Reduced order model based iterative learning control for reduced lift fluctuation in wind turbine blades based on CFD models

Prof. Eric Rogers

School of Electronics and Computer Science, University of Southampton, UK

September 30, 2026 at 2 pm EST **Fuller Labs PHL Perreault Hall - Lower Section**

Zoom link: https://wpi.zoom.us/j/93007938481 **Passcode**: 670267

Abstract

The subject of this seminar is aerodynamic load control for wind turbines, which has the potential to increase power extraction efficiency, including economic competitiveness when compared to other sources of alternative energy. The general feasibility of this approach is developments in sensor and actuator technology, which enables their embedding into the rotor blades. Minimizing lift fluctuations due to disturbances is feasible when combined with active control to modify the blade section aerodynamics.

Eric Rogers (Life Member, IEEE) received the M.S. and Ph.D. degrees in control systems from the University of Sheffield, Sheffield, U.K., in 1984, and the D.Sc. degree in research in control systems from The Queen's University of Belfast, Belfast, U.K., in 2004. He is a Professor of Control Systems Theory and Design with the School of Electronics and Computer Science, University of Southampton, Southampton, U.K. He has an extensive record of advisory work for funding agencies and industries in the U.K. and elsewhere. His major research interests include iterative learning control theory and applications in both engineering and health care, multidimensional system theory and applications, long-range autonomy for autonomous underwater vehicles, and flow control. Dr. Rogers is the Editor-in-Chief for International Journal of Control.

Aerospace Engineering Seminar

Aircraft Behavior under Adverse Weather: Aerospace Icing Phenomenon

Dr. Haiyang Hu

School of Engineering, Aerospace Engineering Department, Worcester Polytechnic Institute, MA

September 2, 2026 at 2 pm EST **Fuller Labs PHL Perreault Hall - Lower Section**

Zoom link: https://wpi.zoom.us/j/94279973447 **Passcode**: 159129

Abstract

Aircraft and aero-engine icing is a significant weather-related hazard to flight safety in cold environments. Ice accretion on critical aircraft surfaces—including wings, propellers, aero-engine fan and compressor blades, and aerodynamic sensors—can result from the impingement of supercooled water droplets and/or ice crystals in clouds. The resulting ice accumulation can substantially alter aerodynamic characteristics and degrade aircraft and engine performance, posing a serious threat to flight safety.

In this seminar, the speaker will present a series of experimental investigations into dynamic ice accretion and unsteady heat-transfer processes associated with aircraft and aero-engine icing, with particular emphasis on inlet guide vane (IGV) icing induced by supercooled water droplets and ice-crystal icing within aero-engines. Leveraging the unique capabilities of the Icing Research Tunnel, comprehensive experimental studies have been conducted to characterize the critical microphysical and thermodynamic processes governing ice accretion under various icing conditions.

Various advanced experimental diagnostic techniques, including Particle Image Velocimetry (PIV), Digital Image Projection (DIP), and high-speed infrared (IR) thermography, have been developed and employed to quantify droplet and ice-crystal impingement dynamics, unsteady heat transfer during ice accretion, dynamic solidification processes over test surfaces, and the transient behavior of wind-driven water runback flows. In addition, the anti-/de-icing performance of various state-of-the-art hydro-/ice-phobic coatings and functional surfaces has been quantitatively evaluated across a broad range of icing conditions, from dry rime to wet glaze icing.

The findings from these studies provide new insights into the fundamental physics governing aircraft and aero-engine icing, contribute experimental data to validate and improve icing-accretion models, and support the development of more effective anti- and de-icing strategies for safer and more efficient aircraft and aero-engine operations in cold-weather environments.

Dr. Haiyang Hu is an assistant professor in the Aerospace Engineering Department at WPI. He earned his Ph.D. from the Department of Aerospace Engineering at Iowa State University in 2021. His current research interests focus on developing advanced experimental diagnostic techniques/platforms and exploring their applications in active/passive flow control, aircraft performance in adverse weather, non-thermal plasma, and UAV/UAM/UAS.