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The importance of aircraft noise in the planning of airports in South Africa.

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Presentation Contents

- Anger at airport noise.
- International standards and regulations.
- Noise mitigation measures.
- In-house noise control and management.

Introduction

Anger at Airport Noise

- Frankfurt Airport, September 2002; 56 330 airport noise complaints.
- Stansted Airport, residents submitting 100 objections per day to proposed runways.
- Brussels Airport, proposing to spend $151 million on appeasing disgruntled neighbours.
- *Flight International 17-30 December 2002.*

Basics of Noise

- Unwanted sound.
- Usually temporary.
- Annoying if it varies, or has tonality.

Comparative Illustration

- Car passing at 12m = 65dB.
- Truck passing at 12 m = 85dB sounds twice as loud as the car.
- MD80 departure passing 1500ft overhead creates 85dB.
- Telephone dialtone = 80dB.

Noise Scales

- “A” weighting most closely represents human ear’s perception of noise.
- dBA commonly used in aircraft noise measuring.

Noise Metrics

- LAmax – Maximum noise level for a given noise event.
- SEL – Sound exposure level. A measure of the physical energy of the noise event which takes into account intensity and duration.

Average Energy Metric

- LAeq – Equivalent sound level. Measures steady A-weighted sound over a specified time period, usually 24 hours.
- Weighted metrics – eg in SA the Noisiness Index adds a weighting of 10 dB to flights between 10pm and 6am, in the USA the DNL adds a weighting to flights between 10pm and 7am.
- Equivalent and weighted metrics used for land-use planning purposes.

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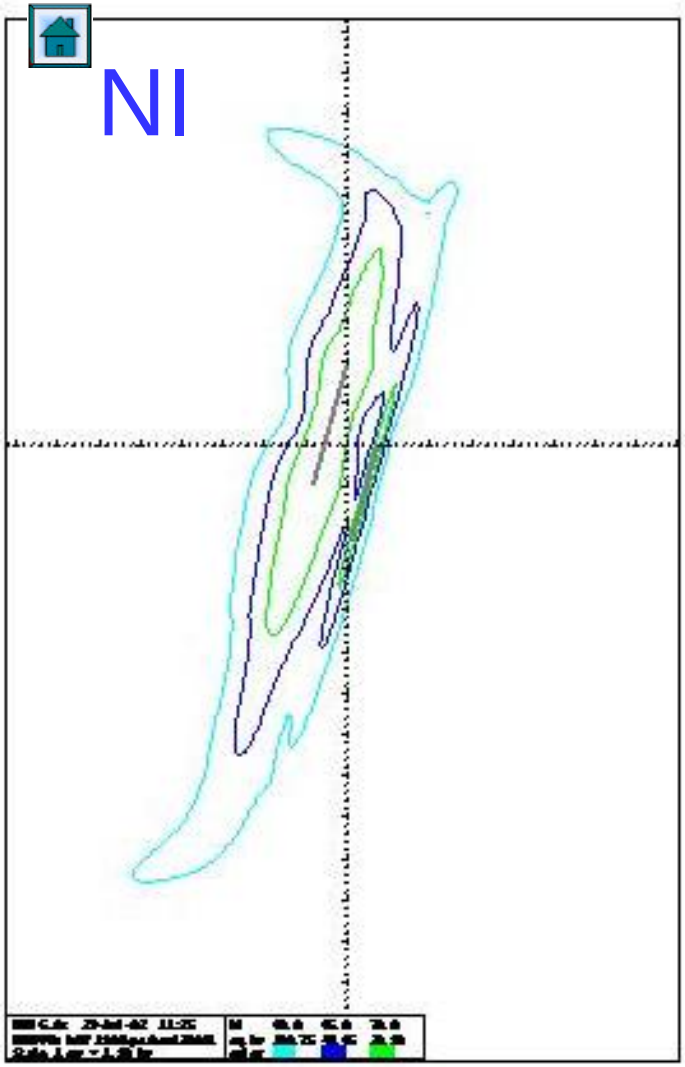
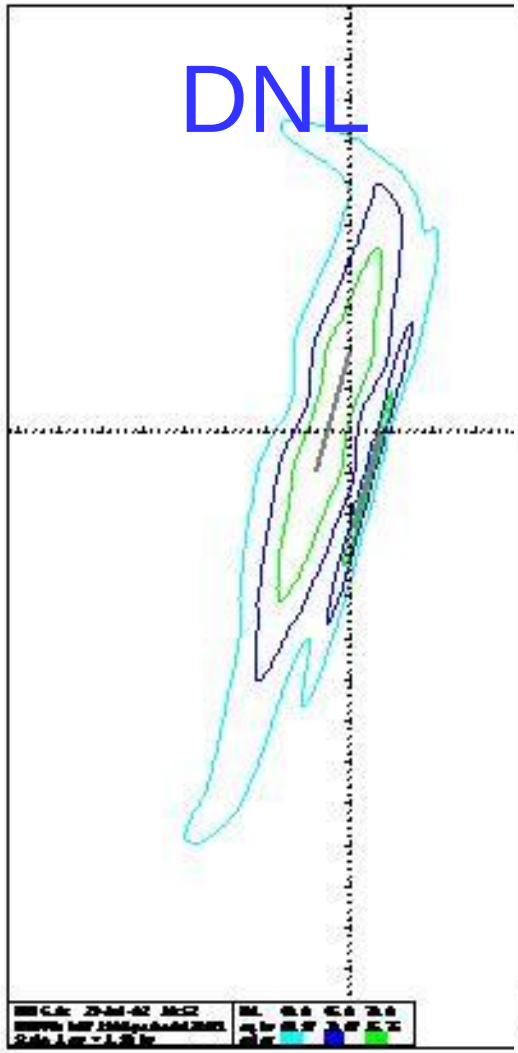
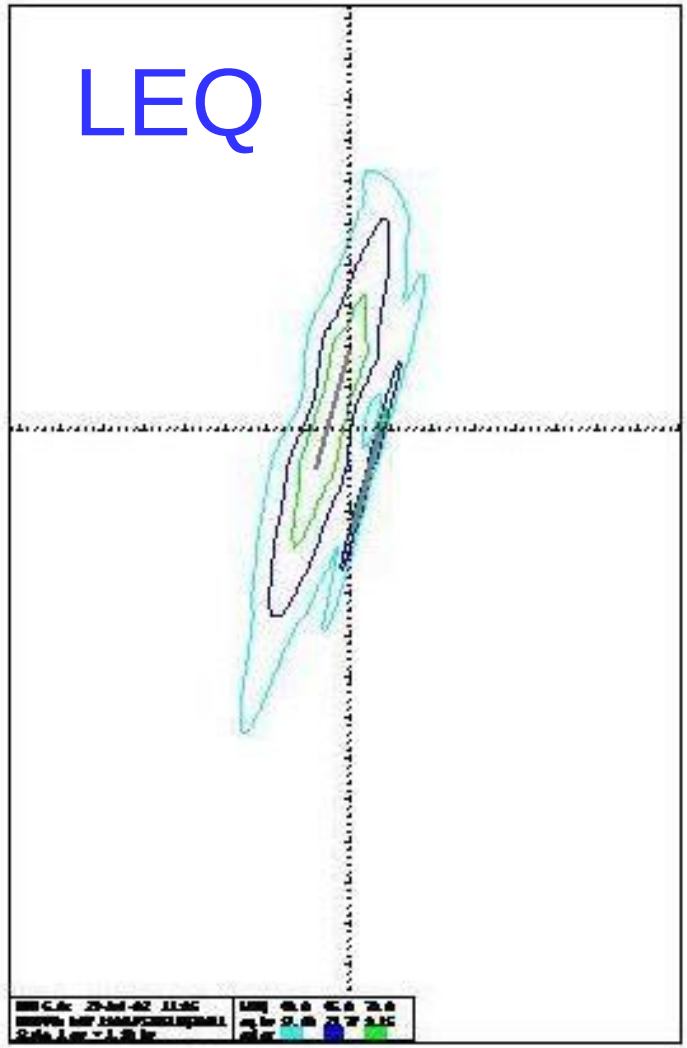


DNL



LEQ

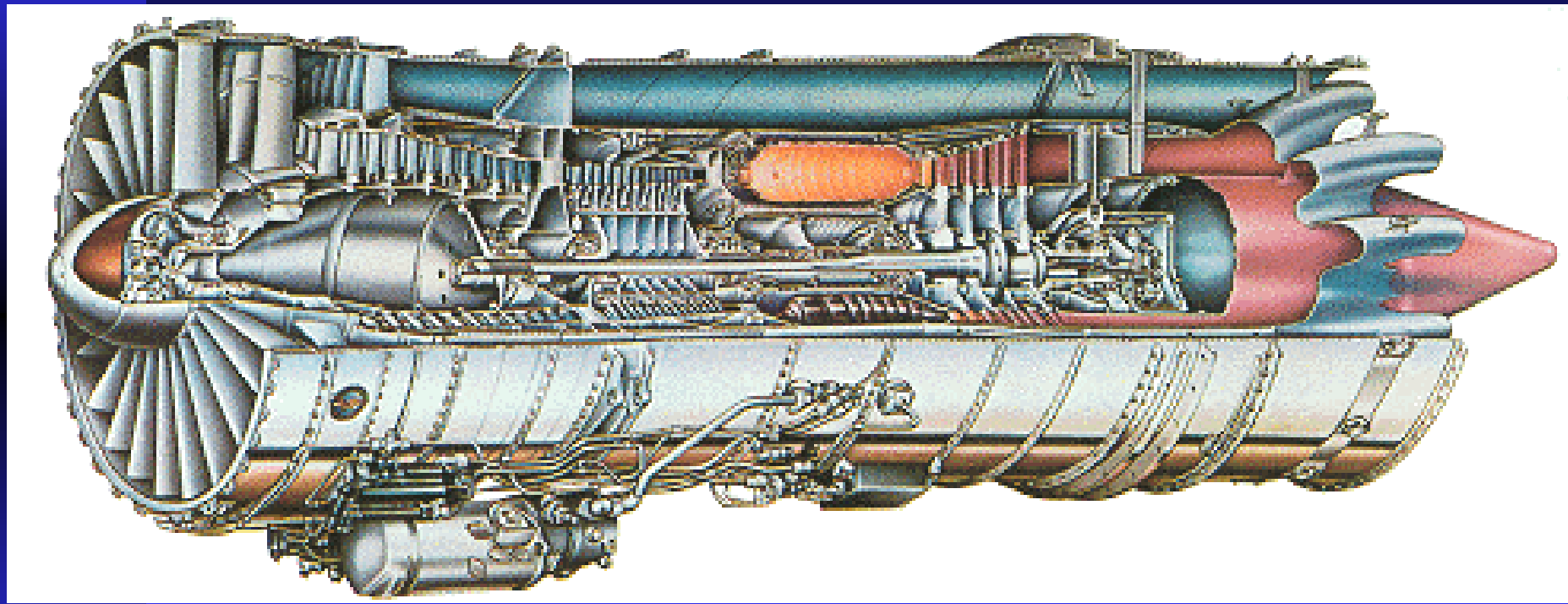


International Standards & Regulations

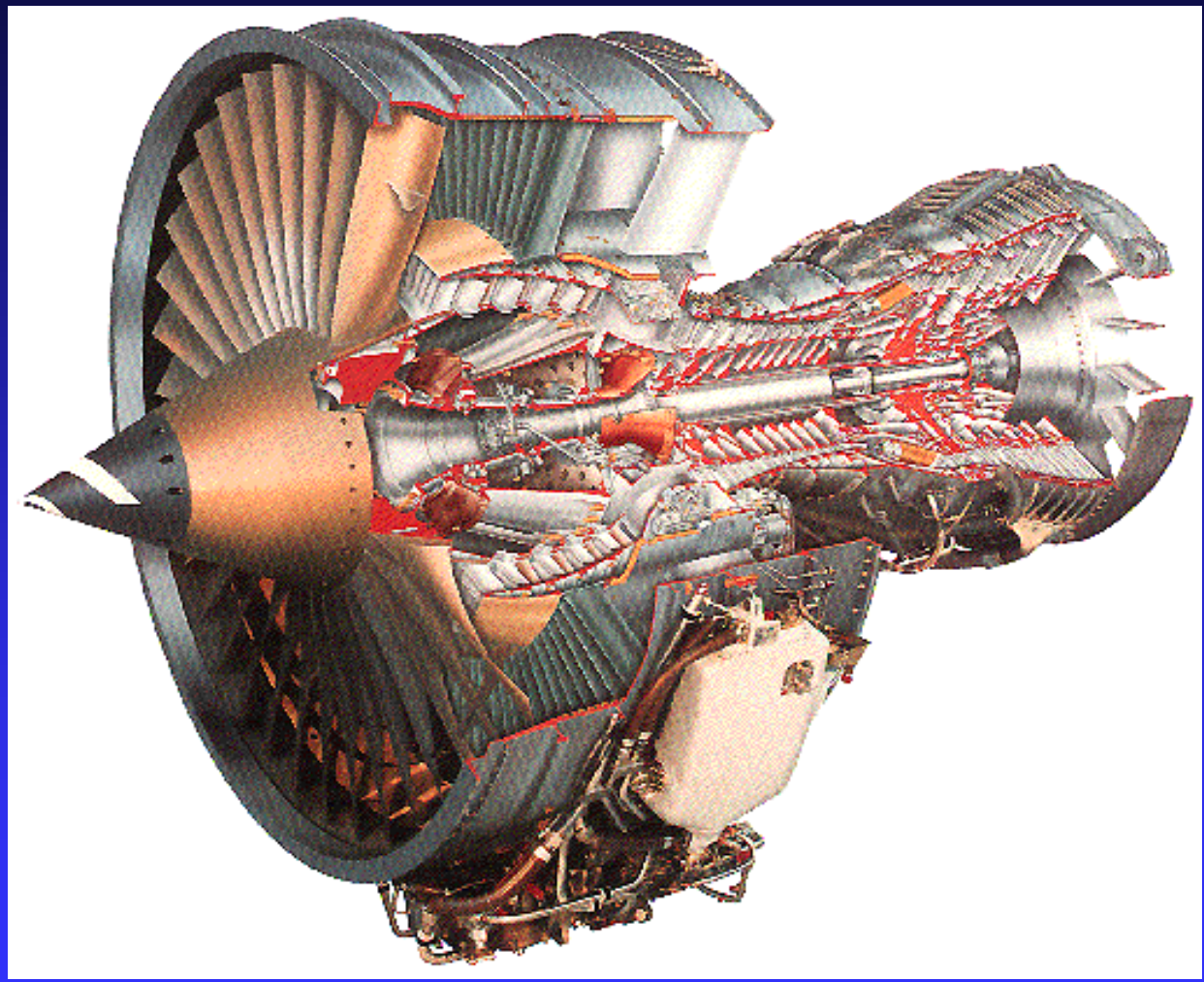
- Within the UN, ICAO responsible for aviation matters.
- ICAO Annex 16 Volume 1 Aircraft Noise has reference.
- Non-noise certificated (NNC) aircraft were not covered by Annex 16.

- Chapter 2 aircraft were certificated before 6 October 1977.
- Chapter 3 aircraft were certificated after 6 October 1977 and are the “quietest”.
- Within Chapter 3, the larger the aircraft, the more noise it is permitted to make. “Quietness” is therefore a relational term.

Example of a Chapter 2 jet engine



Example of a Chapter 3 jet engine



Example of a non-noise certificated aircraft (NNC)

Examples of Chapter 2 aircraft

Examples of Chapter 3 aircraft

Other Standards-setting & Regulatory Authorities

- Europe – JAA.
- USA – FAR Part 36, Stage 2 & 3 very similar to ICAO Chapter 2 & 3.
- SAE – A-21 Committee on Aircraft Noise conducts acoustic research – modelling.
- RSA – DOT currently finalising a policy on Aircraft Noise and Engine Emissions.

  SANS 10103 and 10107 govern land-use planning and aircraft noise modelling.

Aircraft Bans and Operational Restrictions

- NNC and Chapter 2 aircraft banned in America, Europe and Oceania.
- Non-addition rule operative from 1990, & non-complying aircraft were to be phased-out by April 2002.
- Chapter 2 operators may face curfews etc at airports which have not implemented bans and phase-out.

Aircraft Noise Control in Africa

- About 375 Chapter 2 and NNC aircraft still being operated.
- Some States have proposals, or weak controls to limit NNC and Chapter 2 aircraft.
- Any limitations on Chapter 2 aircraft in African States will have major consequences for operators of these aircraft.

ICAO CAEP

- Committee on Aviation Environment Protection (CAEP) recently agreed to tighter “Chapter 4” aircraft noise certification standards.
- Most current production aircraft can meet the proposed standard.
- Operators of older Chapter 3 aircraft may encounter restrictions.

Noise Mitigation Measures

- Aircraft noise impact extends many kilometers from the airport boundary.
- Some airports consider this not to be their problem.
- Noise within the airport perimeter also a problem.
- ICAO encourages States and interested / affected parties to co-operate.

- Engine modification.
- New aircraft purchase.
- Operational controls:
  - Curfews
  - Prohibition
  - Total night time noise limit (budget)
  - Noise abatement flight profiles
  - Preferential runways
  - Minimum noise routes
  - Runway operations
  - Noise complaints

- Long term land-use planning.
  - Airport noise contours:
    - Noise modelling.
    - Noise monitoring.

Engine Modification

- Hush kits:
  - Reduce noise.
  - Penalty of increased fuel consumption and reduced performance.
  - Cost of a hush-kit can be more than the value of the aircraft.

Engine Modification

- Re-engine:
  - Remaining airframe life?
  - Cost implications.

New Aircraft Purchase

- NNC and Chapter 2 aircraft may be replaced with Chapter 3 aircraft.
- But… be aware of CAEP/6 revisions to Annex 16.
- Cost considerations may preclude this option.

Operational Controls

- Curfews and operating restrictions:
  - Curfews eliminate night noise.
  - Reduce ability of aviation industry to move people and goods.
  - Runway congestion and peaking may result.
  - High density airports.
  - Intercontinental flights.

Prohibition on Noisy Aircraft

- NNC and Chapter 2 aircraft only have restrictions placed on their operating times.
- Operators with a high percentage of NNC and Chapter 2 aircraft are negatively impacted.

Total Night-time Noise Limit

- Also known as a noise budget.
- A total noise limit is set. Through noise monitoring, the limit is monitored, and when it is exceeded, flights are restricted.
- Can be challenging to implement and monitor.

Noise Abatement Procedures

- When aircraft are close to the ground, noise abatement procedures can be effective:
  - Reduce thrust when it is safe to do so on departure.
  - Delay deployment of flaps and undercarriage on arrival.
  - Implement continuous-descent profiles.

Preferential Runways

- If an airport has multiple runways, those runways which result in the least noise impact could be used.
- Alternatively, the use of runways for arriving and departing aircraft could be rotated so as to share the noise impact.
- Requires comprehensive knowledge of census statistical data.

Runway Operations

- Use of reverse thrust may be limited within safety considerations.
- Intersection departures may be limited. The full length of the runway could be used, in order for the aircraft to climb as high as possible before overflying noise sensitive areas.

Noise Complaints

- A noise mitigation office may receive and investigate complaints.
- Operators contravening limits may be asked to explain themselves, or eventually be penalised.

Funding Considerations

- Implementation, monitoring and enforcement cost money.
- "Polluter pays principle…"
- Is the *aircraft* operator, or the *airport* operator the polluter?
- Costs must be paid out of revenue somewhere.
- Operators may display strong resistance.

Long-term Land-use Planning

- Airport operators and town planners should co-operate.
- Ensures best combination of land-use and fulfillment of airport's potential.
- Future noise from predicted growth must be taken into account.
- New runway developments, flight path changes and aircraft fleet and operational changes must be planned for.

Long-term Land-use Planning

- Airport noise contours are crucial for planning purposes.
- When combined with land-use maps, actual or potential conflicts may be identified.
- States should have guidelines or better still legislation in place for land-use planning.
- Land development objectives should be set.

Establishing In-house Noise Control and Management Capacity

- Communication between and involvement of key role players is crucial.
- Inclusivity rather than exclusivity.
- Not limited to the largest airports.


AIR FRANCE
F-GETA
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ZS-NLM

Establishing In-house Noise Control and Management Capacity

- Tourism plays a major economic role in South Africa.
- Charter operators shuttling tourists between hub airports and holiday destinations should consider the impact of their operations.
- Aircraft may be small, but the “sense of place” may be hampered.

Establishing In-house Noise Control and Management Capacity

- Noise modelling will enable interested and affected parties to examine the noise impacts of all aircraft operations.
- When equivalent level contours will not suffice, supplemental noise information can be made available.
- Includes maximum noise, time duration above a specified level, number of aircraft above a specified level, total number of aircraft etc.

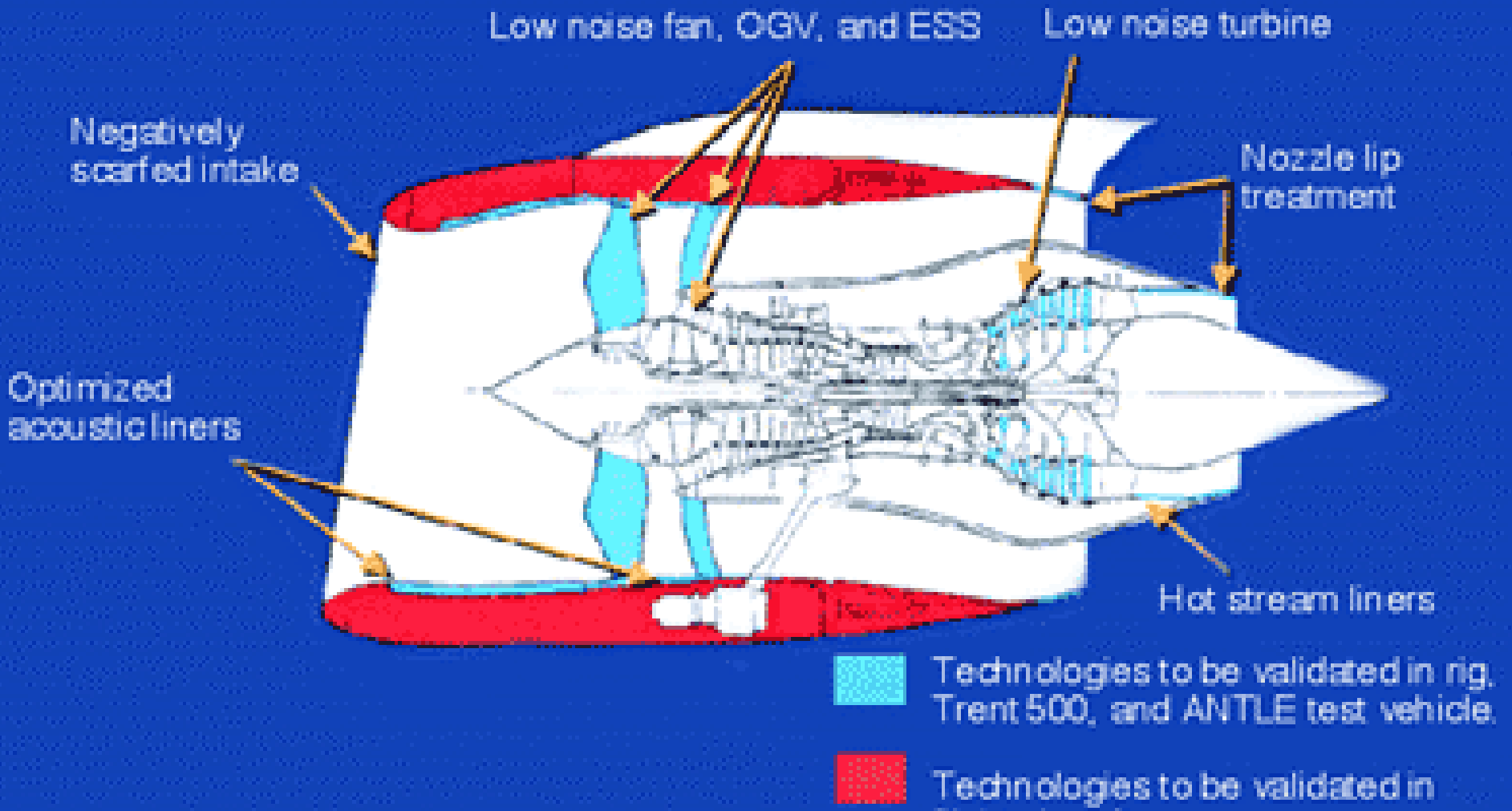
What should airports be doing?

- Communication – airlines, airports, town planners, residents etc.
- Setting noise control goals.
- Establish an airport environmental committee.
- Meet regularly to assess progress towards goals.

What are the manufacturers doing?

- Boeing
- Airbus
- CFM
- IAE
- GE
- Pratt & Whitney

Quiet engine technology



Source: Society of Automotive Engineers

Boeing Rolls-Royce quiet engine

Source: *www.boeing.com*

University of the Witwatersrand

Wits gives you the edge.

End of presentation.