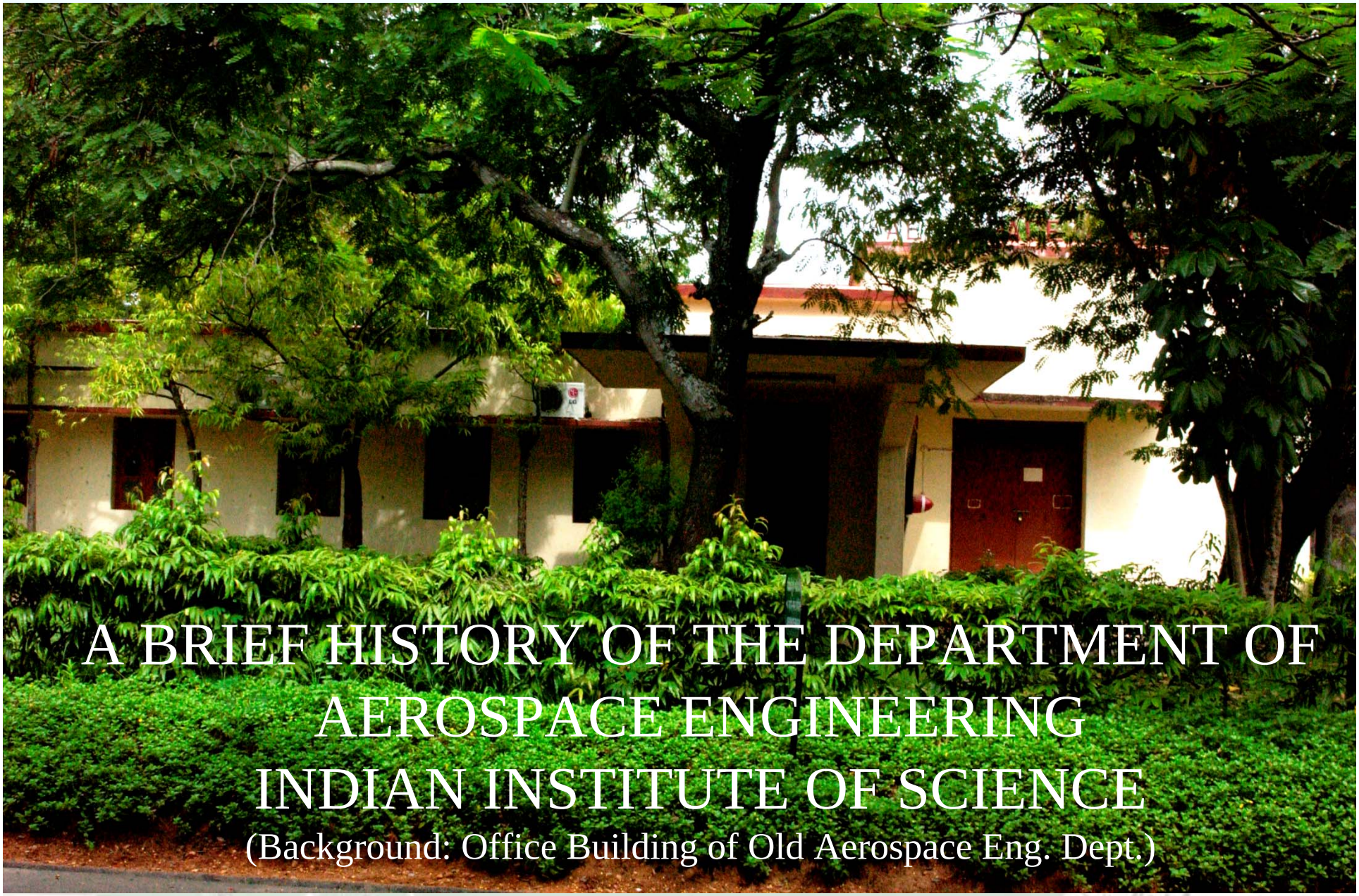


A BRIEF HISTORY OF THE DEPARTMENT OF AEROSPACE ENGINEERING INDIAN INSTITUTE OF SCIENCE

(Background: Office Building of Old Aerospace Eng. Dept.)

Sharing the Indian Aerospace Scene

1940: HAL established

Seth Walchand Hirachand

1942: Department of Aeronautical Engg started at IISc

1940s and ‘50s

- Close collaboration with HAL
- Establishment of teaching, research & test facilities

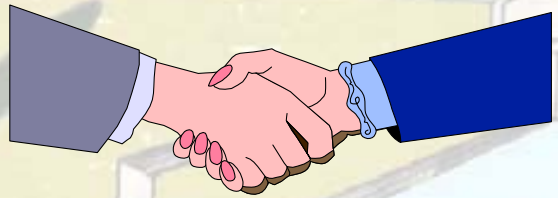
open circuit wind tunnel: 1958

Sharing the Indian Aerospace Scene

(late 50's - 60's)

- Aeronautical Engineering departments started at IITs and PEC.
- NAL : started in 1959 and moved to Bangalore in 1960
- ADE : started in 1959

- Department played an advisory role and provided the trained personnel and faculty



Sharing the Indian Aerospace Scene

(late 50's - 60's)

DRDO : started programs on rockets and missiles

Department:

started its own programs on rockets & missiles

started a course on rockets & missiles in 1968

Joint Advanced Technology Programme

May 1983

IISc-DRDL collaborative programme

to support Integrated Guided Missile Development Programme (IGMDP)

Phases 1-V (1983-2007):

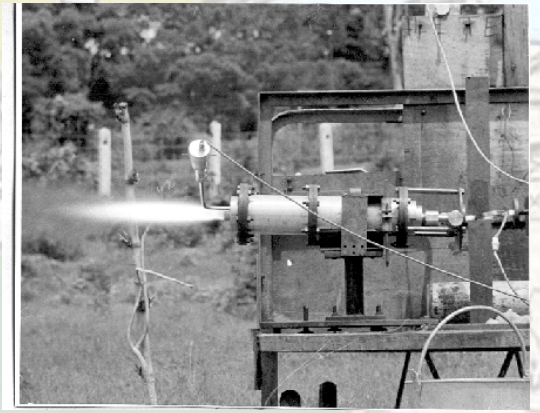
Total core funding to the tune of Rs. 50 million

Sharing the Indian Space Programs
(1970's)

- Indian space programs initiated
  - 1963: 1st sounding rocket launched from Thumba
  - 1969: ISRO formed
  - 1972: DOS formed


SLV - 3 on the launcher

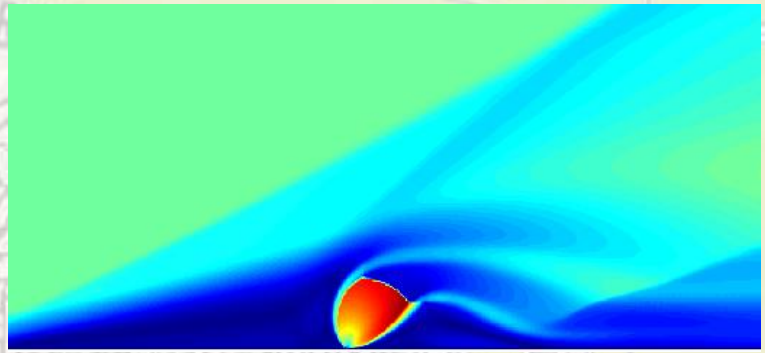
- Department
  - 1960's: Started activities on rocketry, propellants, orbital mechanics
  - 1970's: Guidance, control & navigation areas
  - Renamed as Department of Aerospace Engg.




1977 IISc-ISRO Educational Programme
1982 ISRO-IISc Space Technology Cell
Sponsored Research Projects
Sponsored Students for ME & Research
Colloquia in Space Science & Tech.
Visiting Scientists
------ etc

Sharing the Indian Aerospace Programs
(1970's-1980's)

- CFD gains importance



- Department :
  - Becomes focal point for CFD activities
  - Teaching & research in the frontier areas of CFD
  - National & international collaborations
  - Train students at IISc & other institutions

ARDB Center of Excellence in Computational Fluid Dynamics

(1997)

- Dedicated faculty
- Fundamental work
- Industrial interaction
- Hub for collaborative programs

Sharing the Indian Aerospace Programs

(Helicopter program: early 1970's)

- HAL initiates indigenous design of helicopters
- HAL-IISc helicopter training program

Composite Structures

- Late 1970's
  - Rocket nozzles
  - ALH
  - HANSA
  - LCA

- Research began in early 1970's
  - Steep growth in 80's & 90's
  - Composites in aerospace structures
  - Centre for excellence in composites (1997)

Aerospace Propulsion

- Atomization and Spray Research.
- Combustion Instabilities.
- Propellants and Internal Ballistics.
- Propellant Acquisition.

Flight Training

- Using the Department's Pushpak aircraft
  - Flight training for all students of our department
  - Remote sensing program for
    - CES (IISc)
    - Govt of Karnataka
    - Dept of Science & Technology
  - Flight orientation for scientists from NAL
  - Instrument calibration runs for BEL & other industries
  - Telemetry of flight data for NAL

(The decommissioned aircraft now welcomes everyone in the new AE building)

New Research Initiatives

(late 90's & recent past)

- To bolster Defense & Space Programs
  - Reusable & hypersonic vehicles
  - Scramjets
  - Shock tubes

Aerodynamics

- Basic fluid dynamics
- High enthalpy aerodynamics
- Experimental aerodynamics
- Atmospheric sciences

- Major facilities
  - Two large low-speed wind tunnels (open circuit & closed circuit)
  - Several small wind tunnels
  - Hypersonic tunnel
  - Two supersonic wind tunnels (76 mm x 25 mm)
  - Four hypersonic tunnels
  - Two shock tubes (39mm & 51mm) for chemical kinetic study
  - CFD

Aerospace Structures

(Aeroservoelasticity laboratory, Rotorcraft laboratory, Smart structures and systems laboratory, Non-destructive testing laboratory, Composite fabrication laboratory)

Research Areas

- **Smart rotor: Active trailing edge flap & active twist control**
- **Health monitoring of rotor blades**
- **Helicopter rotor optimization**

- **Piezoceramic electrovibratory deicing**
- **Oscillating airfoil aerodynamics**

- **Fatigue and fracture**
- **Structural health monitoring**
- **Non destructive evaluation**
- **Development of artificial neural network approach for accoustic emission signal analysis**

- **Smart structures: Vibration control, noise control, health monitoring and airfoil shape control**
- **Modeling of smart structures and systems**
- **Adaptive finite element techniques and modeling tools**

Propulsion

- Research areas
  - Rocket propulsion: solid, liquid & hybrid
  - Combustion in gas turbine engines
  - Propulsion system engineering
  - Space electric propulsion
  - Electromechanics
  - Energy engineering
  - Computational combustion
  - High energy materials
- Laboratories & Facilities
  - Advanced facilities for atomization and sprays studies
  - Advanced aeroacoustics laboratory
  - Advanced facilities for computational combustion
  - Well equipped chemistry laboratory
  - Centre for gasification & propulsion laboratory

Guidance, Navigation & Control

Aerospace Navigation

- Radio Navigation
- Inertial navigation
- Global positioning system
- Hybrid navigation
- Aircraft landing system
- Passsive position location
- Aircraft and spacecraft attitude determination

Aerospace Guidance Systems

- Homing guidance
- Proportional navigation augmented
- Angle & time constrained guidance
- Integrated guidance and control
- Integrated estimation and guidance

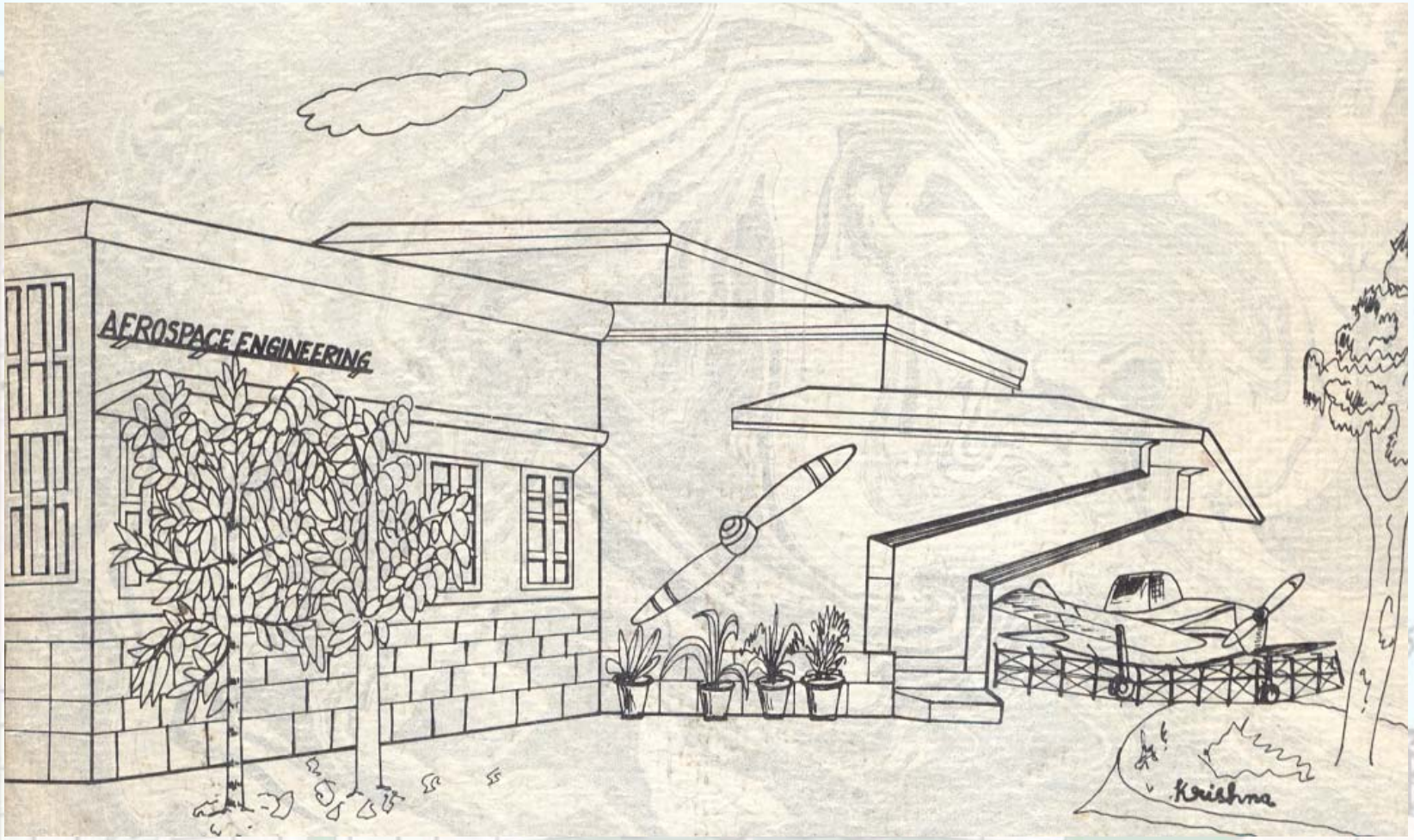
Radar Systems

- Signal processing
- Clutter rejection
- Ambiguity resolution
- Signal design
- Doppler weather radars
- Advanced Tracking theory

Aviation Systems

- Aviation weather surveillance system
- Weather data handling
- Wind shear, turbulence and wave phenomena
- Aviation safety
- Modern aircraft navigation systems
- Air traffic management

Longest Service…Largest Still….Contributed most man power and leaders… perhaps the most recognized and honoured



Thank You