

# Karen E. Willcox

Associate Professor of Aeronautics and Astronautics  
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Massachusetts Institute of Technology

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## Education

1993 University of Auckland Bachelor of Engineering, First Class Honours (Engineering Science)  
1996 Massachusetts Institute of Technology S.M. (Aeronautics and Astronautics)  
Thesis: *Aeroelastic Computations in the Time Domain using Unstructured Meshes*  
2000 Massachusetts Institute of Technology PhD (Aeronautics and Astronautics)  
Thesis: *Reduced-Order Aerodynamic Models for Aeroelastic Control of Turbomachines*

## Experience

Massachusetts Institute of Technology  
2005-present Associate Professor of Aeronautics and Astronautics  
2001-2005 Assistant Professor of Aeronautics and Astronautics  
2000 Post-Doctoral Associate, Fluid Dynamics Research Laboratory  
1994-1999 Research Assistant, Fluid Dynamics Research Laboratory and Gas Turbine Laboratory  
University of Auckland  
2008-2009 Visiting Associate Professor  
Stanford University  
April 2005 Visiting Scholar  
Sandia National Laboratories  
2005 Six-month sabbatical research stay  
Boeing Phantom Works  
2000-2001 Visiting Researcher, Blended-Wing-Body Group  
NASA Dryden Flight Research Center  
1996 Aerospace Intern

## Research Interests

Model Order Reduction, Multidisciplinary Design Optimization, Computational Fluid Dynamics, Aircraft Design, Aircraft Environmental Impact

## Teaching Experience

Undergraduate: Principles of Automatic Control, Signals and Systems, Computational Methods in Aerospace Engineering

Graduate: Multidisciplinary System Design Optimization, Flight Vehicle Aerodynamics

## Professional Memberships and Committees

American Institute of Aeronautics and Astronautics (AIAA), Associate Fellow  
AIAA Multidisciplinary Design Optimization Technical Committee (2001-present)  
American Society of Mechanical Engineers, Member  
American Society for Engineering Education, Member  
Society for Industrial and Applied Mathematics, Member  
National Academies Decadal Survey of Aeronautics, Member of Aerodynamics & Acoustics Panel (2005-2006)  
National Research Council, Committee to Conduct an Independent Assessment of the Nation's Wake Turbulence Research and Development Program (2007)

## Selected Publications

Willcox, K. and Peraire J., Balanced Model Reduction via the Proper Orthogonal Decomposition, *AIAA Journal*, Vol. 40, No. 11, p. 2323, 2002.

Bui-Thanh, T., Damodaran, M. and Willcox, K., Applications of Proper Orthogonal Decomposition for Inviscid Transonic Aerodynamics, *AIAA Journal*, Vol. 42, No. 8, August 2004, pp. 1505-16.

Markish, J. and Willcox, K., Value-based multidisciplinary techniques for commercial aircraft system design, *AIAA Journal*, Vol. 41, No. 9.

Bashir, O., Willcox, K., Ghattas, O., van Bloemen Waanders, B., and Hill, J., Hessian-Based Model Reduction for Large-Scale Systems with Initial Condition Inputs, *International Journal for Numerical Methods in Engineering*, Vol. 73, Issue 6, pp. 844-868, 2008.

Bui-Thanh, T., Willcox, K., and Ghattas, O., Model Reduction for Large-Scale Systems with High-Dimensional Parametric Input Space, *SIAM Journal on Scientific Computing*, to appear.