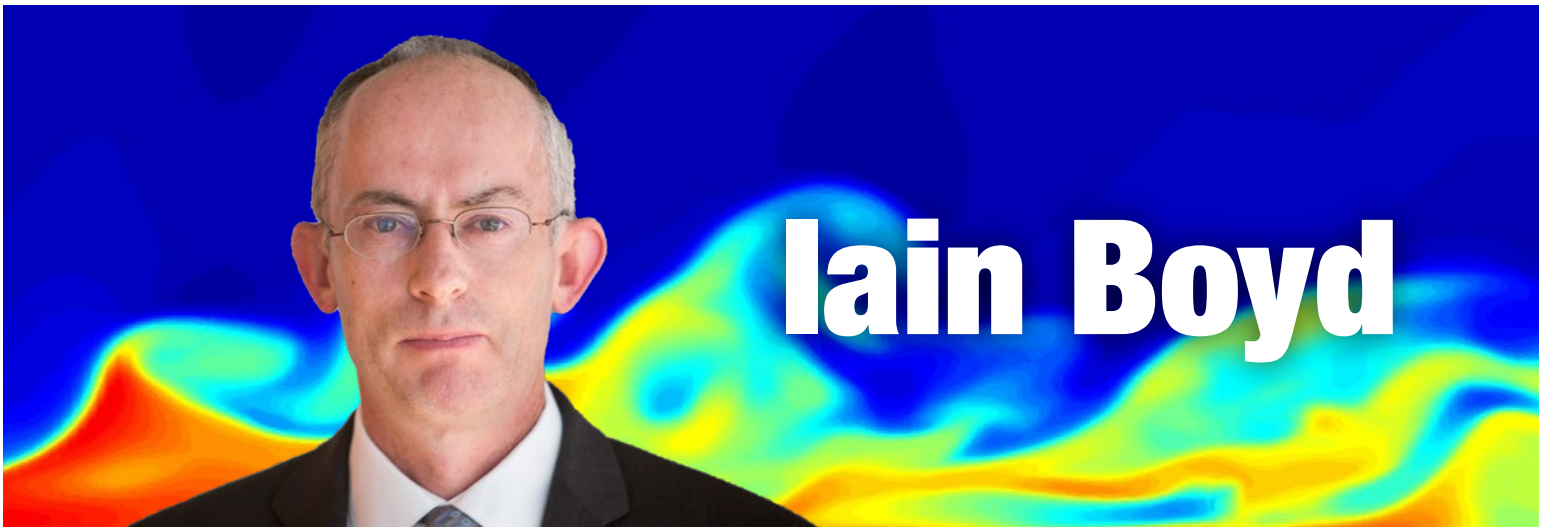
Aerospace Seminar



James E. Knott Professor of Engineering in the Department of Aerospace Engineering at the University of Michigan

Fully Coupled Modeling of Nonequilibrium Flow and Material Response for Hypersonic Vehicles

Monday, Jan. 14, 2019 | DLC | 12:00 P.M.

Abstract: Nonequilibrium describes a physical process that is not able to reach a well-defined equilibrium state within a time scale relevant to a system. For gas flow around a hypersonic vehicle, nonequilibrium energy transfer and chemistry of the molecules directly affect the heat transfer to the vehicle. The thermal response of the material comprising the hypersonic vehicle Thermal Protection System (TPS) is analyzed using strong coupling to the external nonequilibrium flow. The coupling is performed through detailed modeling of the surface energy processes. Several examples are presented of application of the fully coupled modeling framework to gas-surface interactions relevant to hypersonic flight.

Bio: Iain D. Boyd is the Faculty Director of Government Relations and the James E. Knott Professor of Engineering at the University of Michigan. He received a PhD in aeronautics and astronautics (1988) from the University of Southampton in England. He previously worked at NASA Ames Research Center in aerothermodynamics and space propulsion and was a faculty member at Cornell University. His research involves the development and application of physical models and computational methods for analysis of nonequilibrium gas and plasma dynamics processes. Dr. Boyd is a Fellow of the American Institute for Aeronautics & Astronautics (AIAA), and received the 2018 AIAA Thermophysics Award and the 1998 AIAA Lawrence Sperry Award. He is also a Fellow of the American Physical Society and the Royal Aeronautical Society. Dr. Boyd serves on the editorial boards of the Journal of Thermophysics and Heat Transfer and Physical Review Fluids, and was a member of the Air Force Scientific Advisory Board, serving as its Vice Chair from 2013-2016.