Dee Howard Lecture Series

Dr. Rodney Bowersox

Professor
Aerospace Engineering Department
Texas A&M University

Hypersonic Viscous Aerothermochemistry - External Aerothermodynamics and Scramjet Fuel-Air Mixing

ABOUT THE SPEAKER

Rodney Bowersox serves as Senior Associate Dean for Research in the College of Engineering and Deputy Director of the Texas A&M Engineering Experiment Station state agency. He is the Ford I Professor of Aerospace Engineering and Texas A&M University Regents Professor. He also served as Department Head of Aerospace Engineering (2012–2020). His interests are in theoretical, experimental, and computational aerothermochemistry and hypersonic flows, with applications in aerothermodynamics, propulsion, and planetary entry. He is the founding director of the Texas A&M National Aerothermochemistry and Hypersonic Flight Laboratory. He is the TEES Executive Director and PI for the University Consortium for Applied Hypersonics, which is funded by the DoD Joint Hypersonic Transition Office. He was a DoD Vannevar Bush Faculty Fellow from 2017–2023 and is a member of the Air Force Scientific Advisory Board (2018–2020, 2022–Present). He was elected Fellow of the American Institute of Aeronautics and Astronautics in 2020 and American Society of Mechanical Engineers in 2004. He earned his BS, MS, and PhD degrees in Aerospace Engineering from Virginia Polytechnic Institute and State University in 1988, 1990, and 1992, respectively. He was elected to the National Academy of Engineering in 2025.

ABSTRACT

Current national interests in hypersonic flight provide motivation for accurate simulation of high-speed and propulsive flows, where combined viscous and high temperature gas effects are leading scientific challenges that limit system efficiencies and thermal management. The purpose of this presentation is to describe the elements of our approach, which is aimed at providing new physical understanding, mathematical treatments, and experimental discovery for high-speed viscous flows with non-equilibrium aerothermochemistry. First, an overview research challenges associated with hypersonic viscous flow is provided. Second, mathematical treatments founded in physics-based transport are presented. Third, test infrastructure development at Texas A&M University will also be described, with a preview into future capabilities. Fourth, three example problems are described, which include (1) Reynolds stress transport equation modeling and experimentation for hypersonic flows with pressure gradients, (2) energy flux transport modeling and experimentation for hypersonic flows in thermal non-equilibrium, and (3) modeling, control, and experimentation of supersonic jet interaction flows. The presentation is concluded with a preview into the ongoing high enthalpy modeling and experimentation effort.

Sponsored by the Wayne and Julie Fagan Endowed Fellowship

Wednesday, April 30th at 11:00am

Location: BSE 2.102 & https://utsa.zoom.us/j/92765610623

UTSA
Department of Mechanical, Aerospace, and Industrial Engineering

Pizza and refreshments will be provided