Workshop Series 1 Panel
“Aircraft Design Validation – Environmental Standards”
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Moderator:
- Gilles Morin, Chief Aircraft Certification Standards, Transport Canada Civil Aviation

Panel Members:
- Warren Gillette, Environmental Specialist, FAA
- Jan Boettcher, Environmental Protection Officer, EASA
- Alan Eccleston, Chief Airworthiness Engineer, Rolls-Royce
- Guy Readman, Certification Manager Environmental Protection, EASA
- Jodi Diamant Boustead, Chief Engineer, Airworthiness and Certification, Pratt & Whitney Canada
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AGENDA

➢ HARMONIZATION

➢ BALANCED APPROACH FOR NOISE

➢ NOISE vs. EMISSIONS: Trade-offs or Conflict?

➢ ENVIRONMENT vs. SAFETY
  ➢ An authority’s perspective
  ➢ An industry’s perspective

➢ OPEN DISCUSSION
HARMONIZATION

Warren Gillette
Environmental Specialist
FAA
Current Status

- Standards among participants are sufficiently similar to allow bilateral agreements.
- Standards and recommended practices are similar to international standards and practices and relatively harmonized at the legislative level, e.g., EASA CS 34 and 36 and US 14 CFR Part 34 and 36.
- In theory, results for any environmental certification test would be repeatable and any differences or exceptions would be understood and addressed by both parties.
Issues

- Harmonization at legislative level is not so complex.
- Implementation may introduce variations that may challenge goal of an "equivalent level of safety or environmental compliance," e.g.,

  - Guidance Documents
  - Staff qualifications and training
  - Delegation schemes and oversight
  - Authority over changes in type design
  - Types and kind of documentation
  - Specific certification practices in field
Possible Steps to Achieve

Meet regularly and include not just policy, but certification staff to:

- Familiarize all with similarities, differences and equivalency.

- Formulate program documentation and technical implementation procedures together.

- Promote mutual cooperation in compliance finding activities.

- Promote mutual training programs.
BALANCED APPROACH FOR NOISE

Jan Boettcher
Environmental Protection Officer
EASA
Points of Discussion

- ICAO Standards vs. local rules.
- Design improvements vs. operational improvements.
ICAO Balanced Approach*

Objectives

» Address aircraft noise problems at individual airports in an environmental responsive and economically way.

» Achieve maximum environmental benefit most cost-effectively.

ICAO Balanced Approach

Four Elements

- Reduction of noise at source.
- Land-use planning and management.
- Noise abatement operational procedures.
- Operating restrictions.
ICAO Balanced Approach

Analysis & selection of measures

➢ To achieve maximum environmental benefit in the most cost effective-manner.

➢ Combination of measures may be necessary to achieve noise objectives.

Note: The Balanced Approach was introduced in Europe with Directive 2002/30/EC
Noise vs. Emissions

Trade-offs or Conflict?

Alan Eccleston
Chief Airworthiness Engineer
Rolls-Royce
Environmental design trade-offs

- Engine pressure ratio
- Bypass ratio
- Flight altitude and route

- NO\textsubscript{x}
- Noise
- Contrails and cirrus clouds

One tonne of kerosene burned generates:
- 3.16 tonnes CO\textsubscript{2}
- 1.29 tonnes water

ICCAIA holding dialogue on environmental interdependencies (specifically noise and fuel burn)
Noise & Specific Fuel Consumption improvement

1980’s technology

Current technology

Advanced Turbofan

Open Rotor

Noise Margin relative to Chapter 3 (dB)

SFC Improvement

-30%
-20%
-10%
0%
10%
20%
25%
30%
35%
AIRWORTHINESS
vs.
ENVIRONMENTAL STANDARDS
An authority’s perspective

Guy Readman
Certification Manager
Environmental Protection
EASA
Bilateral Agreements Considerations

- International, National and Local Political influence:
  - Positive contribution?
  - Interference?

- How stringent and the extent to which EP Standards are implemented is a political decision.

- Compliance goes beyond meeting standards – it also determines “noise and cleanliness characteristics” which:
  - Enter into the public domain.
  - Used for other purposes (e.g. defining airport operating restrictions).
Environmental Protection - Another Dimension of “Safety”

Noise: potential health effects
- Sleep Deprivation
- Stress
- Hearing Damage
- Quality of Life

Engine emissions: potential environmental and health effects
- Acid Rain (SOx & NOx)
- Ozone Destruction linked to skin cancer (NOx)
- Greenhouse gas lead to climate change - extreme weather conditions, rise in sea level, ecological stress (CO2, NO)
- Local air quality (Particulate Matter)
Influence of the ICAO Process

- The ICAO/CAEP process relies on consensus.
- Challenges with ICAO Standards and Advisory Material:
  - Complexity and ambiguity of text.
  - Translated text does not always reflect the intent of original text.

Recommendation:

- Use simple and clear text ("plain English").
- Promote dialogue between CAEP and end-users.
AIRWORTHINESS
vs.
ENVIRONMENTAL STANDARDS
An industry’s perspective

Jodi Diamant Boustead
Chief Engineer
Airworthiness and Certification
Pratt & Whitney Canada
### Potential Conflicts: Aircraft Safety vs. Environmental Issues

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<th><strong>Aircraft/Flight Safety</strong></th>
<th><strong>Environmental Impact</strong></th>
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<tr>
<td>Approach procedures</td>
<td>stabilized approach</td>
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<td>Traffic separation</td>
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<td>compatibility with aircraft fuel system</td>
<td>type of emissions ? - overall environmental impact</td>
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<td>Fire Extinguishing Systems</td>
<td>weight</td>
<td>release of agent - overall environmental impact</td>
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# Cost/Benefit Trade-offs

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<tr>
<th>Description</th>
<th>Cost</th>
<th>Implementation Time</th>
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<tbody>
<tr>
<td>Engine Technology Improvements</td>
<td>(high)</td>
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<tr>
<td>Slower Aircraft Speeds</td>
<td>(low)</td>
<td>(low)</td>
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<tr>
<td>Improved Route Planning</td>
<td>(low)</td>
<td>(medium)</td>
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<tr>
<td>Improved Dispatch Procedures</td>
<td>(low)</td>
<td>(medium-low)</td>
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<tr>
<td>Improved ATM</td>
<td>(medium-high)</td>
<td>(medium-high)</td>
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Open Discussion
2009 Europe / US International Aviation Safety Conference

“Global safety in challenging times - How can we better achieve harmonised implementation?”

2-4 June 2009
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