



**D E S I G N  
R E S E A R C H  
E N G I N E E R I N G**

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## **Eric S. Winkel, Ph.D.**

### **Professional Specialization**

Fluid dynamics, acoustics, heat transfer, and thermodynamics along with other general mechanical engineering disciplines. Design, design analysis, and failure analysis of mechanical systems. Laboratory and field testing of maritime related mechanical, electrical, and hydrodynamic systems. Marine dynamics, resistance and propulsion, maneuvering, and stability of boats and personal watercraft. Accident investigation, analysis and reconstruction related to recreational watercraft. Digitization and CAD rendering of accident scenes and vessels.

Design and development of instrumentation for measurement of turbulent, multi-phase, and polymeric flows. Design and execution of large scale and laboratory scale fluid dynamics experiments related to ship resistance, propulsion, and acoustics involving instrumentation, data reduction, and analysis. Numerical and analytical modeling of single-phase and multi-phase flows.

### **Professional Background**

B.S.E. (Mechanical Engineering), University of Michigan - Ann Arbor, 2003

M.S.E (Mechanical Engineering) University of Michigan - Ann Arbor, 2004

Ph.D. (Mechanical Engineering) University of Michigan - Ann Arbor, 2007

### **Project Engineer,**

Design Research Engineering

January 2007-present

### **Research Consultant,**

Sandia National Laboratories

April 2006-December 2006

### **Research Assistant,**

Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI

2003-2007

### **Undergraduate Research Assistant,**

Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI

2001-2003

### **Honors**

Magna cum Laude, University of Michigan

Rackham Merit Fellowship, University of Michigan

### **Continuing Education**

- Participant in NASBLA staged boat collisions (September 2007, Chester, VA)
- Training Seminar and Certification for the English XL Tribometer (January 2008, Tampa, FL)
- Attendance to the ASTM Conference on Pedestrian Safety (January 2008, Tampa, FL)
- Participant in NASBLA staged boat collisions (September 2008, Chester, VA)
- Attendance to NTSB Marine Accident Investigation – MS101 (January 2009)
- Participant (remote controls and data acquisition) in NASBLA staged boat collision (May & September 2009, Chester, VA)
- Faro Laser Scanner LS – Training Program (December 2009, Novi, MI)
- Attendance to the Chesapeake Power Boat Symposium (March 2010, Annapolis, MD)

### **Memberships and Affiliations**

- Acoustical Society of America – Associate Member

### **Conference, Meeting or Symposium Papers & Presentations**

“Air Layer Drag Reduction,” American Physical Society – Division of Fluid Dynamics, 2008, San Antonio, TX (with S. L. Ceccio, B. R. Elbing, D. R. Dowling and M. Perlin).

“Air Layer Drag Reduction,” American Physical Society – Division of Fluid Dynamics, 2007, Salt Lake City, UT (with B. R. Elbing, M. Perlin, D. R. Dowling, S. L. Ceccio).

“Near-wall PTV Measurements in a High-Reynolds-Number Flat-plate Turbulent Boundary Layer,” American Physical Society – Division of Fluid Dynamics, 2007, Salt Lake City, UT (with G. F. Oweis, M. Perlin, S. L. Ceccio, and D. R. Dowling).

“High-Reynolds-Number Flat-Plate Turbulent Boundary Layer Measurements,” American Physical Society Division of Fluid Dynamics, November 2006, Tampa Bay, FL (with J. M. Cutbirth, M. Perlin, S. L. Ceccio, and D. R. Dowling).

“Structural Monitoring from Noise Cross-Correlation,” Acoustical Society of America, Summer Meeting, June 2006, Providence, RI (with K. G. Sabra, D. A. Bourgoyne, D. R. Dowling, S. L. Ceccio, M. Perlin, and W. A. Kuperman).

“PIV and LIF Measurements of a Turbulent Boundary Layer with Injected Drag-reducing Polymers at High Reynolds Numbers,” American Physical Society – Division of Fluid Dynamics, 2005, Chicago, IL (with G. Oweis, D. R. Dowling, M. Perlin, and S. L. Ceccio).

“Development of a micro-PIV/ LIF System for the Study of High Reynolds Number Turbulent Boundary Layers,” American Physical Society Division of Fluid Dynamics, November 2004, Seattle, WA (with G. F. Oweis, D. R. Dowling, S. L. Ceccio).

“Bubble Size Measurements for Air Injected into a Turbulent Boundary Layer in Fresh Water, Salt Water, and Surfactant Solutions,” American Physical Society Division of Fluid Dynamics, November 2004, Seattle, WA (with S. L. Ceccio, D. R. Dowling, and M. Perlin).

“Drag Reduction in High Shear Turbulent Pipe Flow,” American Physical Society – Division of Fluid Dynamics, November 2004, Seattle, WA (with G. Garwood, D. Walker, and S. L. Ceccio).

“High-Reynolds-Number Turbulent Boundary Layer Pressure Fluctuations With and Without Bubbles,” American Physical Society Division of Fluid Dynamics, November 2003, East Rutherford, NJ (with W. C. Sanders, S. L. Ceccio, D. R. Dowling, and M. Perlin).

“Bubble Friction Drag Reduction at High Reynolds Number,” American Physical Society Division of Fluid Dynamics, November 2003, East Rutherford, NJ (with W. C. Sanders, E. Ivy, J. Cho, S. L. Ceccio, D. R. Dowling, and M. Perlin).

“Flat Plate Turbulent Boundary Layer Measurements at High Reynolds Numbers,” American Physical Society Division of Fluid Dynamics, November 2002, Austin, TX (with W. C. Sanders, C. Judge, E. Ivy, S. L. Ceccio, D. R. Dowling, and M. Perlin).

“Turbulent Boundary Layer Pressure Fluctuations at Large Scales and High Reynolds Number,” Acoustical Society of America, June 2002, Pittsburgh, PA (with W. C. Sanders, C. Judge, D. R. Dowling, M. Perlin, and S. L. Ceccio).

#### **Articles in Refereed Journals, Conference or Symposium Proceedings**

“The Mean Velocity Profile of a Smooth Flat-Plate Turbulent Boundary Layer at High Reynolds Number,” submitted to *Journal of Fluid Mechanics*, 2010 (with G. F. Oweis, J. M. Cutbirth, S. L. Ceccio, M. Perlin, and D. R. Dowling)

“High-Reynolds-number Turbulent-Boundary-Layer Wall Pressure Fluctuations with Dilute Polymer Solutions,” submitted to *Physics of Fluids*, 2010 (with B. R. Elbing, S. L. Ceccio, M. Perlin, and D. R. Dowling).

“Vehicle Chassis, Body, and Seat Buckle Acceleration Responses in the Vehicle Crash Environment,” *SAE Int. J. Passeng. Cars – Mech. Syst.*, 2(1): 1151-1170, 2009 (with D. E. Toomey, E. M. Paddock, and R. Burnett)

“High-Reynolds-Number Turbulent Boundary Layer Friction Drag Reduction from Wall-Injected Polymer Solutions,” *Journal of Fluid Mechanics*, 2009 (with G. Oweis, S. A. Vanapalli, D. R. Dowling, M. Perlin, M. J. Solomon, and S. L. Ceccio)

“Degradation of Homogeneous Polymer Solutions in Large Diameter, High Shear Turbulent Pipe Flow,” *Experiments in Fluids*, 2009 (with B. R. Elbing, M. J. Solomon, and S. L. Ceccio)

“Bubble-Induced Skin-Friction Drag Reduction and the Abrupt Transition to Air-Layer Drag Reduction,” *Journal of Fluid Mechanics*, 2008 (with B. R. Elbing, K. A. Lay, S. L. Ceccio, D. R. Dowling, and M. Perlin)

“High-Reynolds-Number Turbulent-Boundary-Layer Wall Pressure Fluctuations with Skin-Friction Reduction by Air Injection,” *Journal of the Acoustical Society of America*, 2008 (with B. R. Elbing, S. L. Ceccio, M. Perlin, and D. R. Dowling).

“Investigation of Drag Reduction Methods by Air Injection beneath a Turbulent Boundary Layer at High-Reynolds-Number,” 6<sup>th</sup> *International Conference on Multiphase Flow*, Leipzig, Germany, 2007 (with B. R. Elbing, M. Perlin, D. R. Dowling, and S. L. Ceccio)

“On Using Cross-correlations of Turbulent Flow-induced Ambient Vibrations to Estimate the Structural Impulse Response: Applications to Structural Health Monitoring,” *Journal of the Acoustical Society of America*, 2007 (with K. G. Sabra, D. A. Bourgoyne, B. R. Elbing, S. L. Ceccio, M. Perlin, and D. R. Dowling).

“Friction Drag Reduction at High Reynolds Numbers with Wall Injected Polymer Solutions,” 26<sup>th</sup> Naval Hydrodynamics Symposium, September 2006, Rome, Italy (with G. F. Oweis, S.A. Vanapalli, D. R. Dowling, M. Perlin, M. J. Solomon, and S. L. Ceccio).

“Bubble Friction Drag Reduction in a High Reynolds Number Flat Plate Turbulent Boundary Layer,” *Journal of Fluid Mechanics*, Volume 552, 2006 (with W. C. Sanders, D. R. Dowling, M. Perlin, and S. L. Ceccio).

“High-Reynolds-Number Turbulent-Boundary-Layer Surface Pressure Fluctuations with Bubble or Polymer Additives,” ASME International Mechanical Engineering Congress and Exposition, 2005, Orlando, FL (with B. R. Elbing, D. R. Dowling, M. Perlin, and S. L. Ceccio).

“Turbulent Boundary Layer Drag Reduction at High Reynolds Numbers with Wall-Injected Polymer Solution,” International Conference on Fast Sea Transport, June 2005, St. Petersburg, Russia (with D. R. Dowling, M. Perlin, and S. L. Ceccio).

“Influence of Bubble Size on Micro-Bubble Drag Reduction,” International Conference on Fast Sea Transport, June 2005, St. Petersburg, Russia (with X. Shen, S. L. Ceccio, and M. Perlin).

“Drag Reduction by a Homogenous Polymer Solution in Large Diameter, High Shear Pipe Flow,” 2<sup>nd</sup> International Symposium on Seawater Drag Reduction, May 2005, Busan, Korea. (with G. C. Garwood, S. Vanapalli, B.R. Elbing, D. T. Walker, S. L. Ceccio, M. Perlin, and M. J. Solomon)

“Bubble-size Distributions Produced by Wall Injection of Air into Flowing Freshwater, Saltwater, and Surfactant Solutions,” *Experiments in Fluids*, Volume 37, 2004 (with S. L. Ceccio, D. R. Dowling, and M. Perlin)

“Bubble Drag Reduction at Large Scales and High Reynolds Numbers,” 25<sup>th</sup> Symposium on Naval Hydrodynamics, August 2004, St. Johns, Newfoundland (with W. C. Sanders, J. Cho, E. Ivy, R. Etter, D. R. Dowling, M. Perlin, and S. L. Ceccio).

#### **University Reports (non-refereed)**

“Air-layer Induced Skin-friction Drag Reduction,” University of Michigan Department of Naval Architecture and Marine Engineering, 2007, Report 352 (with B. R. Elbing, K. A. Lay, S. L. Ceccio, D. R. Dowling, and M. Perlin).

#### **Doctoral Dissertation**

“High Reynolds Number Turbulent Boundary Layer Measurements and Skin-friction Drag Reduction with Gas or Polymer Injection,” The University of Michigan, Ann Arbor, MI, January 2007.