

Department of Aerospace Engineering
Indian Institute of Science
Bangalore

Brief Outline of Department

The department of Aerospace Engineering is one of the oldest departments in the country encompassing all the disciplines of aerospace engineering such as aerodynamics, aerostructures, propulsion and guidance and control. The department has well equipped laboratories which actively contribute to students' research as well as generate design data for both DRDO and ISRO missions. In addition to pursuing research the 35 strong faculty members make valuable contributions to the industries through industrial consultancy projects.

Teaching & research Activities

The department of Aerospace Engineering offers M.E degree by course work and M. Sc. (Engg.) and Ph.D degrees by research work. The students can choose courses from a large number of courses offered by about 35 faculty members of the department or from the other departments in the institute. Typically there are about 60 students in M.E course and about 75 students in research programs. In addition to teaching and guiding the students the faculty members undertake large number of research schemes and consultancy projects.

Facilities Created

1. Step scan FT-IR spectrometer useful for identification of species in the high temperature chemical reactions induced in shock tubes. This time resolved facility is being used by many users in the campus for spectroscopic identification of chemical species.



2. Digital Phosphor Oscilloscope used for structural health monitoring and non-destructive testing of smart composite structures. Health/ structural fault monitoring in turbine blades of aircraft engines are also performed and their FFT spectrum analyzed.



3. Constant Temperature Hot Wire Anemometer used for monitoring the velocity fluctuations in the wind tunnel flows.

4. Signal Conditioner used for general purpose in the low turbulence laboratory.

5. Intelligent Data Acquisition System used for structural health monitoring and non-destructive evaluation, structural vibration control and reduction of noise in helicopters by optimizing adaptive anti-resonance isolation (AARIS) system. Control algorithm is implemented on an indigenously designed and built DSP (Analog devices processor 2181) based intelligent controller, which is capable of real time onboard autonomous operation in aircraft and helicopters.

6. Microwave Generator for the atomic resonance absorption spectroscopy system used for identifying the transient species in high temperature reactions initiated in single pulse shock tube.



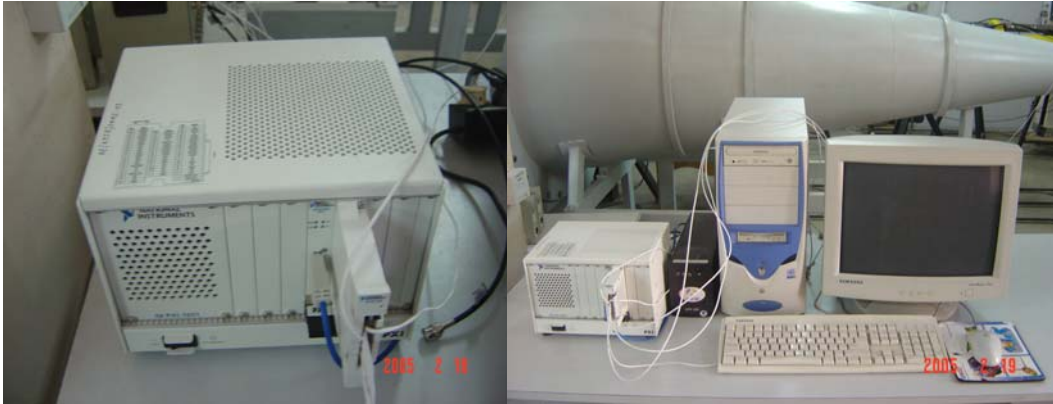
7. Vacuum Monochromator used for identifying the transient species in high temperature reactions using atomic resonance absorption spectroscopy.



8. Vibration Shaker used for structural health monitoring and structural vibration control. A wide band random vibration with three-sigma excitation of 10g is introduced on to real aircraft fin tip and it has been demonstrated that 80% reduction in vibration level is achieved using robust control implemented using Indigenous DSP based system and high voltage amplifier. This results compares favorably with that achieved recently for F-18 Aircraft in USA.



9. PC Based Data Acquisition System used for acquisition and processing of data at very high sampling rate from experiments of millisecond duration or less in the hypersonic shock tunnels.



10. Yokogawa Scope Corder used as a multichannel data acquisition system and signal conditioner for acquiring data from the millisecond duration flows in hypersonic shock tunnels and expansion tube facilities.
11. Multichannel NI PXI-6115 S series multifunction I/O board & NI DAQ for windows used for acquiring heat transfer and aerodynamic force data from the shock tunnel tests.
12. High Frequency Pressure Probes used for measuring the pressure rise behind the primary and reflected shock waves in the hypersonic shock tunnel, shock tube and expansion tube facilities.
13. Nozzle-Dump Tank/Test section Coupled to Vacuum Pumping System attached to the expansion tube facility which will be used for mounting the test model, calibration probes and flow visualization using schlieren technique.



- 14.** Multi axis manipulator- It's a computer controlled four axis high precision manipulator. Three linear axes each of travel 500 mm and resolution 50 micrometers. The rotary axis of 380 arc degree with a resolution of 0.1 arc degree. Used for real time digital radiography and computed tomography.



- 15.** Stainless Steel Rods used for fabricating the coupling joint between the compression tube and the shock tube portion of the expansion tube facility and also to enhance the wall thickness of the shock tube to withstand the driver pressures exceeding 1000 bar.
- 16.** DEWE-DAQP Medium Voltage Input amplifiers used to amplify the weak signals of heat transfer rates and aerodynamic forces for hypersonic vehicles in the shock tunnels acquired using the multichannel data acquisition systems.
- 17.** High Sensitivity Ultra Miniature Pressure Sensors used for measuring very low pressures inside the scramjet engine combustor while testing in hypersonic or free piston driven shock tunnels.

For further details contact:

Prof. B. N. Raghunandan

Chairman,

Department of Aerospace Engineering
Indian Institute of Science, Bangalore 560 012.

Email: chairman@aer.iisc.ernet.in

Tel.: (080) 22932416

Fax: (080) 23600134