

MCEN GRADUATE SEMINAR

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The Response of a Compressible Gas to Extremely Rapid Transient, Spatially Resolved Energy Addition: An Asymptotic Formulation

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Abstract:

An asymptotics-based analysis of the Navier-Stokes equations is used to study the response of an inert gas volume (the near-field) to localized, spatially distributed, transient energy deposition per unit mass, significantly larger than the ambient specific internal energy in the volume. These near-field gas physics are shown to be compatible with the singular properties of far-field similarity solutions for strong blast waves (the atom bomb problem), considered originally in the 1940's by von Neumann, Taylor and Sedov. An asymptotic reformulation of the strong blast wave problem, using concepts similar to those in the near-field study, is used to rationalize and quantify *ad hoc* approximations by the aforementioned researchers.

Biography:

Kassoy has established a world-wide reputation for advanced research in theoretical fluid mechanics, combustion, reactive gasdynamics and solid rocket motor stability based on application of asymptotic methods to complex, multiscale problems. He retired from the faculty of Mechanical Engineering at the University of Colorado, Boulder (UCB) in 2008, where he was faculty member for 39 years. His research was funded by the National Science Foundation, the Department of Energy, the Army Research Office and the Air Force Office of Scientific Research. For 9 years he served as a senior-level executive administrator at UCB, responsible for campus research oversight, the Graduate School, academic budget and planning and for 3 years in the University of Colorado System, with responsibility for promoting the use of technology to enhance education. He is the author of more than 100 published technical articles in the preeminent journals of fluid mechanics, heat transfer, combustion, applied mathematics and geophysics. He is a Fellow of the American Physical Society, an Associate Fellow of the American Institute for Aeronautics and Astronautics and a member of the Combustion Institute and Sigma Xi. He held a Guggenheim Fellowship (1972-73) and a Fulbright Research Award (1982-83). He is currently writing papers on detonation initiation and explosive phenomena in reactive gas mixtures and initiating a new research project on combustion stability in liquid rocket engines.