

2009-2010 Graduate Seminar Series

The Department of Mechanical Engineering – Engineering Mechanics

Proudly Presents

James C. Hermanson
University of Washington



Professor James C. Hermanson received a Bachelor of Science in Aeronautics and Astronautics from the University of Washington in 1977. Subsequently he was an Engineer with Boeing Aerospace Company. He performed his graduate studies at the California Institute of Technology, earning a Master of Science in 1980 and a Ph.D. in 1985, both in Aeronautics. After his doctoral studies, Dr. Hermanson was a Post-doctoral Fellow at the Institut für Physikalische Chemie at the Universität Göttingen, in Göttingen, Germany. Other professional experience includes the Boeing Aerospace Company in Kent, WA, United Technologies Research Center in East Hartford, CT. and Worcester Polytechnic Institute in Worcester, MA. Professor Hermanson has been with the Department of Aeronautics and Astronautics at the University of

Washington since 2002, where he holds the rank of Professor and also serves as the Associate Chair of the Department.

Professor Hermanson and his research groups are known for their work in compressible flow, combustion and two-phase flows. His work in combustion has included turbulent shear layer mixing and combustion, the stability and emissions of premixed and partially premixed turbulent flames, and the turbulent structure and emissions of strongly-pulsed, turbulent jet diffusion flames in normal- and microgravity. His research in compressible flow has involved the study of the penetration and structure of gas-phase and supercritical-fluid transverse jets in supersonic flow, the instability and mixing associated with shock wave passage through turbulent vortex rings and jets, fuel droplet disruption in supersonic flow, and mixing enhancement in compressible flow by lobed mixers. Multi-phase flow research conducted by Prof. Hermanson's group has examined condensing and evaporation films and the development of ultrasound diagnostics for film thickness measurement.

Thursday, Apr. 15, 2010 3:00 – 4:00 p.m. Room 112, ME-EM Bldg.

Structure and Emissions of Strongly-Pulsed Turbulent Diffusion Flames in Normal- and Microgravity

Many strategies have been explored for the control of flame characteristics and pollutant emissions in combustion systems. In this research strongly-pulsed, turbulent jet diffusion flames were investigated experimentally in microgravity and in normal gravity. The fuel flow was completely shut off between injection pulses, resulting in the generation of compact, puff-like flame structures. Both the cases of fixed injection velocity and fixed fuelling rate were studied. Cross-correlation of temperature measurements and high-speed imaging of the luminous flame were used to examine the dynamic behavior of the large scale flame structures. The celerity of the large-scale flame structures increased markedly as the off-time between pulses was decreased and the degree of interaction between individual flame puffs increased. The mean flame length was only modestly impacted by buoyancy. Correlation with the inverse of downstream distance revealed subtle effects of buoyancy on flame puff structure and celerity. For short injection times the CO concentration substantially exceeded that of the steady (non-pulsed) flame, while the amount of NO was below the steady-flame level. For sufficiently short jet off-times, steady-flame levels of both CO and NO could be achieved, but in some cases with a significantly shorter flame length.

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