

DEPARTMENT OF MECHANICAL ENGINEERING

WILLIAM MAXWELL REED SEMINAR SERIES

Applications of Radiative Heating for Space Exploration

Aaron Brandis, Ph.D.

AMA Inc.

Aerothermodynamics Branch at NASA Ames

Abstract: Vehicles entering planetary atmospheres at high speeds (6 - 12 km/s) experience intense heating by flows with temperatures of the order $\sim 10\,000\text{K}$. The flow around the vehicle experiences significant dissociation and ionization and is characterized by thermal and chemical non-equilibrium near the shock front, relaxing toward equilibrium. Emission from the plasma is intense enough to impart a significant heat flux on the entering spacecraft, making it necessary to predict the magnitude of radiative heating. Shock tubes represent a unique method capable of characterizing these processes in a flight-similar environment. The Electric Arc Shock tube (EAST) facility is one of the only facilities in its class, able to produce hypersonic flows at speeds up to Mach 50. This talk will review the characterization of radiation measured in EAST with simulations by the codes DPLR and NEQAIR, and in particular, focus on the impact these analyses have on recent missions to explore the solar system.

Bio: Dr. Brandis received his undergraduate Bachelor of Engineering (Mechanical and Space) in 2003 and his PhD in “The Measurement and Simulation of Non-equilibrium Radiation Relevant to Titan and Mars Entry” at the University of Queensland and Ecole Central Paris, France in 2009. Dr. Brandis is currently a research scientist employed by AMA Inc. in the Aerothermodynamics branch at NASA Ames. He is the task lead for the model validation component of the Entry Systems Modeling project and PM/PI for NEQAIR, one of the agencies main radiation prediction tools.

Date: October 20, 2017

Place: CB 118

Time: 3:00 to 4:00p

Contact: Dr. Alexandre Martin 257-4462

Meet the speaker and have refreshments
Attendance open to all interested persons