Design Optimization for Improved Tiltrotor Whirl Flutter Stability,” *Proceedings of the 29<sup>th</sup> European Rotorcraft Forum*, Friedrichshafen, Germany, September 2003.
36. Anusonti-Inthra, P., Gandhi, F., and Frecker, M., “Design of a Conformable Rotor Airfoil Using Distributed Piezoelectric Actuation,” *Proceedings of IMECE'03: 2003 ASME International Mechanical Congress & Exposition*, Washington DC, Nov. 16-21, 2003, Paper No. IMECE2003-42659.
37. Sekula, M., and Gandhi, F., “Helicopter Vibration and Rotor Power Reduction through Horizontal Tail Incidence Angle Control,” *Proceedings of the 60th Annual Forum of the American Helicopter Society*, Baltimore, Maryland, June 2004.



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38. Gandhi, F., and Sekula, M., “Helicopter Horizontal Tail Incidence Control to Reduce Rotor Cyclic Pitch and Blade Flapping,” *Proceedings of the 60<sup>th</sup> Annual Forum of the American Helicopter Society*, Baltimore, Maryland, June 2004.
39. Hathaway, E., and Gandhi, F., “Tiltrotor Whirl Flutter Alleviation using Actively Controlled Wing Flaperons,” *Presented at the AHS International 60<sup>th</sup> Annual Forum and Technology Display*, Baltimore, Maryland, June 7-10, 2004.
40. Nissly, A., Anusonti-Inthra, P., Frecker, M., and Gandhi, F., “Shape Optimization of a Compliant Mechanism for an Actively Conformable Rotor Airfoil,” *Proceedings of DETC’04: ASME 2004 Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, Sept 28-Oct 2, 2004, Salt Lake City, Utah, Paper No. DETC2004-57617.
41. Gandhi, F., and Anusonti-Inthra, P., “On the Design of Flexible Skins for Morphing Aircraft Structures,” *Presented at the 15<sup>th</sup> International Conference on Adaptive Structures and Technologies (ICAST)*, Bar Harbor, Maine, Oct. 24 – 27, 2004.
42. Gandhi, F., Remillat, C., and Tomlinson, G., “Constrained Layer Damping Treatment with Gradient Viscoelastic Polymers for Effectiveness over Broad Temperature Range,” *Proceedings of the 13<sup>th</sup> AIAA/ASME/AHS Adaptive Structures Conference*, Austin, Texas, April 2005.
43. Singh, R., Gandhi, F., and Hathaway, E., “Active Tiltrotor Whirl-Flutter Stability Augmentation using Wing-Flaperon and Swashplate Actuation,” *Proceedings of the 46<sup>th</sup> AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference*, Austin, Texas, April 2005.
44. Gandhi, F., “Maximizing the Effectiveness of Pseudoelastic Shape Memory Alloy Wires for Structural Damping Augmentation,” *Invited paper at the Workshop on Damping in Shape Memory Alloys, Composites and Foams*, May 10-11, 2005, Metz, France.
45. Byers, L., and Gandhi, F., “Helicopter Rotor Lag Damping Augmentation Based on a Radial Absorber and Coriolis Coupling,” *Proceedings of the American Helicopter Society 61<sup>st</sup> Annual Forum*, Grapevine, Texas, June 1-3, 2005.
46. Nissly, A., Anusonti-Inthra, P., Gandhi, F., and Frecker, M., “Design Optimization of a Controllable Camber Rotor Airfoil,” *Proceedings of the American Helicopter Society 61<sup>st</sup> Annual Forum*, Grapevine, Texas, June 1-3, 2005.
47. Singh, R., Gandhi, F., and Hathaway, E., “Wing-Flaperon and Swashplate Control for Whirl-Flutter Stability Augmentation of a Soft-Inplane Tiltrotor,” *Proceedings of the 31<sup>st</sup> European Rotorcraft Forum*, Florence, Italy, Sept. 13-15, 2005.
48. Nirakh, A., Brennan, S., and Gandhi, F., “An Implicit Model for Snake Robot Locomotion and Gait Optimization,” *Proceedings of the 2005 ASME International Mechanical Engineering Congress and Exposition*, Nov. 5-11, 2005, Orlando, Florida.
49. Olympio, K., and Gandhi, F., “Design of Flexible Skins for Morphing Aircraft Structures using Honeycomb Cores,” *Presented at the 14<sup>th</sup> AIAA/ASME/AHS Adaptive Structures Conference*, April 2006, Newport, Rhode Island.

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50. Byers, L., and Gandhi, F., “Rotor Blade with Radial Absorber (Coriolis Damper) - Loads Evaluation,” *Proceedings of the American Helicopter Society 62<sup>nd</sup> Annual Forum*, Phoenix, AZ, May 9–11, 2006.
51. Gandhi, F., Yoshizaki, Y., and Sekula, M., “Swashplateless Control of a Rotary-Wing UAV using Variable RPM and a Movable CG,” *Proceedings of the American Helicopter Society 62<sup>nd</sup> Annual Forum*, Phoenix, AZ, May 9–11, 2006.
52. Makinen, S., Hill, M., Gandhi, F., Long, L., Vasilescu, R., and Sankar, L., “A Study of the HART-1 Rotor with Loose Computational Fluid/Structural Dynamic Coupling,” *Proceedings of the American Helicopter Society 62<sup>nd</sup> Annual Forum*, Phoenix, AZ, May 9–11, 2006.
53. Byers, L., and Gandhi, F., “Embedded Absorbers for Helicopter Rotor Lag Damping,” *Proceedings of the 32<sup>nd</sup> European Rotorcraft Forum*, Maastricht, The Netherlands, Sept. 12–14, 2006.
54. Atli, B., Gandhi, F., and Krast, G., “Thermomechanical characterization of shape memory polymers,” *2007 SPIE Conference on Smart Structures and Materials*, San Diego, California, March 18–22, 2007.
55. Gandhi, F., and Kang, S-G, “Beams with Controllable Flexural Stiffness,” *2007 SPIE Conference on Smart Structures and Materials*, San Diego, California, March 18–22, 2007.
56. Olympio, K. R., and Gandhi, F., “Mixed Cellular Honeycomb Zero- $\nu$  Flexible Skins for Morphing Aircraft,” *15th AIAA/ASME/AHS Adaptive Structures Conference*, Honolulu, Hawaii, April 23–26, 2007.
57. Murray, G., Gandhi, F., and Bakis, C., “Flexible Matrix Composite Skins for One-Dimensional Wing Morphing,” *15th AIAA/ASME/AHS Adaptive Structures Conference*, Honolulu, Hawaii, April 23–26, 2007.
58. Paik, J., and Gandhi, F., “Design Optimization for Soft-Inplane Tiltrotor Whirl Flutter Stability,” *63<sup>rd</sup> Annual AHS International Forum and Technology Display*, Virginia Beach, VA, May 1-3, 2007.
59. Prabhakar, T., Gandhi, F., and McLaughlin, D., “A Centrifugal Force Actuated Variable Span Morphing Helicopter Rotor,” *63<sup>rd</sup> Annual AHS International Forum and Technology Display*, Virginia Beach, VA, May 1-3, 2007. Also at *the AHS International/Korean Society for Aeronautical and Space Sciences International Forum on Rotorcraft Multidisciplinary Technology*, Seoul, Korea, October 15-17, 2007.
60. Paik, J., Singh, R., and Gandhi, F., “Active Control for Soft-Inplane Tiltrotor Aeroelastic Stability Augmentation,” *Proceedings of the AHS International/Korean Society for Aeronautical and Space Sciences International Forum on Rotorcraft Multidisciplinary Technology*, Seoul, Korea, October 15-17, 2007.

## ***FUNDED RESEARCH PROJECTS***

Project Title: *Feasibility of Flexbeam Lag Damping Augmentation Methods for Bearingless Rotor Aeromechanical Stability*  
Source of Support: United Technologies Sikorsky Aircraft  
Period Covered: 03/01/97 - 12/31/97  
Award Amount: \$15,000 Total, Co-PI with K. W. Wang (50%)

Project Title: *Reduced Order Structural Models for Airframe Vibration Control*  
Source of Support: United Technologies Research Center  
Period Covered: 08/15/96 - 08/14/98  
Award Amount: \$60,000 Total, PI (100%)

Project Title: *Use of Aeroelastic Couplings and Multi-Point Optimization to Design Damperless Aeromechanically Stable Helicopters*  
Source of Support: US Army Research Office (Young Investigator Award)  
Period Covered: 07/15/97 - 07/14/00  
Award Amount: \$293,717 Total, PI (100%)

Project Title: *Rotor Lead-Lag Control for Helicopter Vibration and Noise Reduction*  
Source of Support: NASA Langley Research Center  
Period Covered: 01/01/98 - 12/31/99  
Award Amount: \$129,288 Total, PI (100%)

Project Title: *Influence of Blade-to-Blade Dissimilarities on Alleviation of Blade-Vortex Interactions*  
Source of Support: US Army Research Office (under MURI program - *Innovative Technologies for Actively Controlled Jet-Smooth Quiet Rotorcraft*)  
Period Covered: 08/01/96 - 07/31/01  
Award Amount: Approx. \$35,000 per year (Yrs.1-3), \$60,000 per year (Yrs. 4-5), PI (100%)

Project Title: *Rotor Vibration Reduction and Stability Augmentation via Multi-Functional Semi-Active and Active-Passive Hybrid Systems*  
Source of Support: National Rotorcraft Technology Center, NASA Ames Research Ctr. (under the Penn State Rotorcraft Center of Excellence program)  
Period Covered: 01/01/96 - 12/31/00  
Award Amount: Approx. \$ 80,000 per year\* (for a five-year period)

\* This research task under the NRTC Rotorcraft Center of Excellence program had K. W. Wang as Co-PI. The figure denoted represents the candidate's portion of funding.

## ***FUNDED RESEARCH PROJECTS, CONTD.***

Project Title: (a) *Development of a Smart Materials Based Actively Conformable Rotor Airfoil*  
(b) *Active Tiltrotor Aeroelastic and Aeromechanical Stability Augmentation*  
Source of Support: National Rotorcraft Technology Center, NASA Ames Research Ctr.  
(under the Penn State Rotorcraft Center of Excellence program)  
Period Covered: 01/01/01 - 12/31/05  
Award Amount: Approx. \$ 80,000 per year\*\* (for a five-year period)

\*\* These research tasks are funded under the NRTC Rotorcraft Center of Excellence program, with the figure denoted representing the candidate's portion of the funding under this program. Task (a) had Mary Frecker as Co-PI.

Project Title: *Control and Trim Optimization for a Compound Helicopter*  
Source of Support: Piasecki Aircraft Corporation  
Period Covered: 03/15/01 - 12/31/02  
Award Amount: \$232,799 Total, Co-PI with Joe Horn (50%).

Project Title: *Morphing Airfoils using Smart Materials*  
Source of Support: National Science Foundation  
Period Covered: 05/16/02 - 05/15/03  
Award Amount: \$55,573 Total, PI (100%)

Project Title: *Closed-Loop Rotor Individual Blade Control for Helicopter  
Blade-Vortex Interaction Noise Reduction*  
Source of Support: NASA Langley Research Center  
Period Covered: 05/01/04 - 09/30/04  
Award Amount: \$15,000 Total, PI (100%)

Project Title: *Ion-Responsive Polyelectrolyte Gel Based Muscular Hydrostat  
Structures for Flexible-Robots and -Robotic Manipulators*  
Source of Support: Defense Advanced Research Projects Agency (DARPA)  
Period Covered: 06/30/04 - 06/30/06  
Award Amount: \$357,348, Lead-PI, with Harry Allcock (Chemistry) as Co-PI  
(candidate's share of funding is \$257,347 for the 24 month period)

Project Title: *Revolutionary Physics-Based Design Tools for Quiet Helicopters*  
Source of Support: Defense Advanced Research Projects Agency (DARPA)  
Period Covered: 09/01/04 - 08/31/06  
Award Amount: \$97,204/year (for a two-year period – Phase 1) \*\*\*

\*\*\* This is a multi-PI DARPA sponsored joint program involving Georgia Tech/PSU/Northern Arizona University. The figure denoted represents the candidate's portion of the funding under this program.

## ***FUNDED RESEARCH PROJECTS, CONTD.***

- Project Title: *Design of Flexible Skins for Morphing Aircraft Structures*  
Source of Support: Air Force Office of Scientific Research – AFOSR (sub-task under project entitled *Compliant Frame: A New Paradigm to Enable Reconfigurable Aircraft Structures*)  
Period Covered: 05/01/05 - 12/31/05  
Award Amount: \$100,000 Total (candidate's share 85%), Co-PI with G. Lesieutre and M. Frecker.
- Project Title: *Active Control for Aeroelastic/ Aeromechanical Stability Augmentation of Soft-Inplane Tiltrotors*  
Source of Support: Center for Rotorcraft Innovation (CRI)  
Period Covered: 01/01/06 - 12/31/08  
Award Amount: \$150,000 Total, PI (100%)
- Project Title: *Passive Design Optimization for Aeroelastic/Aeromechanical Stability Augmentation of Soft-Inplane Tiltrotors*  
Source of Support: Bell Helicopter Textron, Inc.  
Period Covered: 01/01/06 – 12/30/08  
Award Amount: \$150,000 Total, PI (100%)
- Project Title: *Variable-Span Compact Rotors for Sea-Based Missions*  
Source of Support: Office of Naval Research (ONR), part of the Penn State program *Innovative Technologies for Enhanced Safety, Survivability, and Performance of Naval Rotorcraft*  
Period Covered: 01/01/06 - 12/31/06  
Award Amount: \$50,000 Total, PI (100% - figure represents candidate's portion of ONR program funds)
- Project Title: (a) *Shape Memory Alloy (SMA) Cellular Honeycomb based Crashworthy Structures*  
(b) *Performance, Vibration and Noise Benefits of Variable-RPM Rotors*  
Source of Support: Office of Naval Research (ONR), part of the Penn State program *Innovative Technologies for Enhanced Safety, Survivability, and Performance of Naval Rotorcraft*  
Period Covered: 01/01/07 - 12/31/09  
Award Amount: \$381,060 Total, PI (100% - figure represents candidate's portion of ONR program funds)
- Project Title: *Miniature Trailing-Edge Effectors (Active Gurneys) for Rotor Performance and Aeromechanics*  
Source of Support: National Rotorcraft Technology Center.  
(under the Penn State Vertical Lift Research Center of Excellence program)  
Period Covered: 07/01/06 - 06/30/11  
Award Amount: Approx. \$ 80,000 per year (100%, figure represents candidate's share of funding)
- Project Title: *Flex-Skins Using Cellular Cores*  
Source of Support: Air Force Office of Scientific Research (AFOSR), Phase I STTR with NextGen Aeronautics, Inc.  
Period Covered: 09/18/06 - 06/15/07  
Award Amount: \$36,638 Total, PI (100%)

***FUNDED RESEARCH PROJECTS, CONTD.***

Project Title: *Flex-Skins Using Cellular Cores*  
Source of Support: Air Force Office of Scientific Research (AFOSR), Phase II STTR with  
NextGen Aeronautics, Inc.  
Period Covered: 08/01/07 - 07/31/09  
Award Amount: \$250,000 Total, PI (100%)

Project Title: *Application of Geometric Morphing to UUV Design*  
Source of Support: Penn State Applied Research Lab (Exploratory and Foundational Support Program)  
Period Covered: 09/01/06 - 08/31/09  
Award Amount: \$150,000 Total, Co-PI with Dr. Timothy Miller (50%)

## ***RECORD OF STUDENT ADVISEES***

### **Doctoral Students:** *graduation date*

<b>Askari Badre-Alam</b>	12/00	at Lord Corp, Cary, NC, co-advised with K. W. Wang (ME)
<b>Martin Sekula</b>	08/02	at NASA LaRC, Hampton, VA
<b>Phuriwat Anusonti-Inthra</b>	08/02	at National Institute of Aerospace, Hampton, VA
<b>Lionel Tauszig</b>	08/02	at Agusta, Philadelphia, PA
<b>Eric Hathaway</b>	08/05	at Boeing Helicopters, Philadelphia, PA
<b>Lynn Byers</b>	08/06	at United States Military Academy, West Point, NY

<b>Brendon Malovrh</b>	(in progress)	at NASA LaRC since 06/05
<b>Jinho Paik</b>	(in progress)	
<b>Kingnide Olympio</b>	(in progress)	
<b>Eui-Sung Bae</b>	(in progress)	
<b>Bilim Atli</b>	(in progress)	
<b>Terry Johnson</b>	(in progress)	co-advised with M. Frecker
<b>Seung-Pil Kim</b>	(in progress)	

### **Masters Students:** *graduation date*

<b>David Wolons</b>	12/97	
<b>Duk Park</b>	12/97 (M.Eng.)	
<b>Phuriwat Anusonti-Inthra</b>	08/98	
<b>Lionel Tauszig</b>	08/98	
<b>Martin Sekula</b>	12/98	
<b>Kathleen Hufnagel</b>	12/98	co-advised with G. Lesieutre
<b>Sameer Marathe</b>	05/99	co-advised with K. W. Wang (ME)
<b>Eric Hathaway</b>	08/99	
<b>Gautier Chapuis</b>	12/99	
<b>Brendon Malovrh</b>	05/00	
<b>Todd Ulrich</b>	12/01	co-advised with K. W. Wang (ME)
<b>Brian Munsky</b>	08/02	
<b>Roberto Sarjeant</b>	08/02	co-advised with M. Frecker (ME)
<b>Rupinder Singh</b>	08/05	
<b>Appa Rao Nirakh</b>	08/05	co-advised with S. Brennan (ME)
<b>Andrew Nissly</b>	12/05	co-advised with M. Frecker (ME)
<b>Kingnide Olympio</b>	12/06	
<b>Bilim Atli</b>	05/07	
<b>Yuji Yoshizaki</b>	08/07	at Mitsubishi Heavy Industries, Nagoya, since 06/05
<b>Christopher Kroninger</b>	(in progress)	at NASA LaRC since 09/06
<b>Tushar Prabhakar</b>	(in progress)	co-advised with D. K. McLaughlin
<b>Mihir Mistry</b>	(in progress)	
<b>Jason Steiner</b>	(in progress)	
<b>Russell Ruffino</b>	(in progress)	co-advised with Timothy Miller (ARL)
<b>Jamie Bluman</b>	(in progress)	
<b>Gabriel Murray</b>	(in progress)	
<b>Alvord Marques</b>	(in progress)	
<b>Christopher Duling</b>	(in progress)	
<b>Olivier Leon</b>	(in progress)	

**Senior Honors Thesis:** *graduation date*

<b>Eric Hathaway</b>	05/97
<b>Brendon Malovrh</b>	05/97
<b>Brian Munsky</b>	05/00
<b>Jill Tombasco</b>	05/05
<b>Matthew Lewellen (EMch)</b>	05/06
<b>Gabriel Murray</b>	05/07

***POST-DOCTORAL RESEARCHERS MENTORED***

<b>Phuriwat Anusonti-Inthra</b>	09/02 – 08/04
<b>Guanglei Cui</b>	08/04 – 05/05 (with K. Merz, PSU Chemistry Dept.)
<b>Stephen Makinen</b>	10/04 – 10/06

***VISITING SCHOLARS HOSTED/MENTORED***

<b>Sang-Guk Kang</b>	03/05 – 10/05	PhD student at Korea Advanced Institute of Science and Technology (KAIST)
<b>Julien Austruy</b>	04/05 – 10/05	student at Institute Superior Mecanique Paris (ISMEP)

***MEMBERSHIP ON GRADUATE DEGREE CANDIDATES' COMMITTEES***

<u>Student Name</u>	<u>Type of Degree</u>	<u>Student Name</u>	<u>Type of Degree</u>
Anna Howard	Ph.D.	Jonathan Keller	M.S.
Christian Brackbill	Ph.D.	Lynn Byers	M.S.
Matthew Floros	Ph.D.	Chad Hebert	M.S.
Patricia Stevens	Ph.D.	Louis Centolanza	M.S.
Jonathan Keller	Ph.D.	Christian Brackbill	M.S.
Jianhua Zhang	Ph.D.	Matthew Floros	M.S.
Hao Kang	Ph.D.	Jason Petrie	M.S.
David Heverley (ME)	Ph.D.	Jose Palacios	M.S.
Yanning Liu (ME)	Ph.D.	Chris Hennes	M.S.
Louis Centolanza	Ph.D.	Justin Shirey	M.S.
Deepak Ramrakhyani	Ph.D.		
Nilesh Sahani	Ph.D.		
Jun-Sik Kim	Ph.D.		
Hsuan Chen	Ph.D.		
Smita Bharati (ME)	Ph.D.		
Haiyu Zhao (ME)	Ph.D.		
Jose Palacios	Ph.D.		
Chris Hennes	Ph.D.		
Sreeni Narayan Nampy	Ph.D.		
Götz Bramesfeld	Ph.D.		



***RECORD OF TEACHING***

<u>Semester</u>	<u>Course No.</u>	<u>Sec.</u>	<u>Cr.</u>	<u>Title</u>	<u>Enroll-ment</u>	<u>Course Assistance</u>
Spr 96	302	1	3	Aerospace Structures II	39	½ TA
Spr 96	402B	2	2	Aircraft Design (V/STOL)	5	(with E. C. Smith)
Fall 96	504	1	3	Aerodynamics of V/STOL Aircraft	19	None
Spr 97	302	1	3	Aerospace Structures II	48	¼ TA + TI*
Spr 97	597F	1	3	Smart Structures**	12	None
Fall 97	407/504	1	3	Aerodynamics of V/STOL Aircraft	8/8	None
Fall 97	402A	2	2	Aircraft Design (V/STOL)	5	None
Spr 98	302	1	3	Aerospace Structures II	45	½ TA + TI*
Fall 98	407/504	1	3	Aerodynamics of V/STOL Aircraft	12/2	None
Spr 99	302	1	3	Aerospace Structures II	49	TI*
Spr 99	597F	1	3	Smart Structures	16	None
Spr 00	302	1	3	Aerospace Structures II	54	½ TA + TI*
Spr 00	497G/ME455	1	3	Classical and Modern Controls	8/15	½ TA
Fall 00	597F	1	3	Smart Structures	14	None
Spr 01	506	1	3	Helicopter Dynamics	10	None
Fall 01	497G/ ME455	1	3	Classical and Modern Control	3/20	½ TA
Spr 02	302	1	3	Aerospace Structures II	74	½ TA
Fall 02	----- on sabbatical leave of absence -----					
Spr 03	----- on sabbatical leave of absence -----					
Fall 03	597F	1	3	Smart Structures	12	None
Spr 04	302	1	3	Aerospace Structures II	83	½ TA
Fall 04	407/504	1	3	Aerodynamics of V/STOL Aircraft	7/2	None
Spr 05	302	1	3	Aerospace Structures II	85	½ TA + TI*
Spr 05	506	1	3	Helicopter Dynamics	7	None
Fall 05	597F	1	3	Smart Structures	10	None
Spr 06	302	1	3	Aerospace Structures II	90	½ TA

### ***RECORD OF TEACHING (CONTD.)***

Fall 06	301	1	3	Aerospace Structures	90	½ TA
Spr 07	506	1	3	Helicopter Dynamics	9	None
Fall 07	597F	1	3	Smart Structures	14	None
Fall 07	301	1	3	Aerospace Structures	95	(with G. Lesieutre) ½ TA

\* undergraduate teaching intern.

\*\* new course developed by candidate.

### ***DEPARTMENTAL SERVICE***

- Appointed by Department Head to assess the potential of Aerospace Engineering participation in teaching Engineering Mechanics service courses (EMCH 11, 12, 13). Spring-Summer 1996.
- Graduate Studies Committee, Fall 1996–Spring 1999, Fall 2004 onward.
- Structures Curriculum Committee, Fall 1996–Spring 2002, Fall 2003 onward.
- Tuition Surcharge Committee, 1997, 1998, 2000, 2001.
- Undergraduate Studies Committee, Fall 1998–Spring 2002, Fall 2003–Spring 2004.
- Strategic Planning Committee, Fall 1999–Spring 2002 (Chair, Fall 1999–Summer 2001).
- Aerospace Engineering Awards Committee, Member Fall 2000–Spring 2002, Chair 2005–2006.
- Promotion and Tenure Committee, 2001–02, 2003–04, 2004–onward.
- Faculty Search Committee, 2004–2006, Chair.
- Curriculum Reform – Structures and Dynamics subcommittees – Fall 2005 – Spring 2007.
- Co-op Advisor – Fall 2006 onward.

### ***COLLEGE SERVICE***

- Aerospace Representative to the College of Engineering Advising Center, Spring 1996 - Spring 1999, Fall 2007 onward.
- College of Engineering FTCAP<sup>¥</sup> advisor (Aerospace Representative), Summer 1996, 1997.
- Engineering Outreach Council Member, Fall 2003 onward.
- Sabbatical Leave Review Committee, Fall 2005 onward. Chair, Fall 2006.
- PSES Awards Committee Member, 2005-2006.
- Served on AD-14 Administrative Evaluation Committee of the Radiation Science and Engineering Center (Breazeale Nuclear Reactor), Fall 2006 – Spring 2007.

### ***UNIVERSITY SERVICE***

- Graduate Research Exhibition Judge, 1996, 1997, 1998, 2001, 2002, and 2004
- University Faculty Senate, 2006-2010

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<sup>¥</sup> FTCAP = First-Year Testing, Counseling and Advising Program

## ***PROFESSIONAL AFFILIATION***

American Helicopter Society, 1991 onward.

American Institute of Aeronautics and Astronautics, 1994 onward (Senior Member since 2002).

## ***PROFESSIONAL SERVICE***

American Helicopter Society, Aircraft Design Technical Committee, Member from 1996 onward.  
Secretary, 1997, Deputy Chairman, 1998 – 1999, Chairman, 1999 – 2003.

American Helicopter Society, Dynamics Technical Committee, Member from 2002 onward.  
Deputy Chairman, 2006 – onward.

American Institute of Aeronautics and Astronautics, Adaptive Structures Technical Committee,  
Member from April 2006 onward.

SPIE Smart Materials and Structures Conference – Damping and Isolation Program Committee,  
Fall 2004 onward.

SPIE Smart Materials and Structures Conference – Smart Structures Program Committee,  
Fall 2006 onward.

Session Co-Chair (Rotorcraft Session) at the 39th AIAA/ASME/ASCE/AHS/ASC Structures,  
Structural Dynamics and Materials Conference, Long Beach, California, April 1998.

Session Co-Chair (Adaptive Rotorcraft Structures I Session) at the 1999 Adaptive Structures  
Forum, St. Louis, Missouri, April 1999.

Session Co-Chair (Dynamics Session) at the 62<sup>nd</sup> Annual Forum of the American Helicopter Society,  
Phoenix, Arizona, May 2006.

Session Chair at the 2007 SPIE Conference on Smart Structures and Materials,  
San Diego, California, March 2007.

Session Chair at the 15<sup>th</sup> AIAA/ASME/AHS Adaptive Structures Conference,  
Honolulu, Hawaii, April 2007.

Session Chair at the AHS International/Korean Society for Aeronautical and Space Sciences  
International Forum on Rotorcraft Multidisciplinary Technology, Seoul, Korea, October 2007.

**2008 American Helicopter Society Annual Forum Deputy Technical Chair**

**American Helicopter Society Technical Council Member, May 2007 onward**

Organizing Committee, 4<sup>th</sup> ARO Workshop on Smart Structures, Penn State University, Aug. 1999.

**Guest Editor, *Smart Materials and Structures Journal*, Special Issue on Rotorcraft Applications.**  
February 2001.

**Associate Editor, *Journal of Intelligent Material Systems and Structures*, March 2004 onward.**

## **PROFESSIONAL SERVICE (PAPER/PROPOSAL REVIEW ACTIVITIES)**

Paper Reviewer for the following journals:

*Journal of the American Helicopter Society.*  
*AIAA Journal.*  
*Journal of Aircraft.*  
*Smart Materials and Structures.*  
*Journal of Intelligent Material Systems and Structures.*  
*Journal of Sound and Vibration.*  
*Aeronautical Engineering.*  
*Journal of Aerospace Engineering.*  
*ASME Journal of Vibration and Acoustics.*  
*ASME Journal of Dynamic Systems, Measurement, and Control.*  
*ASME Journal of Engineering Materials and Technology.*  
*ASME Journal of Mechanical Design.*

Proposal Reviewer for the following agencies:

US Army Research Office.                      National Science Foundation.

American Helicopter Society

2007 Evaluator of Lichten Award nominee papers and AHS Forum Gessow Award nominee papers

## **AWARDS AND HONORS**

- US Army Rotorcraft Fellowship (1993 – 1995).
- American Helicopter Society Vertical Flight Foundation Fellowship (1994).
- General Electric Foundation Scholarship (1994 – 1995).
- 2nd Place in the American Helicopter Society Student Design Competition, May 1996, Team of five students was supervised by the candidate (jointly with E. C. Smith).
- **US Army Research Office Young Investigator Award, June 1997.**
- **1998 American Helicopter Society Francois Xavier Bagnoud Award for Outstanding Contributions to Vertical Flight Technology by a society member under the age of 35.**
- 2nd Place in the American Helicopter Society Student Design Competition, May 1998, Team of five students was supervised by the candidate (jointly with E. C. Smith).
- Best paper in Aircraft Design at the American Helicopter Society Annual Forum in 2002.
- **2007 Popular Mechanics Breakthrough Award for a Centrifugal Force Actuated Variable Span Morphing Helicopter Rotor.**  
<http://www.popularmechanics.com/technology/industry/4224761.html?series=37>

## ***INVITED SPEAKER***

- |  |       |  |
|--|-------|--|
| - Boeing Helicopters                       | 02/96 | Rotor Stability Augmentation via Multi-Functional Semi-Active and Active-Passive Hybrid Systems                    |
| - NASA Langley Research Center             | 03/96 | Concepts for Low-Vibration, Low-Noise Rotors   |
| - McDonnell Douglas Helicopter Corporation | 10/96 | An Azimuthally Variable Speed Rotor  |
| - United Technologies Sikorsky Aircraft    | 12/96 | Use of Aeroelastic Couplings and Multi-Point Optimization to Design Damperless Aeromechanically Stable Helicopters |
| - United Technologies Research Center      | 12/96 | Active Aeromechanical Stability Augmentation using Fuselage State Feedback   |
| - Army Research Office                     | 10/98 | Novel Structural Damping Concepts and Materials  |
| - Paulstra, France                         | 10/99 | Semi-Active Rotor Vibration Reduction  |
| - Lord Corp., Erie, PA                     | 03/01 | Helicopter Vibration Reduction using Controllable Stiffness/Damping Devices at the Rotor Hub                       |
| - Bell Helicopters Textron                 | 07/01 | PSU Research on Tiltrotor Aircraft and Active Control for Stability Augmentation                                   |
| - Lord Corp., Cary, NC                     | 08/01 | Helicopter Vibration Reduction using Controllable Stiffness/Damping Devices at the Rotor Hub                       |
| - Quinetik/DERA Franborough, UK            | 10/02 | Helicopter Vibration and Noise Reduction, Adaptive Rotors  |
| - Eurocopter, Munich Germany               | 04/03 | Noise and Vibration Reduction of Helicopter Rotors   |
| - EADS, Munich Germany                     | 04/03 | Smart Structures Applications for Vibration Reduction and Morphing   |
| - DLR, Braunschweig Germany                | 04/03 | Analysis of Helicopter Blade-Vortex Interaction Noise with Flight Path or Attitude Modification                    |
| - ISMCM-CESTI, Paris, France               | 05/03 | Smart Materials and Structures: Some Applications and Results  |
| - CNAM, Paris, France                      | 05/03 | Optimal Design of a Smart Conformable Rotor Airfoil  |
| - ONERA, Paris, France                     | 06/03 | Reduction in Blade- Vortex Interaction (BVI) Noise due Individual Blade Control (IBC)                              |
| - ONERA, Paris, France                     | 06/03 | Smart Materials and Structures: Some Applications and Results  |
| - NextGen Aeronautics Torrance, California | 04/05 | A Variable Span Morphing Rotor   |

***INVITED SPEAKER, CONTD.***

- |  |       |   |
|--|-------|---|
| - Lord Corp, Erie, PA  | 04/05 | Rotor Lag Damping using a Radial Absorber and Coriolis Coupling                     |
| - Wkshp on Damping of SMAs, Metz, France                         | 05/05 | Maximizing Effectiveness of SMAs for Structural Damping Augmentation                |
| - Boeing Helicopters   | 07/05 | High-Speed Rotors, Segmented Rotors, and Morphing Rotors using Bi-Stable Mechanisms |
| - NASA Ames Res. Ctr.  | 08/05 | High-Speed Rotors, Segmented Rotors, and Morphing Rotors using Bi-Stable Mechanisms |
| - DARPA Wkshp on Symbiotic Structures, VA                        | 08/05 | Flexible Skins for Morphing Aircraft using Honeycomb Cores                          |
| - Barry Controls Aerospace Boston, MA                            | 02/07 | Rotorcraft Dynamics Research  |
| - Army Research Labs Langley, VA                                 | 05/07 | Rotorcraft Dynamics Research  |
| - Air Force Research Labs Wright-Patt Air Force Base, Dayton, OH | 05/07 | Cellular Materials – A World of Possibilities                                       |
| - Cornerstone Research Group, Dayton, Ohio                       | 05/07 | Research on Morphing Aircraft and Rotorcraft  |
| - Konkuk University, Seoul Korea                                 | 10/07 | Research in Helicopter Aerodynamics   |
| - Seoul National University, Seoul, Korea                        | 10/07 | Flexible Skins for Morphing Aircraft  |