

## MICHAEL B. BRAGG

Executive Associate Dean for Academic Affairs  
Interim Dean Designate  
College of Engineering Professor  
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### EDUCATION

Ph.D., Aeronautical and Astronautical Engineering, The Ohio State University, 1981.  
M.S., Aeronautical and Astronautical Engineering, University of Illinois at Urbana-Champaign, 1977.  
B.S., highest honors, Aeronautical and Astronautical Engineering, University of Illinois at Urbana-Champaign, 1976.

### EMPLOYMENT

Interim Dean Designate, College of Engineering, University of Illinois at Urbana-Champaign, August 16, 2012 -  
Executive Associate Dean for Academic Affairs, College of Engineering, University of Illinois at Urbana-Champaign, 2008-present  
Associate Dean for Research and Administrative Affairs, College of Engineering, University of Illinois at Urbana-Champaign, 2006-2008  
Head, Department of Aerospace Engineering, University of Illinois at Urbana-Champaign, 1999-2006  
Professor, Department of Aerospace Engineering, University of Illinois at Urbana-Champaign, 1995-present  
Associate Professor and Professor, Department of Mechanical and Industrial Engineering, University of Illinois at Urbana-Champaign (0%), 1994-1999  
Associate Professor, Department of Aeronautical and Astronautical Engineering, University of Illinois at Urbana-Champaign, 1990-1995  
Associate Professor, Department of Aeronautical and Astronautical Engineering, The Ohio State University, 1987-1989.  
Assistant Professor, Department of Aeronautical and Astronautical Engineering, The Ohio State University, 1981-1987.  
Graduate Research Associate, The Ohio State University, 1978-1981  
Research Associate, University of Illinois at Urbana-Champaign, (based at NASA Langley Research Center), 1977-1978  
Graduate Research Assistant, University of Illinois at Urbana-Champaign, 1976-1977

### PRESTIGIOUS AWARDS

Vice President-Publications, American Institute of Aeronautics and Astronautics, 2009-2012  
NASA Tech Brief Initial Award, 2011  
General Chair, AIAA Aerospace Science Meeting, 2007  
American Institute of Aeronautics and Astronautics Aerodynamics Award, 2007  
Fellow, American Institute of Aeronautics and Astronautics, 2004  
Stanley H. Pierce Award, University of Illinois, 2004  
College of Engineering Advisors List, 2003  
NASA TGIR award "Revolutionize Aviation" to Aircraft Alliance Project Team, 2002  
NASA TGIR award "Revolutionize Aviation" to AGATE Icing Research Team, 2001  
American Institute of Aeronautics and Astronautics Losey Atmospheric Science Award, 1998  
University Critical Research Initiatives Award for the Aircraft Icing Research Center, 1997 and for the Center for Distributed Air Traffic Management, 2006  
University of Illinois at Urbana-Champaign, List of Teachers Ranked as Excellent: 1993, 1994, 1995, 2001, 2004, 2005, 2011  
Associate Fellow, American Institute of Aeronautics and Astronautics, 1991.  
Aeronautical and Astronautical Engineering Teacher of the Year, 1990

1988 Outstanding Recent Alumnus Award, Dept. of Aeronautical and Astronautical Engineering, University of Illinois at Urbana-Champaign  
The Ohio State University College of Engineering Research Award, 1986

**RESEARCH AND TEACHING**

Professor Bragg teaches aerodynamics and flight mechanics at the undergraduate and graduate level. He has received department, college and university-level recognition for his teaching and advising. Currently he advises 6 graduate students. Over 50 graduate students have received their advanced degrees under Dr. Bragg's guidance as well as 5 post doctoral researchers. Dr. Bragg's primary area of research is aircraft icing where he is an international expert on the effect of ice accretion of aircraft aerodynamics and flight safety. He has directed over \$15 million in externally funded research with the majority since joining Illinois in 1990. This includes his leadership of the NASA/FAA/ONERA/Illinois, US/France international collaboration on airfoil and wing icing aerodynamics. Recently he has become active in research supported by industry related to engine installation aerodynamics and flight control. Much of his research is conducted in the wind tunnels of the Subsonic Aerodynamics Laboratory which Dr. Bragg has built at Illinois and currently directs. Dr. Bragg has won the national AIAA Losey Atmospheric Science award and AIAA Aerodynamics Award for his icing research, is an AIAA Fellow and a past Vice President of AIAA, and serves as a consultant to numerous companies and organizations. He is a past chair of the SAE Aircraft Icing Technology Committee, the AIAA Applied Aerodynamics Committee, the AIAA Aerospace Department Chairpersons Association. Prof. Bragg recently served on the FAA Research and Development Advisory Committee, REDAC, that advises the FAA Administrator, and currently serves on the NASA Advisory Aeronautics Committee which advises the NASA Administrator on aeronautics research and development policy for the agency.

**ADMINISTRATION**

In 2006 Prof. Bragg became the Associate Dean for Research and Administration in the College of Engineering at Illinois. In this role he was responsible for the administration of all personnel and financial matters in the college, all physical facilities, administration of the research program and the graduate programs in the college. In 2008 he was promoted to Executive Associate Dean for Academic Affairs of the College of Engineering. In this current position Prof. Bragg is responsible for all faculty and academic personnel and the strategic management of the over \$300 million budget of the college. On August 16, 2012 he will assume the role as interim dean of the College of engineering at Illinois. He also is very active in international and diversity activities of the college and represents the college in many roles on and off campus. Prof. Bragg just concluded a complete redesign of the research overhead distribution system in the college and is now leading a similar effort for the campus. He has been instrumental in curriculum innovation in the college including supervision of the Technology Entrepreneurial Center. Before moving to college administration, he served as Head of the Department of Aerospace Engineering at Illinois from 1999 to 2006. In this role as the leader of this top-ten ranked department, he had responsibility for 21 faculty, 9 full-time staff, 350 undergraduates and 100 graduate students and post docs. During his tenure undergraduate, graduate, and faculty size increased as did the diversity of these groups. This includes several new faculty, increasing the graduate program by 30 percent, and more than doubling the percentage of women in graduate school and on the faculty. In the last four years of his term through emphasizing interdisciplinary team-based research, the research program in the department grew in funding by over 50 percent. During Prof. Bragg's tenure alumni giving and involvement grew significantly as did interaction with the aerospace industry. Several department laboratories were built or upgraded and a new Aerodynamics Laboratory Building opened on campus in spring 2004.

**CONSULTING ACTIVITIES**

Rolling Hills Research Corporation, El Segundo, CA  
CU Aerospace, Champaign, IL  
Morrison & Forester LLP, San Diego, CA

Aerosafe Inc., Dublin, OH.  
Aero Systems Engineering Inc., St.Paul, MN  
Cirrus Aircraft Company, Duluth, WI  
CFD Research Co., Huntsville, AL  
Transport Canada, Ottawa, Canada  
Cox and Co., New York, NY

## **PATENTS**

“Aircraft Surface Contamination Sensing System Using Control Surface Hinge Moment Measurements,” M.B. Bragg and H. M. Gurbacki, patent # 6,140,942, October 31, 2000.

“Detector Function and System for Predicting Airfoil Stall from Hinge Moment Measurements,” Kerho, M.F., Ansell, P, and Bragg, M.B., patent pending.

## **JOURNAL PUBLICATIONS**

Ansell, P., Kerho, M., and Bragg, M.B., "Stall Warning Using Flap Hinge Moment Measurements," *Journal of Aircraft*, Vol.48, No.5, 2011, pp. 1822-1824.

Broeren, A., Whalen, E., Busch, G., and Bragg, M.B., “Aerodynamics Simulation of Runback Ice Accretion,” *Journal of Aircraft* , Vol. 47, No.3, 2010, pp. 924-939.

Broeren, A.P., Bragg, M.B., Addy, H.E., Lee, S., Moens, F., and Guffond, D., “Effect of High Fidelity Ice-Accretion Simulations on Full-Scale Airfoil Performance,” *Journal of Aircraft*, Vol. 47, No. 1, 2010, pp. 240-254.

Broeren, A.P., Busch, G.T., and Bragg, M.B., “Aerodynamic Fidelity of Ice Accretion Aerodynamic Simulation on a Subscale Model,” *SAE 2007 Transactions: Journal of Aerospace*, Vol. 116, Aug. 2008, pp. 560-575.

Busch, G.T. , Broeren, A.P., and Bragg, M.B., “Aerodynamic Simulation of a Horn-Ice Accretion on a Subscale Model,” *Journal of Aircraft*, Vol. 45, No. 2, 2008, pp. 604-613.

Whalen, E.A, Broeren, A.P., and Bragg, M.B., “Aerodynamics of Scaled Runback Ice Accretions,” *Journal of Aircraft*, Vol.45 No.3, 2008, pp. 1076-1088.

Campbell, S., Broeren, A.P., and Bragg, M.B., “Sensitivity of Aircraft Performance to Icing Parameter Variations,” *Journal of Aircraft*, Vol.44, No.5, 2007, pp. 1758-1760.

Broeren, A.P., Bragg, M.B., and Addy, H., “Flowfield Measurements About an Airfoil with Leading-Edge Ice Shapes,” *Journal of Aircraft*, Vol.43, No.4, 2006, pp. 1226-1234.

Bragg, M.B., Broeren, A.P., Blumenthal, L., “Iced-Airfoil Aerodynamics,” *Progress in Aerospace Sciences*, 41 (2005) p. 323 – 362.

Whalen, E. and Bragg, M.B., "Aircraft Characterization in Icing Using Flight Test Data," *Journal of Aircraft*, Vol. 42, No. 3, 2005, pp 792-794.

Broeren, A.P. and Bragg, M.B., “Effect of Airfoil Geometry on Performance with Simulated Intercycle Ice Accretions,” *Journal of Aircraft*, Vol.42, No.1, 2005, pp. 121-130.

Broeren, A.P., Bragg, M.B., and Addy, H.E. Jr., "Effect of Intercycle Ice Accretions on Airfoil Performance," *Journal of Aircraft*, Vol. 41, No. 1, 2004, pp. 165-174.

Lee, S. and Bragg, M.B., "Investigation of Factors That Effect Iced-Airfoil Performance," *Journal of Aircraft*, Vol. 40, No. 3, 2003, pp. 499-508.

Gurbacki, H.M., Bragg, M.B., "Sensing Aircraft Icing Effects by Unsteady Flap Hinge-Moment Measurement," *Journal of Aircraft*, Vol. 38, No. 3, 2001, pp. 575-577.

Broeren, A.P., and Bragg, M.B., "Spanwise Variation in the Unsteady Stalling Flowfields of Two-dimensional Airfoil Models," *AIAA Journal*, Vol. 39, No. 9, 2001, pp. 1641-1651.

Dunn, T.A., Loth, E. and Bragg, M.B., "A Computational Investigation of Simulated Large-Droplet Ice Shapes on Airfoil Aerodynamics," *Journal of Aircraft*, Vol. 36, No. 5, 1999, pp. 836-843.

Lee, S. and Bragg, M.B., "Experimental Investigation of Simulated Large-Droplet Ice Shapes on Airfoil Aerodynamics," *Journal of Aircraft*, Vol. 36, No. 5, 1999, pp. 844-850.

Saeed, F., Selig, M.S., Bragg, M.B. and Addy, H.E., "Hybrid Airfoil Design Procedure Validation for Full-Scale Ice Accretion Simulation," *Journal of Aircraft*, Vol. 36, No. 5, 1999, pp. 769-776.

Broeren, A.P. and Bragg, M.B., "Flowfield Measurements Over an Airfoil During Low-frequency Oscillations Near Stall," *AIAA Journal*, Vol. 37, No. 1, 1999, pp. 130-132.

Henze, C.M. and Bragg, M.B., "Turbulence Intensity Measurement Technique for use in a Icing Wind Tunnel," *Journal of Aircraft*, No. 3, 1999, pp. 577-583.

Saed, F., Selig, M.S. and Bragg, M.B., "Hybrid Airfoil Design Method to Simulate Full-Scale Ice Accretion Throughout a Given  $\alpha$  Range," *Journal of Aircraft*, Vol. 35, No. 2, 1998, pp. 233-239.

Jasinski, B.J., Noe, S.C., Selig, M.S. and Bragg, M.B., "Wind Turbine Performance Under Icing Conditions," *Transactions of the ASME, Journal of Solar Energy Engineering*, Vol. 120, Feb., 1998, pp. 60 – 65.

Saed, F., Selig, M.S. and Bragg, M.B., "Design of Subscale Airfoils with Full-Scale Leading Edges for Ice Accretion Testing," *Journal of Aircraft*, Vol. 34, No. 1, 1997, pp. 94-100.

Kerho, M.F. and Bragg, M.B., "Airfoil Boundary-Layer Development and Transition with Large Leading-Edge Roughness," *AIAA Journal*, Vol. 35, No. 1, 1997, pp. 75 - 84.

Cummings, M.J. and Bragg, M.B., "Boundary-Layer Transition Due to Isolated 3-D Roughness on an Airfoil Leading Edge," *AIAA Journal*, Vol. 34, No. 9, 1996, pp. 1949 - 1952.

Bragg, M.B., Heinrich, D.C., Balow, F.A., and Zaman, K.B.M.Q., "Flow Oscillation over an Airfoil Near Stall," *AIAA Journal*, Vol. 34, No. 1, 1996, pp. 199-201.

Bragg, M. B. and Khodadoust, A., "A Study of the Spray Characteristics of a Subsonic Wind Tunnel," *Journal of Aircraft*, Vol. 32, No. 1, 1995, pp. 199-204.

Khodadoust, A. and Bragg, M. B., "Aerodynamics of a Finite Wing with Simulated Ice," *Journal of Aircraft*, Vol. 32, No. 1, 1995, pp. 137-144.

- Bragg, M. B., Heinrich, D. C., Valarezo, W. O. and McGhee, R. J., "Effect of Underwing Frost on a Transport Aircraft Airfoil at Flight Reynolds Number," *Journal of Aircraft*, Vol. 31, No. 6, 1994, pp. 1372-1379.
- Kerho, M.F. and Bragg, M.B., "Neutrally Buoyant Bubbles Used as Flow Tracers in Air," *Experiments in Fluids*, Vol. 16, 1994, pp. 393-400.
- Bragg, M.B. and Wells, S.L., "Effect of Wind Tunnel Walls on Airfoil Droplet Impingement," *Journal of Aircraft*, Vol. 31, No. 1, Jan.-Feb., 1993, pp. 175-180.
- Bragg, M.B., Heinrich, D.C. and Khodadoust, A., "A Low-Frequency Flow Oscillation Over Airfoils Near Stall," *AIAA Journal*, Vol. 31, No. 7, July 1993, pp. 1341-1343.
- Soltani, M.R. and Bragg, M.B., "Early Vortex Burst on Delta Wings in Pitch," *AIAA Journal*, Vol. 31, No. 12, Dec. 1993, pp. 2283-2289.
- Bragg, M. B. and Mohler, S. H., Jr., "Predicting Droplet Impingement on Yawed Wings," *Journal of Aircraft*, Vol. 29, No. 5, Sept. - Oct. 1992, pp. 964 - 966.
- Bragg, M.B., Khodadoust, A. and Spring, S.A., "Experimental Measurements in a Large Leading-Edge Separation Bubble Due to a Simulated Airfoil Ice Accretion," *AIAA Journal*, Vol. 30, No. 6, June 1992, pp. 1462-1467.
- Bragg, M.B. and Soltani, M.R., "Measured Forces and Moments on a Delta Wing During Pitch-Up," *Journal of Aircraft*, Vol. 27, No. 3, 1990, pp. 262-267.
- Soltani, M.R., Bragg, M.B. and Brandon, J.M., "Force and Moment Measurements on an Oscillating 70-degree Delta Wing in Subsonic Flow," *Journal of Aircraft*, Vol. 27, No. 3, 1990, pp. 211-217.
- Bragg, M.B., "Experimental Aerodynamic Characteristics of an NACA 0012 Airfoil With Simulated Ice," *Journal of Aircraft*, Vol. 25, No. 9, 1988, pp. 849-854.
- Coirier, W.J. and Bragg, M.B., "A Computational Method for Screened Two-Dimensional Wind Tunnel Inlets," *Journal of Aircraft*, Vol. 24, No. 4, 1987, pp. 281-283.
- Bragg, M.B. and Gregorek, G.M., "Experimental Airfoil Performance with Vortex Generators," *Journal of Aircraft*, Vol. 24, No. 5, 1987, pp. 305-309.
- Bragg, M.B., "A Computer Simulation of the Dispersal of Aerial Sprays," *TRANSACTIONS of the American Society of Agricultural Engineers*, Vol. 29, No. 1, 1986, pp. 10-15.
- Bragg, M.B., Gregorek, G.M. and Lee, J.D., "Airfoil Aerodynamics in Icing Conditions," *Journal of Aircraft*, Vol. 23, No. 1, January 1986, pp. 76-81.
- Bragg, M.B., "Predicting Rime Ice Accretion on Airfoils," *AIAA Journal*, Vol. 22, No. 3, March 1985, pp. 381-387.
- Bragg, M.B., "The Effect of Geometry on Airfoil Icing Characteristics," *Journal of Aircraft*, Vol. 21, No. 7, July 1984, pp. 505-511.
- Bragg, M.B., "A Similarity Analysis of the Droplet Trajectory Equation," *AIAA Journal*, Vol. 20, No. 12, December 1982, pp. 1681-1686.

Ormsbee, A.I., Bragg, M.B., Maughmer, M.D., and Jordan, F.L., "Scaling Wake Particle Interactions for Aerial Applications Research," *Journal of Aircraft*, Vol. 18, No. 7, July 1981, pp. 592-596.

**CONFERENCE  
PROCEEDINGS  
(and edited publications)**

Bragg, M.B., Broeren, A.P. and Blumenthal, L.A., "Iced-Airfoil and Wing Aerodynamics," Proceedings of the FAA In-flight/ground De-icing International Conference, June 16-20, 2003

Bragg, M.B., Basar, T., Perkins, W.R., Selig, M.S., Voulgaris, P.G., Melody, J.W., and Sarter, N.B., "Smart Icing Systems for Aircraft Icing Safety," Proceedings of the FAA In-flight/ground De-icing International Conference, June 16-20, 2003.

Merret, J. and Bragg, M.B., "X- 38 Aerodynamics During Rapid Pitch up," AIAA Paper No. 2003-3526, Proceedings of the 21<sup>st</sup> AIAA Applied Aerodynamics Conference, June 2003.

Lu, B. and Bragg, M.B., "Experimental Investigation of Wake-Survey Method for a Bluff Body With a Highly Turbulent Wake," Paper No. 2002-3060, Proceeding of the 20th AIAA Applied Aerodynamics Conference, St. Louis, June 24-26, 2002.

Lu, B. and Bragg, M.B., "Experimental Investigation of Airfoil Drag Measurement With Simulated Leading-Edge Ice Using the Wake Survey Method," Paper No. 2000-3919, Proceeding of the 18th AIAA Applied Aerodynamics Conference, Denver, August 14-17, 2000, pp. 12-21.

Kim, H.S. and Bragg, M.B. "Effects of Leading-Edge Ice Accretion geometry on Airfoil Aerodynamics," Paper No. 99-3150, Proceeding of the 17th AIAA Applied Aerodynamics Meeting, Norfolk, June 28 – July 1, 1999, pp. 379 - 391.

Bragg, M.B. and Gurbachi, H., "Sensing Aircraft Icing Effects by Flap Hinge Moment Measurement," Paper No. 99-3149, Proceeding of the 17th AIAA Applied Aerodynamics Meeting, Norfolk, June 28 – July 1, 1999, pp. 368-378.

Broeren, A.P. and Bragg, M.B., "Low-frequency Flowfield Unsteadiness During Airfoil Stall and the Influence of Stall Type", Paper No. 98-2517-CP, Proceeding of the 16th AIAA Applied Aerodynamics Meeting, Albuquerque, June 15-18, 1998.

Bragg, M.B., "Aircraft Icing," McGraw-Hill 1999 Yearbook of Science & Technology, McGraw-Hill, 1999, pp. 183 – 185.

Broeren, A.P. and Bragg, M.B., "Low-frequency Flowfield Unsteadiness During Airfoil Stall and the Influence of Stall Type", paper No. 98-2517-CP, Proceeding of the 16th AIAA Applied Aerodynamics Meeting, Albuquerque, June 15-18, 1998.

Mange, R.L. and Bragg, M.B., "Unsteady Aerodynamics of a Chined Forebody Undergoing Forced Pitch Oscillations," Paper No. 97-2211-CP, Proceeding of the 15th AIAA Applied Aerodynamics Meeting, Atlanta, June 23-25, 1997, pp. 41-55

Bragg, M.B., "Aerodynamics of Supercooled-Large-Droplet Ice Accretions and the Effect on Aircraft Control," Proceedings of the FAA International Conference on Aircraft Inflight Icing, Springfield, VA, Report No. DOT/FAA/AR-96/81,II, Vol. 2, Aug. 1996, pp. 387-400.

Broeren, A.P. and Bragg, M.B., "Phase-Averaged Flowfield Measurements About an Airfoil in Unsteady Stall," Paper No. 96-2494-CP, Proceeding of the 14th AIAA Applied Aerodynamics Meeting, New Orleans, June 17-20, 1996, pp. 921 - 931.

Bragg, M.B., Cebrzynski, M., Reichhold, J., Sweet, D. and Shick, R., "An Experimental Method for Water Droplet Impingement Measurement," Proceedings of the AHS/SAE International Icing Symposium, Montreal, Canada, Sept. 18-21, 1995, pp. 279-291.

Mange, R.L. and Bragg, M.B., "Aerodynamics of a Chinned Forebody Oscillating in Pitch," Paper No. 95-1869-CP, Proceeding of the 13th AIAA Applied Aerodynamics Meeting, San Diego, June 19-22, 1995, pp. 867-877.

Kerho, M.F. and Bragg, M.B., "Effect of Large Leading-Edge Roughness on Airfoil Boundary Layer Development," Paper No. 95-1803-CP, Proceedings of the 13th AIAA Applied Aerodynamics Meeting, San Diego, June 19-22, 1995, pp. 322-334.

Bragg, M.B., Heinrich, D.C. and Zaman, K.B.M.Q., "Flow Oscillation over Airfoils Near Stall," Proceedings of the 19th Congress of the International Council of the Aeronautical Sciences, Anaheim, California, USA, Sept. 1994, Vol. 2, pp. 1639-1648.

Bragg, M.B., "Effect of Ice Accretion on Airfoil and Wing Aerodynamics," Proceedings of The First Bomardier International Workshop, Montreal, Canada, September 20-21, 1993, pp 163-185.

Bragg, M.B., Khodadoust, A. and Kerho, M.F., "Flowfield Measurements on a Finite Wing with a Simulated Ice Accretion," Proceedings of the NASA Industry Workshop on Aircraft Icing, Cleveland, OH, July 27-29, 1993, pp. 21-1 to 21-21.

Bragg, M.B., "Effect of Ice Roughness on Aerodynamics," Proceedings of the SAE/AHS Aircraft Icing Technology Workshop, Cleveland, OH, Sept. 21-22, 1992, pp. 1-26.

Khodadoust, A. and Bragg, M.B., "LDV Measurements on a Rectangular Wing With a Simulated Glaze Ice Accretion," Paper No. AIAA-92-2690, Proceedings of the AIAA 10th Applied Aerodynamics Conference, Palo Alto, CA, June 22-24, 1992, pp. 672-687.

Bragg, M.B., Khodadoust, A. and Kerho, M., "Aerodynamics of a Finite Wing With Simulated Ice," Proceedings of the 5th Symposium on Numerical and Physical Aspects of Aerodynamic Flows, California State University at Long Beach, CA, January 1992 .

Bragg, M.B., Khodadoust, A., Soltani, M.R., Wells, S.L. and Kerho, M.F., "Aerodynamic Measurements on a Finite Wing With Simulated Ice," Paper No. AIAA-91-3217, Proceedings of the AIAA 9th Applied Aerodynamics Conference, Baltimore, Maryland, Sept. 23-25, 1991, pp. 123-132.

Potapczuk, M.G., Bragg, M.B., Kwon, O.J. and Sankar, L.N., "Simulation of Iced Wing Aerodynamics," AGARD Fluid Dynamics Panel Specialist Meeting on Effects of Adverse Weather on Aerodynamics, Toulouse, France, AGARD CP 496, April, 1991, pp. 7-1 to 7-15, also NASA TM 104362.

Bragg, M.B., "The Effect of Structural Ice on Aircraft Component Aerodynamics," Paper 88-A5.1, Proceedings of the Fourth International Conference on Atmospheric Icing of Structures, Paris, France, Sept. 5-7, 1988, pp. 134-138.

Soltani, M., Bragg, M.B. and Brandon, J.M., "Experimental Measurements on an Oscillating 70-Degree Delta Wing in Subsonic Flow," AIAA Paper No. 88-2577-CP, Proceedings of the AIAA 6th Applied Aerodynamics Conference, Williamsburg, VA, June 1988, pp. 414-427.

Bragg, M.B., "The Effect of Ice on Aircraft Aerodynamics" and "Numerical Prediction of Icing Effects on Aircraft," two chapters of an FAA publication, Aircraft Icing Handbook, DOT/FAA/CT-88/8-1, 1988.

Gregorek, G.M. and Bragg, M.B., "General Aviation Highlights, 1986," *Aerospace America*, December 1986.

Bragg, M.B. and Gregorek, G.M., "An Experimental Study of a High Performance Canard Airfoil with Boundary Layer Trip and Vortex Generators," AIAA Paper No. 86-0781-CP, The 14th Aerodynamic Testing Conference Publication, March 1986.

Bragg, M.B., Gregorek, G.M. and Lee, J.D., "Experimental and Analytical Investigations Into Airfoil Icing," Proceedings of the 14th Congress of the International Council of the Aeronautical Sciences, Toulouse, France, Sept. 1984, pp. 1127-1138.

## CONFERENCE PAPERS

Blois, G., Christensen, K., Best, J., Elliott, G., Austin, J., Garcia, M., Bragg, M.B., Dutton, C., and Fouke, B., "A Versatile Regractive-Index-matched Flow facility for Studies of Complex Flow Systems Across Scientific Disciplines," AIAA-2012-736, 50th AIAA Aerospace Sciences Meeting, Nashville, Tennessee, Jan. 9-12, 2012

Hortensius, R., Elliott, G., and Bragg, M.B., "An experimental Investigation of the Flow Through the Aft Portion of a High-Flow Nacelle Bypass Concept," AIAA-2012-872, 50th AIAA Aerospace Sciences Meeting, Nashville, Tennessee, Jan. 9-12, 2012.

Bottalla, J., Bragg, M.B., Sheahan, J.J., and Winkler, C.M., "Performance of an Airfoil with a Power-saving, Tab-assisted Flap System," AIAA-2011-3810, AIAA Applied Aerodynamics Meeting, Honolulu, Hawaii, June 27-30, 2011.

Ansell, P., Bragg, M.B., and Kerho, M., "Envelope Protection System Using Flap Hinge Moment Measurements," AIAA-2010-4225, 28th AIAA Applied Aerodynamics Conference, Chicago, Illinois, June 28-1, 2010.

Busch, G. and Bragg, M.B., "Computational Prediction of Propeller Performance in Icing Conditions," AIAA-2010-7983, 2nd AIAA Atmospheric and Space Environments Conference, Toronto, Canada, Aug. 2-5, 2010.

Campbell S., Neogi, N., and Bragg, M.B., "An Operational Strategy for Persistent Contrail Mitigation," AIAA-2009-6983, 9th AIAA Aviation Technology, Integration, and Operations Conference (ATIO) and Aircraft Noise and Emissions Reduction Symposium (ANERS) , Hilton Head, South Carolina, Sep. 21-23, 2009

Chiles, I., Loth, E., Bragg, M.B., Yeong, Y.H., and Elliot, G., "Computations of Engine Bypass in a Wind Tunnel Configuration," AIAA-2009-4208, 39th AIAA Fluid Dynamics Conference, San Antonio, Texas, June 22-25, 2009

Yeong, Y.H., Chiles, I., Bragg, M.B., Elliott, G., Loth, E., and Connors, T., "Wind Tunnel Testing of a Nacelle Bypass Concept for a Quiet Supersonic Aircraft," AIAA-2009-4207, 39th AIAA Fluid Dynamics Conference, San Antonio, Texas, June 22-25, 2009

Busch, G. and Bragg, M.B., "Experimental Study of Full-Scale Iced Airfoil Aerodynamic Performance Using Sub-Scale Simulations," AIAA-2009-4264, 1st AIAA Atmospheric and Space Environments Conference, San Antonio, Texas, June 22-25, 2009

Broeren, A.P., Whalen, E., Busch, G., and Bragg, M.B., "Aerodynamic Simulation of Runback Ice Accretion," AIAA-2009-4261, 1st AIAA Atmospheric and Space Environments Conference, San Antonio, Texas, June 22-25, 2009

Busch, G., Bragg, M.B., and Broeren, A.P., "Prediction of Propeller Performance in Icing Conditions Using Vortex Theory," AIAA -2009-4259, 1st AIAA Atmospheric and Space Environments Conference, San Antonio, Texas, June 22-25, 2009

Campbell, S., Neogi, N., and Bragg, M.B., "An Optimal Strategy for Persistent Contrail Avoidance," AIAA-2008-6515, AIAA Guidance, Navigation and Control Conference and Exhibit, Honolulu, Hawaii, Aug. 18-21, 2008

Busch, G., Broeren, A.P., and Bragg, M.B., "Aerodynamic Fidelity of Sub-scale Two-Dimensional Ice Accretion Simulations," AIAA-2008-7062, 26th AIAA Applied Aerodynamics Conference, Honolulu, Hawaii, Aug. 18-21, 2008

Broeren, A.P., Bragg, M.B., Addy, H., Lee, S., Moens, F., and Guffond, D., "Effect of High-Fidelity Ice Accretion Simulations on the Performance of a Full-Scale Airfoil Model," AIAA Paper No. 2008-434, Reno, Nevada, Jan. 7-10, 2008

Broeren, A.P., Busch, G., and Bragg, M.B., "Aerodynamic Fidelity of Ice Accretion Simulation on a Subscale Model," SAE paper No. 2007-01-3285, Aircraft Ground Operations and Deicing Conference, Seville, Spain, September 24-27, 2007.

Jacobs, J.J., and Bragg, M.B., "Two- and Three-Dimensional Iced Airfoil Separation Bubble Measurements by Particle Image Velocimetry," AIAA Paper No. 2007-88, Reno, Nevada, Jan. 8-11, 2007

Campbell, S., Broeren, A.P., Bragg, M.B., and Miller, D., "Aircraft Performance Sensitivity to Icing Conditions," AIAA Paper No. 2007-86, Reno, Nevada, Jan. 8-11, 2007.

Bragg, M.B., Broeren, A.P., Addy, H., Potapczuk, M., Guffond, D., and Montreuil, E., "Airfoil Ice-Accretion Aerodynamic Simulation," AIAA Paper No. 2007-85, Reno, Nevada, Jan. 8-11, 2007.

Busch, G., Broeren, A.P., and Bragg, M.B., "Aerodynamic Simulation of a Horn-Ice Accretion on a Subscale Model," AIAA Paper No. 2007-87, Reno, Nevada, Jan. 8-11, 2007.

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Whalen, E.A., Melody, J.W., Bragg, M.B., and Basar, T., "Aircraft Characterization in Icing Using Flight Data," AIAA Paper No. 2004-0773, Reno, NV, January 5-8, 2004.

Gurbacki, H.M. and Bragg, M.B., "Unsteady Flowfield About an Iced Airfoil," AIAA Paper No. 2004-0562, Reno, NV, January 5-8, 2004.

Pan, J., Loth, E., and Bragg, M.B., "'Simulations of Airfoils with Ice-Shapes," AIAA Paper No. 2003-0729, Reno, NV, January 6-9, 2003.

Hossain, K.N., Sharma, V., Bragg, M.B., and Voulgaris, P.G., "Envelope Protection and Control Adaptation in Icing Encounters," AIAA Paper No. 2003-0025, Reno, NV, January 6-9, 2003.

Broeren, A.P. and Bragg, M.B., "Effect of Airfoil Geometry on Performance with Simulated Intercycle Ice Accretions," AIAA Paper No. 2003-0728, Reno, NV, January 6-9, 2003.

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Holly M. Gurbacki, H.M., Bragg, M.B., "Unsteady Aerodynamic Measurements on an Iced Airfoil," AIAA Paper No. 2002-0241, Reno, NV, January 14-17, 2002.

Merret, J., Hossain, K.N. and Bragg, M.B., "Envelope Protection and Atmospheric Disturbances in Icing Encounters," AIAA Paper No. 2002-0814, Reno, NV, January 14-17, 2002.

Bragg, M.B., Basar, T., Perkins, W.R., Selig, M.S., Voulgaris P.G., Melody, J.W. Sarter, N.B., "Smart Icing Systems for Aircraft Icing Safety," AIAA Paper No. 2002-0813, Reno, NV, January 14-17, 2002.

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Melody, J.W, Pokhariyal, D, Merret, J., Baser, T., Perkins, W.R. and Bragg, M.B., "Sensor Integration for Inflight Icing Characterization Using Neural Networks," AIAA Paper No. 2001-0542, Reno, NV, Jan. 8-11, 2001.

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- Lee, S., Kim, H. and Bragg, M.B., "Investigation of Factors that Influence Iced-Airfoil Aerodynamics," AIAA Paper No. 2000-0099, Reno, NV, Jan. 10-14, 2000.
- Bragg, M., Hutchison, T., Merret, J., Oltman, R., and Pokhariyal, D., "Effect of Ice Accretion on Aircraft Flight Dynamics," AIAA Paper No. 2000-0360, Reno, NV, Jan. 10-14, 2000.
- Jackson, D. and Bragg, M.B., "Aerodynamic Performance of an NLF Airfoil With Simulated Ice," AIAA Paper No. 99-0373, Reno, NV, January 11-14, 1999.
- Lee, S. and Bragg, M.B., "Effects of Simulated-Spanwise Ice Shapes on Airfoils: Experimental Investigation," AIAA Paper No. 99-0092, Reno, NV, January 11-14, 1999.
- Bragg, M.B., Perkins, W.R., Sarter N.B., Basar, T., Voulgaris, P.G., Gurbacki, H.M., Melody, J.W. and McCray, S.A., "An Interdisciplinary Approach to Inflight Aircraft Icing Safety," AIAA Paper No. 98-0095, Reno, NV, January 12-15, 1998.
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- Lee, S., Dunn, T., Gurbacki, H.M., Bragg, M.B. and Loth, E., "An Experimental and Computational Investigation of Spanwise-Step-Ice Shapes On Airfoil Aerodynamics" AIAA Paper No. 98-0490, Reno, NV, January 12-15, 1998
- Farag, K.A. and Bragg, M.B., "Three Dimensional Droplet Trajectory Code for Propellers of Arbitrary Geometry," AIAA Paper No. 98-0197, Reno, NV, January 12-15, 1998
- Jasinski, B.J., Selig, M.S. and Bragg, M.B., "Wind Turbine Performance Under Icing Conditions," AIAA Paper No. 97-0977, Reno, NV, January 6-9, 1997.
- Reichhold, J.D. and Bragg, M.B., "Experimental Determination of the Droplet Impingement Characteristics of a Propeller," AIAA Paper No. 97-0179, Reno, NV, January 6-9, 1997.
- Saeed, F., Selig, M.S. and Bragg, M.B., "A Hybrid Airfoil Design Method to Simulate Full-Scale Ice Accretion Through a Given CL-Range," AIAA Paper No. 97-0054, Reno, NV, January 6-9, 1997.
- Bragg, M.B., Lee, S. and Henze, C.M., "Heat-Transfer and Freestream Turbulence Measurements for Improvement of the Ice Accretion Physical Model," AIAA Paper No. 97-0053, Reno, NV, January 6-9, 1997.
- Saeed, F., Selig, M.S. and Bragg, M.B., "A Design Procedure for Subscale Airfoils with Full-Scale Leading Edges for Ice Accretion Testing," AIAA Paper No. 96-0635, AIAA 34th Aerospace Sciences Meeting, Reno, NV, January 15-18, 1996.
- Bragg, M.B., Cummings, M.J., Lee, S. and Henze, C.M., "Boundary-Layer and Heat Transfer Measurements on an Airfoil With Simulated Ice Roughness," Paper No. 96-0866, AIAA 34th Aerospace Sciences Meeting, Reno, NV, January 15-18, 1996.

Winkler, J.F. and Bragg, M.B., "Local Flowfield About Large Distributed Roughness in the Initial Ice Accretion Process," Paper No. 96-0868, AIAA 34th Aerospace Sciences Meeting, Reno, NV, January 15-18, 1996.

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Bragg, M.B., Kerho, M.F. and Cummings, M.J., "Effect of Initial Ice Roughness on Airfoil Aerodynamics," Paper No. 94-0800, AIAA 32nd Aerospace Sciences Meeting, Reno, N.V., January 10-13, 1994.

Khodadoust, A. and Bragg, M.B., "A Numerical Study of the Spray Characteristics of the UIUC Subsonic Wind Tunnels," Paper No. 94-0603, AIAA 32nd Aerospace Sciences Meeting, Reno, N.V., January 10-13, 1994.

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Bragg, M.B., Kerho, M.F. and Khodadoust, A., "LDV Flowfield Measurements on a Straight and Swept Wing with a Simulated Ice Accretion," Paper No. 93-0300, AIAA 31<sup>st</sup> Aerospace Sciences Meeting, Reno, NV, January 11-14, 1993.

Kerho, M.F. and Bragg, M.B., "Helium Bubble Visualization of the Spanwise Separation on a NACA 0012 with Simulated Ice Shape," Paper No. AIAA-92-0413, AIAA 30<sup>th</sup> Aerospace Sciences Meeting, Reno, NV, 1992.

Wells, S.L. and Bragg, M.B., "A Computational Method for Calculating Droplet Trajectories Including Effects of Wind Tunnel Walls," Paper No. AIAA-92-0642, AIAA 30<sup>th</sup> Aerospace Sciences Meeting, Reno, NV, Jan. 1992.

Farag, K., Bragg, M.B., Martin, C. and Daneshgar, G., "Three-Dimensional Droplet Trajectory Method for Propellers," Paper No. AIAA-92-0644, AIAA 30<sup>th</sup> Aerospace Sciences Meeting, Reno, NV, Jan. 1992.

Khodadoust, A., Bragg, M.B., Kerho, M.F., Wells, S.L. and Soltani, M.R., "Finite Wing Aerodynamics With Simulated Glaze Ice," Paper No. AIAA-92-0414, 30<sup>th</sup> Aerospace Sciences Meeting, Reno, NV, Jan. 6-9, 1992.

Bragg, M.B., Khodadoust, A., Soltani, M.R., Wells, S.L. and Kerho, M.F., "Effect of a Simulated Ice Accretion on the Aerodynamics of a Swept Wing," Paper No. 91-0442, AIAA 29th Aerospace Sciences Meeting, Reno, NV, Jan. 1991.

Tenison, G., Bragg, M.B. and Farag, K., "A Comparison of a Droplet Impingement Code to Icing Tunnel Results," Paper No. AIAA-90-0670, AIAA 28th Aerospace Sciences Meeting, Reno, Nevada, Jan. 1990.

Bragg, M.B. and Khodadoust, A., "Measured Aerodynamic Performance of a Swept Wing with a Simulated Ice Accretion," Paper No. AIAA-90-0490, AIAA 28th Aerospace Sciences Meeting, Reno, Nevada, Jan. 1990.

Bragg, M. B. and Gregorek, G. M., "Environmentally Induced Surface Roughness Effects on Laminar Flow Airfoils: Implications for Flight Safety," Paper No. AIAA-89-2049, AIAA/AHS/ASEE Aircraft Design, Systems and Operations Conference, Seattle, WA, July 1989.

Bragg, M.B. and Khodadoust, A., "Effect of Simulated Glaze Ice on a Rectangular Wing," AIAA Paper No. 89-0750, presented at the 27th AIAA Aerospace Sciences Meeting, Reno, NV, Jan. 9-12, 1989.

Bragg, M.B. and Soltani, M.R., "An Experimental Study of the Effect of Asymmetrical Vortex Bursting on a Pitching Delta Wing," AIAA Paper No. 88-4334, presented at the AIAA Atmospheric Flight Mechanics Conference, Minneapolis, MN., Aug. 15-17, 1988.

Bragg, M.B. and Khodadoust, A., "Experimental Measurements in a Large Separation Bubble due to a Simulated Glaze Ice Shape," AIAA Paper 88-0116 presented at the AIAA 26th Aerospace Sciences Meeting, Reno, Nevada, Jan. 12, 1988.

Bragg, M.B. and Spring, S.A., "An Experimental Study of the Flowfield About an Airfoil with Glaze Ice," AIAA Paper No. 87-0100, presented at the AIAA 25th Aerospace Sciences Meeting, Reno, Nevada, Jan. 12, 1987.

Bragg, M.B. and Coirier, W.J., "Aerodynamic Measurements of an Airfoil with Simulated Glaze Ice," AIAA Paper No. 86-0484, AIAA 24th Aerospace Sciences Meeting, Reno, Nevada, Jan. 1986.

Gregorek, G.M. and Bragg, M.B., "Aircraft Performance Penalties Due to Ice Accretion," SAE Business Aircraft Meeting and Exposition, Wichita, Kansas, April 1985.

Bragg, M.B. and Coirier, W.J., "Detailed Measurements of the Flowfield in the Vicinity of an Airfoil with Glaze Ice," Paper No. AIAA-85-0409, AIAA 23rd Aerospace Sciences Meeting, Reno, Nevada, January 1985.

Bragg, M.B., "The Role of Airfoil Geometry in Minimizing the Effect of Insect Contamination of Laminar Flow Sections," Paper No. AIAA-84-2170, AIAA 2nd Applied Aerodynamics Conference, Seattle, Washington, August 1984.

Petrie, S.L., Freuler, R.J., Gregorek, G.M., and Bragg, M.B., "Modeling Techniques for Transonic Airfoils," Society of Computer Simulation Multi-Conference, San Diego, California, February 1984.

Bragg, M.B., "Predicting Airfoil Performance with Rime and Glazed Ice Accretion," Paper No. AIAA-84-0106, AIAA 22nd Aerospace Sciences Meeting, Reno, Nevada, January 1984.

Gregorek, G.M. and Bragg, M.B., "Performance Analyses for Aircraft in Icing Conditions," Paper No. AIAA-84-0180, AIAA 22nd Aerospace Sciences Meeting, Reno, Nevada, January 1984.

Bragg, M.B. and Gregorek, G.M., "An Analytical Investigation of the Icing Properties of Several Low and Medium Speed Airfoils," Paper No. AIAA-83-0109, AIAA 21st Aerospace Science Meeting, Reno, Nevada, January 1983.

Bragg, M. B., Gregorek, G. M. and Shaw, R. J., "Wind Tunnel Investigation of Airfoil Performance Degradation Due to Icing," Paper No. AIAA-82-0582, AIAA 12<sup>th</sup> Aerodynamic Testing Conference, Williamsburg, VA, March 1982.

Bragg, M.B. and Gregorek, G.M., "Aerodynamic Characteristics of Airfoils with Ice Accretions," Paper No. AIAA-82-0282, AIAA 20th Aerospace Sciences Meeting, Orlando, Florida, January 1982.

Bragg, M.B., Gregorek, G.M., and Shaw, R.J., "An Analytical Approach to Airfoil Icing," Paper No. AIAA-81-0403, AIAA 19th Aerospace Sciences Meeting, St. Louis, Missouri, January 1981.

Ormsbee, A.I., Bragg, M.B., and Maughmer, M.D., "Scaling Wake-Particle Interactions for Aerial Applications Research," Paper No. AIAA-80-1873, AIAA Aircraft Systems and Technology Meeting, Anaheim, California, August 1980.

Jordan, F.L., McLemore, H.C., and Bragg, M.B., "Status of Aerial Applications Research in the Langley Vortex Research Facility and the Langley Full Scale Wind Tunnel," Paper No. AIAA-78-1481, AIAA Aircraft Systems Meeting, San Francisco, California, August 1978.

## RESEARCH GRANTS

<b><u>Brief Title</u></b>	<b><u>Supporting Agency (PI or Co-PI)</u></b>	<b><u>Total \$ Amount</u></b>	<b><u>Period of Time</u></b>
"Methods for Predicting Particle Wake Interactions in Aerial Applications"	NASA Grant Co-PI	\$7,600	1/80- 12/81
"Effects of Ice Accretion on 2-D Aerodynamic Shapes"	NASA Grant PI	\$843,000	2/80- 12/89
"The Role of Airfoil Geometry in Minimizing the Effect of Insect Contamination of Laminar Flow Sections"	NASA Grant PI	\$35,000	3/83- 12/84
"The Design and Evaluation of a New Concept for Wind Tunnel Model Data Acquisition and Reduction"	Ohio State University Seed Grant Co-PI	\$12,000	7/84-6/86
"An Experimental Study of the Shock Boundary Layer Interaction on a Flat Plate at Hypersonic Speeds"	NASA Lewis Research Center Co-PI	\$247,000	3/86-3/89
"An Experimental Study of the Effect of Pitch Rate on Delta Wing"	NASA Langley Research Center	\$80,000	4/86-6/88

Aerodynamics"	PI		
"An Experimental Research Program on the Supersonic Throughflow Turbofan"	NASA Lewis Research Center Co-PI	\$135,000	2/89-2/90
"Icing Evaluation of Two Propeller Airfoil Sections"	Dowty Rotol Ltd. of England Co-PI	\$6,200	10/81-5/82
"Evaluation of Wing Icing Parameters"	Piper Aircraft PI	\$1,500	2/84-4/84
"Developing Icing Analysis Techniques for Axisymmetric Bodies"	Dowty Rotol Ltd. of England PI	\$2,500	2/84-7/84
"Icing Analysis of the Gulfstream IV Aircraft"	Gulfstream Aerospace PI	\$12,000	10/84-1/85
"Update of the Aircraft Icing Handbook"	Federal Aviation Administration PI	\$22,500	5/85-6/86
"Icing Analysis of the General Electric Unducted Fan Engine"	General Electric Corp. PI	\$11,500	6/87-9/87
"Droplet Impingement Computational Method for Aircraft Configurations"	B.F. Goodrich Corp. PI	\$65,000	10/87-12/89
"An Experimental Study of a Hypersonic Engine Inlet"	General Electric Corp. PI	\$73,000	7/88-7/90
"Effect of Ice Accretion on Aircraft Aerodynamics"	NASA Lewis Research Center PI	\$482,448	1/90-9/94
"Propeller Ice Accretion Program"	Goodrich Aerospace PI	\$203,510	2/91-12/95
"Further Experimental Investigation of Low-Frequency Flow Oscillation on Airfoils"	NASA Lewis Res. Ctr. PI	\$97,169	11/92-11/95
"Effect of Underwing Frost on Transport Aircraft Takeoff - Experiment"	FAA Technical Ctr. PI	\$12,624	3/92-4/92
"Effect of Underwing Frost on Transport Aircraft Takeoff - Analysis"	FAA Technical Ctr PI	\$45,834	6/92-2/93

"Roughness Effects on Ice-Induced Separated Flows"	UIUC Campus Research Board PI	\$25,000	9/91-5/92
"Renovation Of Mechanical Engineering Laboratory"	NSF Co-PI	\$750,000	10/92-10/93
"Surface Roughness Effects Due to Ice Accretions (NASA Training Grant - J. Winkler graduate student)"	NASA Lewis Research Center PI	\$66,000	7/93-6/96
"Effect of Large-Droplet Ice Accretions on Airfoil and Wing Aerodynamics"	FAA Technical Center PI	\$1,795,339	8/96-3/2010
"A Study of Ice Accretion Physics to Improve the Prediction of Ice Accretion on Aircraft"	NASA Lewis Research Center PI	\$294,988	11/96-11/99
"The Effect of the Critical Ice Accretion on Airfoil and Wing Performance"	NASA Lewis Research Center Co-PI	\$160,203	10/96-10/99
"Aerodynamics of Airfoils with Ice"	Cox & co PI	\$50,000	5/97-11/99
"Aircraft Icing Research Center"	UIUC Critical Research Initiatives Program - PI	\$200,000	7/97-6/99
"Smart Icing Systems"	NASA Lewis Research Center PI	\$2,101,181	1/98-3/04
"Unsteady Flow about an Iced Airfoil (NASA Training Grant–H. Gurbacki graduate student)"	NASA Glenn Research Center PI	\$66,000	10/99-9/03
"Aerodynamic Flowfield Characterization for Icing"	NASA Glenn Research Center PI	\$91,000	7/99-10/00
"Unsteady Aerodynamics of Iced Airfoils"	UIUC Campus Research Board PI	\$25,000	10/99-10/00
"Iced Aircraft Flight Mechanics Modeling"	STI Inc. PI	\$97,500	8/99-7/00
"Experimental Study of Iced-Airfoil Aerodynamics"	NASA Glenn PI	\$621,000	12/00-2/06
"Advanced Pressure Recovery NLF"	Eidetics Co.	\$48,300	1/01-4/02

Airfoils"	PI		
"Yaw Control of a Lifting Vehicle at High Angle of Attack (NASA Training Grant – J.Merret graduate student)"	NASA Johnson PI	\$70,000	8/01-8/04
"Simulation Methods for Iced-Aircraft"	NASA Glenn Research Center PI	\$628,000	2/03-2/07
"Effect of Large-Droplet Ice Accretions on Airfoil and Wing Aerodynamics and Control"	FAA PI	\$424,895	1/03 to 12/05
"PIV Measurements of the Unsteady Flowfield Around an Airfoil with Simulated Ice Accretion"	NASA Glenn Research Center PI	\$72,000	7/03-7/06
"Simulation of Icing on Turbomachinery"	Ohio Aerospace Institute Co-PI (PI-Loth)	\$75,000	1/04-7/05
"Wind Tunnel Evaluation of Ice-Shape Aerodynamics"	Pratt and Whitney PI	\$30,238	6/05 to 8/05
"Robust Flow Control for Radically Enhanced Natural Laminar Flow Wings"	Rolling Hills Research PI	\$10,400	6/05–10/05
"Full-scale Wind Tunnel Models"	NASA Glenn Research Center PI	\$336,166	3/05 – 6/06
"Center for Air Transportation Systems Research"	UIUC Critical Research Initiatives Program PI	\$200,000	6/06-6/08
"Development of a Large-Scale Low-Boom Supersonic Inlet for Investigating Micro-Array Flow Control"	NASA Glen Research Center Co-PI (PI-Loth)	\$1,247,991	12/07- 12/10
"Supersonic Business Jet Installation Aerodynamics"	Gulfstream/Rolls Royce PI	\$2,000,000	12/07-8/12
"Real Time Control Surface Hinge Moment Measurements For Novel Flight Envelope Monitoring System"	NASA Dryden PI	\$305,113	1/09-8/12
"Diffuser and Ducting Performance Improvement Utilizing Actuators"	Rolls Royce Co-PI (PI-Elliott)	\$100,000	1/10-12/10
"Effect of ice accretion on Full-	Federal Aviation	\$690,101	5/10-5/14

Scale, Swept-Wing, Aerodynamic Performance and Control Effects”	Administration PI		
“Development and Wind Tunnel Testing for Powered Tabbed Control Surfaces”	Boeing PI	\$49,232	4/10 -3/11
“Versatile Electric Propulsion Aircraft Testbed”	NASA Dryden PI	\$30,000	2/11-2-12
“Development of Experimental Icing Simulation Capability for Full-Scale Swept Wings”	NASA Glenn PI	\$550,000	1/11-12/13

**GRADUATE STUDENTS**

## M.S. Degrees Granted (name and year)

R.J. Zaguli	1983
J.L. Maresh	1984
M.R. Soltani	1986
W.J. Coirier	1986
R.P. Lowrie	1986
J.B. Shilling	1986
D.E. Erwin	1987
A. Khodadoust	1987
S.A. Spring	1987
J.W. Cole	1988
S.R. Mohler	1990
M.F. Kerho	1992
S.L. Wells	1992
A.W. Carey	1993
J.F. Winkler	1993
D.C. Heinrich	1993
F.A. Balow	1994
M.J. Cummings	1995
A.P. Broeren (M&IE)	1996
S.C. Noe	1996
J.D. Reichhold	1996
S. Lee	1997
C.M. Henze	1997
D.J. Jackson	1999
H.M. Gurbacki	2000
D. Pokhariyal	2001
J. Merret	2002
R.S. Oltman	2002
K. Hossain	2003
E. Whalen	2003
R. Arakoni	2003
H. Kim	2004
L. Blumenthal	2005
C. LaMarre	2005
T. Kacmar	2006
G. Busch	2007
S. Campbell	2007
Y. Yong	2009
P. Ansell	2010

J. Bottalla	2011
A. Herrera	2011
R. Hortensius	2011
J. Diebold	2012

## Ph.D. Degrees Granted (name and year)

M.R. Soltani	1992
A. Khodadoust	1993
M.F. Kerho	1995
R.L. Mange	1995
J.W. Winkler	1996
A.P. Broeren (M&IE)	1999
S. Lee	2001
H.M. Gurbacki	2003
B. Lu	2003
J. Merret	2004
E. Whalen	2007
J. Jacobs	2007
G. Busch	2009
S. Campbell	2010

## Current students

P. Ansell  
R. Hortensius  
J. Diebold  
A. Mortonson  
M. Monastero  
G. Fujiwara

## Post-doctoral Associates and Visiting Scientists (name, dates, citizenship, current employer)

M.R. Soltani, 1992-1993, Iran, Sharif University, Tehran, Iran  
A. Khodadoust, 1993-1994, USA, The Boeing Company, Long Beach, CA  
M.F. Kerho, 1995, USA, Rolling Hills Research, Los Angeles, CA  
A.P. Broeren, 1999-2003, USA, NASA Glenn Research Center, Cleveland, OH  
S. Lee, 2001-2002, USA, NASA Glenn Research Center, Cleveland, OH  
B. Woodard, 2012 - present

**COURSE  
DEVELOPMENT**

AAE 199 Undergraduate Open Seminar - Aircraft Flight Testing, new freshman discovery class  
AAE 201 Principles of Aerospace Systems, new introductory undergraduate course  
AAE 260 Aerospace Laboratory, updated lab course with modern equipment/experiments  
AAE 391DAS, developed undergraduate course for aircraft safety  
AAE 415 Wing Theory, updated graduate course  
AAE 493U Unsteady Aerodynamics, new graduate level course

**PROFESSIONAL  
SERVICE**

American Institute of Aeronautics and Astronautics  
Fellow since 2004  
Past chair, vice-chair, and secretary of the Columbus section of AIAA  
Atmospheric Environment Technical Committee, 1983-1986  
General Aviation Systems Technical Committee, 1986-1989  
Ground Testing Technical Committee, 1989-1993  
Chairman, National Student Paper Competition, 1991-1993  
Session Organizer and Session Chairman, AIAA Ground Testing Conf., 1992.  
Applied Aerodynamic Technical Committee, 1996-2002  
Organizing Committee for 1999 Aerospace Sciences Meeting

Organizer and instructor, Effect of Surface Roughness on Aircraft Aerodynamics Short Course  
Vice Chair and Chairman Elect, 1999-2000  
Chair, 2000-2002  
Fellows selection committee, 2005, 2007, 2009  
General Chair, Aerospace Sciences Meeting 2007  
Vice President for Publications, 2009 – 2012  
Board of Directors, 2009-2012 (member of several board subcommittees)  
Session organizer and chair at numerous conferences  
Society of Automotive Engineers:  
SAE AC-9C Committee on Aircraft Icing Technology, 1985-present  
Chairman, 1990-1992  
Vice-Chairman/Chairman Elect 1988-1990  
Organizer, Aircraft Icing Research in Europe Meeting, Zurich, Switzerland, 1989  
Organizing Committee, International Aircraft Icing Meeting, NASA Lewis, 1987  
Chairman, Subcommittee on Icing Test Facilities, 1988-1997  
Aerospace Department Chairs Association, 1999 – 2006  
Vice chair 2002, chair 2003  
Experimental Aircraft Association  
Aircraft safety presentations at the International Convention 1980 - 2000.  
American Society of Engineering Education  
NASA Lewis High-Speed Inlet Technology Peer Review Committee, 1992-1993  
Design of the vortex generators for the *Voyager* aircraft. The first unrefueled flight around the world.  
International Advisory Committee, Fifth International Workshop on Atmospheric Icing of Structures, Tokyo, Japan 1990.  
Federal Aviation Administration Working Group 12A, 1997 – 2000.  
Federal Aviation Administration International ARAC Committee, Ice Protection Harmonization Working Group, 1998 – 2000.  
United States Air Force, Air University Board of Visitors, 2000-2009  
United States Air Force, Air Force Institute of Technology Advisory Board, 2000-2009  
Research, Engineering and Development Advisory Committee (REDAC), Federal Aviation Administration, 2004 – 2007 (Subcommittee for Aircraft Safety, 2004-present)  
Advisory Board, Aerospace Engineering Department, Ohio State University, 2004-present  
University of Colorado Boulder, Aerospace Engineering Review Committee, 2005  
University of Cincinnati, Aerospace Engineering Graduate Program Review Committee, 2009

**UNIVERSITY  
SERVICE (Illinois)**

Department Curriculum Committee, 1990-1999  
Department Faculty Search Committees, 1990-1992  
Department Laboratory Committee, 1990-1993  
Department Advisory Committee, 1992-1993, 1994-1995, 1995-1996, 1997-1998.  
Department Head Evaluation Committee, 1992-1993  
Department Planning Committee, 1993-1995, 1999-present  
Department Awards Committee, 1994-1995, 1999-present  
Department Graduate Program Committee, 1995-1996  
Department Strategic Planning Committee, chair 1996-1998  
chair offsite planning meeting, 1997  
Department, Chair of the Faculty, 1998-1999  
Department, Coordinator of the Aerodynamics, Fluid Mechanics, Combustion and Propulsion Faculty, 1995-1999  
Faculty advisor, AIAA student chapter 2001-2003  
College Teaching Evaluation and Improvement Committee, 1991- 97, chair 1996-1997  
COE Teaching College Guest Speaker, 1999  
COE Administrative Committee, 1999-present

COE Promotion and Tenure Committee, 2003-2005  
Chair, CSL Director Search Committee, 1999  
Chair, TAM Department Head Search Committee, 2003  
Chair, College Latino/a Action Plan, 2004  
UIUC Panelist, 2004 Community of Scholars Conference  
UIUC Faculty Senate, 1997 – 2000  
Associate Dean search committees and search committee chair, several committees  
Campus CIO Search Committee, 2007  
Campus Dean of the Graduate School Search Committee, 2008  
College Administrative Committee, 1999-present  
College ICR Committee, chair, 2008-2009  
ADSC Singapore Steering Committee, 2009-present  
Campus ICR Working group, 2012 chair  
Numerous ex officio committee memberships as Associate and Executive Associate Dean

Ohio State University

Freshman Orientation Program Faculty representative for the College of Engineering  
College Committee on Academic Affairs, 1981-1989  
    Chairman, 1988-1989  
    Course Proposal Subcommittee, 1981-1984  
    Chairman of the Subcommittee on Numerical Analysis, 1984-1986  
    Enrollment Management subcommittee, 1985-1986  
Chairman of the College Math Liaison Committee, 1984-1988  
College CAD/CAM Committee, 1984-1988  
General Electric Scholarship Committee, 1986-1989  
RADHS Minority Program, 1982  
ACE Day Program, 1982  
Department Graduate Studies Committee, 1984-1989  
Department Planning Committee, 1983-1984  
Department Chairman Search Committee, 1986-1987  
Department Laboratory Committee, 1988-1989  
Assistant Director Aero and Astro Res Lab 1984-1989

**INVITED  
PRESENTATIONS**

“The Effect of Roughness on Airfoil Aerodynamics,” SAE AC9C Aircraft Icing Committee, Orlando, FL, Oct. 22, 1991.

“Effect of Underwing Frost on Transport Aircraft Takeoff Performance,” Aeronautical and Astronautical Engineering Seminar, University of Illinois at Urbana-Champaign, Oct. 12, 1992.

“Airfoil Roughness Research” and “Airfoil Icing Research,” WCES Blade Roughness Planning Meeting, National Renewable Energy Laboratory, Golden CO, April 20, 1993.

“Flowfield Measurements on a Finite Wing with a Simulated Ice Accretion,” Aircraft Icing Peer Review, NASA Lewis Research Center, Cleveland, OH, Sept. 8-9, 1993.

“Low-Frequency Flow Oscillation over Airfoils Near Stall,” Internal Fluid Mechanics Seminar Series, NASA Lewis Research Center, Cleveland, OH, April 19, 1994.

“Aerodynamics of Supercooled-Large-Droplet Ice Accretions and the Effect of Aircraft Control,” FAA International Conference on Aircraft Inflight Icing, Springfield, VA, May 6, 1996.

- “Effect of Ice Accretion on Aircraft Control,” Mechanical Engineering Seminar, Concordia University, Montreal, Canada, Feb. 5, 1997.
- “Smart Icing Systems,” NASA Lewis Research Center, March 12, 1998.
- “Critical Ice Accretion Aerodynamics,” FAA 12A Committee, Seattle, WA, April 6, 1998.
- “Icing Research at UIUC and Smart Icing Systems,” Boeing Long Beach, April 22, 1998.
- “Smart Icing Systems,” BF Goodrich Research Facility, Brecksville, OH, May 27, 1998.
- “Aircraft Aerodynamics in Icing Conditions,” Dept. of Aeronautical and Astronautical Engineering Seminar, Urbana, IL, Sept. 9, 1998.
- “Ice Accretion Scaling Through Model Design,” NASA Ice Accretion Scaling Workshop, Cleveland, OH, Oct. 2, 1998.
- “Smart Icing Systems for Flight Safety,” Bombardier Flight Test Center, Wichita, KS, Oct. 26, 1998.
- “Scale Effects in Icing Aerodynamics,” Wichita State University, Oct. 27, 1998.
- “Aircraft Icing,” AIAA Student Conference, Ohio Aerospace Institute, Cleveland, OH, March 5, 1999.
- “Aircraft Icing Safety Research,” U.S. Aviation Underwriters/US Aircraft Insurance Group, New York, NY, March 8, 1999.
- “Smart Icing Systems Research,” NASA Langley Research Center, Hampton, VA, Sept. 9, 1999.
- “Residual/Inter-cycle Icing Research,” FAA Technical Center, Atlantic City, NJ, Oct. 12, 1999.
- “Smart Icing Systems,” SAE World Aviation Congress, San Francisco, Oct. 19, 1999.
- “NASA/UIUC Smart Icing Systems Research Program,” SAE AC9C meeting, Fort Walton Beach, FL, October, 26, 1999.
- “Smart Icing Systems Update,” NASA Glenn, Cleveland, March 24, 2000.
- “Increasing Safety Through Smart Icing Systems,” SAE Advances in Aviation Safety Conference, Daytona Beach Florida, April 11, 2000.
- “Icing Aerodynamics Research at Illinois,” Aero Issues in Icing, NASA Glenn, Cleveland, April 18, 2000
- “Smart Icing System Application to Aircraft IPS,” BFGoodrich – Rosemount, Minneapolis, Oct. 30, 2000.
- “Ice Tolerant - Smart Icing Systems,” Aircraft Icing Forum, NASA Glenn, Cleveland, Nov. 13, 2000.
- “Space Research at Illinois,” NASA Johnson Space Flight Center, Houston, November 20, 2000.

“Intercycle Icing Research Program,” NASA Glenn, Cleveland, Feb. 22, 2001.

“The IMS: A New System in Support of Decision-Making and Action Selection In Actual Icing Conditions,” The 11<sup>th</sup> International Symposium on Aviation Psychology, Columbus, OH., March 7, 2001. (and session chair)

“Icing Aerodynamics Research at Illinois,” ONERA Chatillon, France, January 14, 2003

“Icing Simulation Research,” ONERA Fauga-Mauzac, France, April 1, 2003

“Aircraft Icing and Its Effects on Aerodynamics and Performance,” Aerospace Engineering Department, University of Michigan, September 25, 2003.

“Aircraft Icing Aerodynamics,” Aircraft icing Short Course University of Tennessee, Tullahoma 2004 and Wichita 2005.

“Propulsion Integration for a Quiet Supersonic Business Jet,” Gulfstream Aerospace, Savannah, GA, Aug. 15, 2006.

“Supersonic Business Jet Bypass Flow Analysis”, Gulfstream Aerospace, Savannah, GA, December 11, 2007

“Ice Accretion Aerodynamic Simulation,” (with M. Potapczuk), SAE, Seville, Spain, September 25, 2007.

“Supersonic Business Jet Bypass Flow”, Rolls Royce, Indianapolis, 2008

“Recent Results for Propulsion Integration for Supersonic Flight,” Rolls Royce, Derby, UK, January 23, 2009

“Effect of Ice Accretion on 3-D Wing Aerodynamics and Control,” The Boeing Company, Renton, WA, Nov. 12, 2009.

“Real-time Control Surface Hinge Moment Measurements For Novel Aerodynamic Health Monitoring System,” NASA Dryden Research Center, Dryden, CA, Dec. 8, 2009.

“Effect of Ice Accretion on 3-D Wing Aerodynamics and Control,” ONERA, Toulouse, France, May 31, 2010.

“Simulation of Ice Accretion on 3-D Wing,” ONERA, Toulouse, France, October 11, 2011.