ISVR Anechoic and Reverberation Chambers

At the University of Southampton
Our Facilities
The Large Anechoic Room at the ISVR is one of the largest in the country.

Construction
- Built as a box within a box, it is acoustically isolated from the rest of the building and adjacent chambers by an air gap.
- The reinforced concrete walls are 305 mm thick.

Wall Lining
- There are over 8,000 non-flammable glass-fibre cored wedges, extending 910 mm from the walls, floor and ceiling.

Dimensions
- Without wedges the bare chamber is 9.15 m x 9.15 m x 7.32 m, volume 611 cubic metres.
Large Reverberation chamber

- **Construction**
  - Built as a box within a box and isolated from the surrounding building. The internal surfaces are finished with a hard gloss paint to give a high reflection coefficient.

- **Dimensions**
  - Non-parallel walls, mean edge lengths 9.15 m × 6.25 m × 6.10 m high. Volume 348 cubic metres. Surface area 302 square metres.

- **Access**
  - Double doors and interconnecting doorway / test aperture to small chamber.

Sound level testing within the Reverberation Chamber
Research Groups:

- Fluid Dynamics & Acoustics
- Dynamics Group
- Signal Processing & Control
- Human Sciences Research Group

*(Tour of facilities separate to ISVR)*
Fluid Dynamics and Acoustics: Aircraft noise (Rolls-Royce UTC)
Turbofan Noise

• Understand the fundamental mechanisms of fan noise generation and propagation.

• Work towards new low noise fan designs.

• Develop new methods to reduce fan noise.
Jet and exhaust noise

- Understand the fundamental mechanisms of jet noise.
- Develop techniques to measure jet noise – source location.
- Develop methods to reduce/control jet noise.
Virtual acoustics and Audio Engineering

• Electroacoustics
  – Microphone arrays
  – Loudspeaker arrays
  – Transmission Line Loudspeakers
  – Compression Drivers

• Psychoacoustics
  – Auditory process models
  – Low frequency sound quality assessment

Forty channels spherical loudspeaker array
Railway noise and vibration

- Predict/measure noise (and vibration) from trains.
- Reduce the environmental impact of rail systems.
- Develop new technology to mitigate rail noise.

Field measurements of ground vibration

ISVR/Corus rail damper
Signal Processing and Control

Research Themes

• Active control of sound and vibration.
• Biomedical and Neural Signal Processing
• Bioacoustics and sonar
• Condition Monitoring
Control System for Propeller Aircraft Active Noise System

- Controller with 46 structural actuators and 72 microphones built by Ultra Electronics and now fitted to over 1,000 aircraft
Modelling Cochlear Mechanics

- Modelling the physical mechanisms of normal hearing and of how the brain processes the signals it receives, helps us understand deafness and to develop aids for the hearing impaired.
ISVR Enterprise
ISVR Consultancy Work

- Business areas include:
  - Anything that causes noise or vibration
  - Modelling
  - Measurements
  - Industrial
  - Transportation
  - Building Vibration
  - Automotive
  - Marine

Working with train companies to develop noise dampeners
Automotive and Marine

- Noise source and transmission path identification
- Silencer design
- Noise and vibration assessment and control (ships / oil rigs / leisure)
- Active control of noise and vibration

Research aims to find ways of decreasing noise output
The Anechoic Chamber
Inside the Anechoic chamber
Consultancy work

- Noise evaluations of consumer products
- If our experts detect more noise than desired they work with the manufacturer to develop the product so that noise levels are reduced.
- Tested products include microwave ovens, PCs, air conditioning units and computer back up devices.
Links to Aircraft Industry

• Noise radiation from scale models of aircraft engine nacelles are simulated in the chamber.

• Novel configurations can be tested cheaply for their noise characteristics.

• Acoustically absorbing panels are developed from such tests to reduce noise in real turbofan engines.

Research looks to find materials that can make aeroplane noise more tolerable.
The Reverberation Chamber
Consultancy work

- Companies use the chamber to test the “acoustical absorbance” of material, the sound transmission of materials and acoustic fatigue of components and structures.

- Applications to car manufacturing, aircraft manufacturing, train manufacturing and general building practices, where designers aim to use materials that can absorb and protect people from noise.

- Smaller chamber: Can be used to test the transmission of sound through materials such as doors and double glazing.
Links to Aircraft and Space Industry

- Researchers can generate high acoustic noise levels which are comparable to jet engines and space rockets.
- They can test whether equipment contained inside these craft can withstand high noise levels.

ISVR tests whether equipment inside space craft can withstand engine noise levels.