PURDUE UNIVERSITY

School of Aeronautics and Astronautics

The AAE Spring 2013 Colloquium Series

Issues Related to Heterogeneous Solid-Propellant Combustion

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3:00 P.M.
ARMS 1109

COLLOQUIUM

Abstract

Over the past decade a considerable amount of effort has been dedicated to computational simulations of heterogeneous solid propellant combustion. A variety of tools have emerged from these studies. The most important are the modeling of propellant morphology, homogenization, and an unsteady three-dimensional coupled combustion code with complete coupling of the gas-phase combustion processes and the solid-phase heat conduction across the unsteadily regressing non-planar propellant surface. The combustion code is both parallel and scalable. These tools have been applied to the study of both non-aluminized and aluminized heterogeneous propellants.

After a brief introduction, various issues with regard to heterogeneous propellant flames will be discussed. These include the particle packing problem; the manner in which one-dimensional unsteady descriptions can be constructed from the multidimensional framework, for use as a subgrid component of rocket simulations; fluctuations arising from the propellant morphology and its effect on chamber flow acoustics; and the phenomena of erosive burning.

Bio

Dr. Thomas L. Jackson is a Research Professor in the Department of Aerospace Engineering (AE) and a Computational Science and Engineering Affiliate (CSE), all at the University of Illinois at Urbana-Champaign. Dr. Jackson is also Chief Scientist and a founding member of IllinoisRocstar LLC. He received his Ph.D. in Mathematics from Rensselaer Polytechnic Institute in 1985, after which he joined the staff of the Institute for Computer Applications in Science and Engineering (ICASE) where he had previously been a Graduate Research Assistant. In 1987 he became an Assistant, then (in 1992) an Associate, Professor at Old Dominion University in the Department of Mathematics and Statistics. In 1993 he returned to ICASE for five years before moving to the University of Illinois at Urbana-Champaign, where he now works. He has co-edited two books, co-authored a textbook on hydrodynamic stability, and authored or co-authored more than 180 archival and conference papers. He is currently a member of the Combustion Institute, ASME, APS DFD, and an Associate Fellow of AIAA. He has been a paper and grant referee for many organizations and journals, and is currently an Associate Editor for AIAA Journal. His expertise is in the area of basic fluid mechanics, combustion, stability, solid propellant combustion and particle packing, and the large-scale simulation thereof.

An informal coffee & cookie reception will be held prior to the lecture at 2:30 p.m. in the Hostetler Student Lounge (directly in front of ARMS 3rd floor elevators).