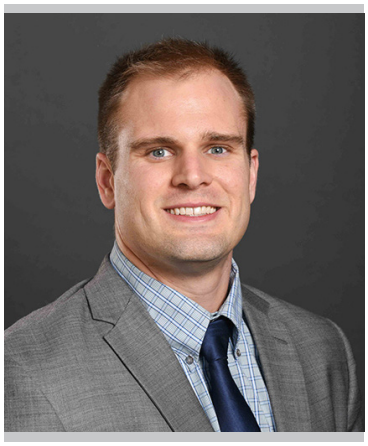
UNIVERSITY OF MARYLAND

THE BURGERS PROGRAM FOR FLUID DYNAMICS
THE FLUID DYNAMICS REVIEWS SEMINAR SERIES

INVESTIGATION OF THERMOPHYSICAL BEHAVIOR OF NON-IDEAL FLUIDS: SUPERCRITICAL MIXING AND INSTABILITIES IN TWO-PHASE FLOW



Thursday , November 2, 2023 | 3 pm

DeWalt Seminar Room
2164 Glenn L. Martin Hall

Speaker

TABER WANSTALL

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ABSTRACT

Significant thermophysical and transport non-idealities can occur along the boiling line and near the critical point of a fluid. Investigating these non-ideal behaviors is essential for understanding and optimizing processes involving non-ideal fluids, such as supercritical mixing and two-phase flow. The focus of the present work is twofold. First, supercritical injection and mixing for combustion-based applications is investigated experimentally to quantify fuel-air mixing effects under subcritical and supercritical conditions. Building on the experimental findings, a theoretical analysis is conducted to establish a phase diagram for binary fluid mixing based solely on initial fluid temperatures and pressures, providing a comprehensive understanding of the mixing process. The second aspect of this work centers on thermal instabilities in two-phase flow, particularly within the context of thermal management for aircraft applications. Theoretical and experimental analysis is implemented to quantify specific thermal instability mechanisms in two-phase pumped loop systems.

BIO

Dr. Taber Wanstall joined the University of Dayton in 2021 as an Assistant Professor in the Department of Mechanical and Aerospace Engineering after receiving his Ph.D. from the University of Alabama the year prior. His research interests cover a wide array of topics in the thermal-fluid sciences including: fuel sprays and combustion, real-fluid thermodynamics and supercritical mixing, development and implementation of quantitative optical diagnostics, two-phase flow, and hydrodynamic stability. In his research, he seeks to corroborate first principle/mathematical understandings with experimental validations.

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