

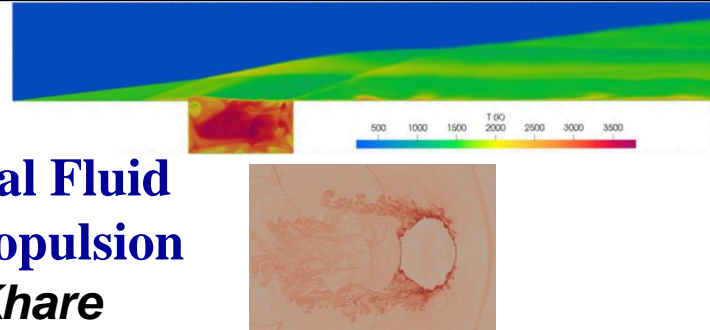


*American Institute of
Aeronautics and Astronautics
Dayton-Cincinnati Section*

**Lunch 'n' Learn
18 Aug 2023**

Fundamental Internal and External Fluid Physics Relevant to Hypersonic Propulsion

Guest Speaker: Dr. Prashant Khare



Abstract: This talk discusses some of the recent work at the Khare Research Group on two fundamental flow phenomena: (1) the interactions between shock waves and liquid interfaces; and (2) thermochemical non-equilibrium flows that a vehicle experiences at Mach numbers higher than 5. These research endeavors are motivated by complex physiochemical processes relevant to high-speed propulsion, an understanding of which is critical to the development of next-generation liquid-fueled hypersonic vehicles. In the first part of the presentation, results from a recent study that quantitatively investigates the fundamental physics underlying near-field deformation and fragmentation behavior of single and multiple liquid cylinders placed in the path of a traveling normal shock wave using high-fidelity numerical simulations. The mathematical formulation to investigate this multiphase problem is based on a modified 5-equation Kapila model that incorporates pressure-relaxation, viscous, and surface tension effects. The second part of the presentation will focus on the fluid dynamics resulting from the interactions between a Mach 11 flow and a 25° ramp embedded with a rectangular cavity. The discussion will be based on high-fidelity simulations that take into account thermal and chemical non-equilibrium processes and conjugate heat transfer.

Biography: Dr. Prashant Khare is the Associate Department Head and Program Chair of the Department of Aerospace Engineering at the University of Cincinnati (UC). He earned his Ph.D. degree in aerospace engineering from the Georgia Institute of Technology and an MS degree in mechanical engineering from the Pennsylvania State University. Dr. Khare's research interests span a wide spectrum of topics, including fundamental multiphase fluid dynamics, turbulent chemically reacting flows, thermochemical non-equilibrium hypersonic flows, machine learning, and high-performance computing (CPUs, GPUs and Quantum computing). He is an invitee to this year's National Academy of Engineering (NAE) Frontiers of Engineering (FoE) Symposium, and a recipient of Georgia Tech and Penn State 40 Under 40 awards, AIAA Outstanding Scientific Technical Contributions Section award, the Sigma Xi Young Investigator award, and ILASS' W.R. Marshall Award, among several awards and recognitions that he has received for his technical and scientific contributions.

Time: 11:45 am

Location:

*China Garden Buffet
112 Woodman Dr.
Dayton, OH 45431*

Lunch:

*You will be able to
purchase the buffet*

