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ICAO

International Civil Aviation Organization is a specialized agency of the United Nations.

Task: to codify the principles and techniques of international air navigation and ensure safe and efficient air transportation

Bodies:
Assembly: member states, reviews the work of the organization, approves amendments to the Convention on International Civil Aviation (Chicago, 1944), which are subject to ratification by Member States.
Council: 36 member states, reports to the Assembly, gives direction of work, adopts international Standards and Recommended Practices (SARPs) to develop the Annexes

CAEP: Committee on Aviation Environmental Protection, policies and standards on aircraft noise and aircraft engine emissions

Regulatory Framework
ICAO’s Noise Policies

**Environmental Goal:**
“Limit or reduce the number of people affected by significant a/c noise”

- Annex 16, Vol. 1
  - Regulation on certification noise for aircraft types
- Balanced Approach
  - Process for to reduce noise impacts in the vicinity of airports

Annex 16 (Environmental Protection) Vol. 1

Noise Standard principles:

The prime purpose of noise certification is to ensure that the **latest available noise reduction technology** (state of the art) is incorporated into the aircraft design demonstrated by procedures which are relevant to day to day operations, to ensure that noise reduction offered by technology is reflected in reductions around airports. (CAEP 7)

Consists of:
13 different chapters of a/c types including calculations of noise levels as a function of Take-Off mass
Certification

Noise certification Reference:

Fly-over: 6.5 km from brake release point, under the take-off flight path
Sideline: the highest noise measuring recorded at any point 450m from the runway axis during take-off
Approach: 2km from the runway threshold, under the approach flight path

Cumulative levels are defined as the arithmetic sum of the certification levels at each of the three points

Aircraft mass is included in the calculation

(Noise measurement at airport: check DIN 45643:2011 Measurement and assessment of aircraft sound)

Chapter 14 (outcome of CAEP 9)

Increase in stringency of 7 EPNdB relative to Chapter 4 (cumulative levels)

Supplementary condition of not less than 1.0 dB below Chapter 3 at each certification point

Applicable to new types submitted to certification on or after 31 December 2017 (31 December 2020 for aircraft < 55t)

Change in the noise limits applicable to subsonic jet a/c with take-off masses < 8.618 t
Development of certification standards

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Applicable year</th>
<th>Cum Margin (EPNdB)</th>
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<tbody>
<tr>
<td>2</td>
<td>1972</td>
<td>-16</td>
</tr>
<tr>
<td>3</td>
<td>1978</td>
<td>0 (Reference)</td>
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<tr>
<td>14</td>
<td>2017/2020</td>
<td>+17</td>
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Restrictions

Aircraft operating restrictions were first considered in 1990. The Assembly established a global phase-out of Chapter 2 aircraft. States were allowed to impose restrictions on non-Chapter 3 aircrafts (over 25 years old). The phase-out was implemented between 1995 and April 1, 2002. No operation restrictions were allowed on Chapter 3 aircraft. So the phase-out addressed the concept of aircraft economic life.

In 2001 the question of phase-out of Chapter 3 aircraft surfaced again along with a new standard of Chapter 4. CAEP had to analyse in detail on the benefits. The result was no global phase-out of Chapter 3 aircraft (limited environmental benefits, but extreme costs). Instead ICAO endorsed the concept of the Balanced Approach (ICAO, Appendix C of Assembly Resolution A33-7).
**Legal Framework – Balanced Approach**

**ICAO:**

1968 Assembly Resolution A16-3: Aircraft noise in the vicinity of airports
2001 Assembly Resolution A33-7, Appendix C
2007 Assembly Resolution A36-22, Appendix C
2008 Doc 9829: Guidance on the Balanced Approach to Aircraft Noise Management

**The Main Objective:**

Noise problems can be addressed in an environmentally and economically responsible way within the system, guaranteeing a clear framework for securing competition and offering planning reliability for established airline networks and airport development.

All elements should be regarded equally, operational restrictions should only be the last resort. And if implemented, an appropriate phase-in time should be granted so that aircraft operators can adjust their business plans (example: phase-out Chapter 2 a/c established in 1990, decision in 1995, effective in 2002).
BA is about Appropriateness of Measures

The concept of BA is based on steering a/c operations and environmental impact in the vicinity of an airport.

The appropriateness of the chosen measure has to be in direct relation to the needed mitigation.

Securing operation is the final task, there are different, but appropriate measures in each element of the BA.

Each measure has to be valued (environmentally, socially and economically) regarding long term planning reliability for all stakeholders.

Objectives (BA)

**Principle:** a systematic, flexible and global applicable solution by all stakeholders to fight aircraft noise

- Harmonized airport by airport approach
- Use of objective and measurable criteria
- Consultation with stakeholders (collaborative approach)
- Timely and adequate notification of decisions
- Planning Reliability

Can be achieved by adopting a flexible, consistent and transparent process when assessing noise objectives and alleviation measures.
Procedure to Define the Optimal Measures:

- Process Owner: relevant authority (FAA, CAA, HMWVL)
  - Prove of a/c noise problem
  - Assessment of the current and future noise impacts
  - Evaluation of costs and env. benefits
  - Selection of measures (environmental benefit + cost-effectiveness)
  - Achieve transparency of evaluated measures
  - Consultation with stakeholders (operators that use the airport)
  - Provision for dispute resolution (public)

Concept and Elements

- Assessment of noise situation
- Four principal elements:
  - Reduction of noise at source
  - Land-use planning and management
  - Noise abatement operational procedures
  - Operational restrictions on aircraft
- Analysis and selection of measures
  - Interrelationships
Concept and Elements 1
Assessment of Noise Situation

➢ Identify noise problem

➢ Define noise objective

➢ Tools/procedures useful for assessing:
   – Noise contours
   – Noise index
   – Baseline (year) and forecast
   – Management plans

Concept and Elements 2
Four Main Elements

I. Reduction of Noise at Source

   – Today operational standard is Chapter 3 worldwide
   – Today certification standard is Chapter 4 (Chapter 14 in 2017)
   – Expensive research and development costs
   – High investment costs for airlines
   – Operational time of a/c about 25-30 years

II. Land-use Planning and Management

Airport Planning Manuel, Part 2, (Doc 9184)
Harmonizing land-use and airport activities

Ensuring at existing airports that further residential developments do not endanger reduction on noise already achieved (prevention method)

Conversion of incompatible land-use
III. Noise Abatement Operational Procedures

Safety requirements (!)
Procedures to minimize noise load under the flight path (inbound, outbound), residential areas
Ground operation of a/c and a/c services
➢ Relatively low costs

Examples:
– Run-ups areas or facilities
– GPUs, APU, PCA
– Reverse trust
– Descent operations: low drag – low power / CDO
– Differential runway use
– Aerobridges & Hydrant refueling reducing ground movement

IV. Operational Restrictions

ICAO requirement: Last resort due to impacts of operational restrictions
Bans and restrictions have negative impact on airport capacity and traffic flow (a/l networks, connectivity)
Night flight restrictions have negative economic impacts – not only on local level, but also on regional, national and international level

Examples:
– Brussels (Belgium) DHL: super hub in Europe, loss of 1,500 direct jobs
Concept and Elements 3
Analysis and Selection of Measures

- Follows comparative economic analysis based on “best practice” evaluation techniques / methods
  - CDM (cooperate decision making), sensitivity analysis

- To achieve maximum environmental benefits in the most cost-effective manner

- Combinations of measures can be necessary to achieve noise objectives

- Interrelationships must be taken into account
  - Between different main elements of BA
  - Between noise and emissions (trade-off noise, CO₂, NOx)

Is the BA the right tool for airports?

Not well covered in the BA
- Noise Monitoring, Flight Tracking
- Complaints Management
- Community Relations
- Communications – Publications, Website, Meetings
- Community Outreach – Education, Projects

The process of the BA
- Will not lead to an understanding with the affected population in the vicinity
- Will lead to confrontations in the public
- Has no value for a/p’s community engagement
Airport Noise Charges

ICAO's policy on noise charges was developed in 1981.
- noise charges as preventive measures
- costs are attributed to airports
- costs are to be recovered from the users
- at airports facing noise problems
- costs have to be non-discriminatory between users

Tool by ACI World developed since 2002: Noise Rating Index

- is an effective tool that is compatible with the ICAO system of noise certification standards; combines cumulative reductions with reductions at the three measurement points
- provides a consistent reference point to encourage manufacturers to develop and market the quietest possible aircraft and encourage airlines to upgrade their fleets as rapidly as possible.

Differentiation of noise classes

<table>
<thead>
<tr>
<th>Noise class</th>
<th>Measured noise</th>
<th>NRI</th>
<th>LAX dB(A)</th>
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<tr>
<td>1</td>
<td>CRJ 7</td>
<td>A320</td>
<td>80.1 – 81.5</td>
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<td></td>
<td>83.1 – 84.5</td>
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<tr>
<td>4</td>
<td>B777-2/S/W/E</td>
<td></td>
<td>84.6 – 86.0</td>
</tr>
<tr>
<td>5</td>
<td>MD11 Cargo</td>
<td></td>
<td>86.1 – 87.5</td>
</tr>
<tr>
<td>6</td>
<td>A380</td>
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<td>87.6 – 89.0</td>
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<td>16</td>
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<td>93.6</td>
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</table>
ICAO documentation (a/c and a/p noise related)

**Annex 14: Aerodromes**
- Volume I – Aerodrome Design and Operations
- Volume II – Heliports

**Annex 16: Environmental Protection**
- Volume I – Aircraft Noise

**Guides:**
- Guidance on the Balanced Approach to Aircraft Noise (Doc 9829)

**Manuals:**
- Airport Planning Manual, Part 2 Land use and Environmental Control (Doc 9184)
- Airport Economics Manual (Doc 9562)
- Manual of Airport and Air Navigation Facility Tariffs (Doc 7100)
- Continuous Descend Operations (CDO) (Doc 9931)

**Database:**
- ICAO Noise Data Bank (NoiseDB)

**Others:**
- Effects of PANS-OPS Noise Abatement Departure Procedures on Noise and Gaseous Emissions (CIR 317)
- Noise Abatement Procedures (Doc 9888)
- Noise Assessment for Land-Use Planning (CIR 116)

Thank You

Questions?