

Dear All,

INDIAN INSTITUTE OF SCIENCE
BANGALORE

INSTITUTE COLLOQUIUM
(Mechanical Sciences)

Prof. K.P.J. Reddy
Department of Aerospace Engineering

will deliver a lecture

on

Overview of Hypersonic and Shock Wave Research
in High Enthalpy Aerodynamics Laboratory

Wednesday, September 30, 2009
at 4.00 pm in the Faculty Hall

THE DIRECTOR
will preside

All are cordially invited

Coffee/Tea:5.30 pm Venue: Reception Hall

Abstract

Global efforts are focused on the development of technologies and engines to bring the hypersonic space vehicles into the realms of civilian transport, while pushing the space travel capabilities to reach out to moon and mars at affordable costs. India has joined these efforts with its own ambitious programmes, such as, human in space program, landing of man on moon and mars exploration proposed by ISRO and hypersonic technology demonstrator vehicle of DRDO. Major hurdles in these efforts are the highly interdisciplinary nature of the hypersonic aerodynamics and lack of ground test facilities and trained scientific manpower. Keeping these demands in view our group initiated research activities in the areas of hypersonics, scramjets and shock waves about a decade ago and built most advanced high speed test and diagnostic facilities and successfully established very active research group addressing all the relevant areas of research. These facilities include a series of hypersonic shock tunnels HST2, HST3 (free piston driven shock tunnel- only one of its kind in the country), HST4 (one of the biggest hypersonic facility in the country) and HST5 (biggest combustion driven shock tunnel in the country), a couple of shock tubes CST1 and CST2 for high temperature chemical kinetics studies and about a dozen shock tubes for various scientific and industrial applications. The flow diagnostic facilities include high speed schlieren with a camera capable of taking 0.2 million fps, home grown electrical discharge technique, digital holography and interferometry and other spectroscopic techniques for flow field measurement. While all the experimental facilities are capable of meeting the needs of the national programmes,

their primary usage is for our basic research. We have made major contributions in the areas of hypersonic flow control using various techniques, chemical kinetics at high temperatures and pressures, development of high temperature materials for space applications, intake studies for scramjet engines, biological and industrial applications of shock waves. Our research on aerospikes, energy deposition into the free stream, heat addition into the shock layer by exothermic reaction of chromium atoms and magnetohydrodynamics has demonstrated aerodynamic drag reduction capabilities of these techniques for hypersonic flight vehicles. In addition, we have been able to establish active collaboration with wide range of departments within the campus and many reputed universities and institutes abroad in the areas of hypersonics and shock waves. An overview of the unique facilities listed above with their capabilities and some typical important research results of recent studies will be presented in the colloquium.