Noise Certification Workshop

Session 2: Aircraft Noise Certification

Harmonisation

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In June 1990 at a meeting of the JAA Council and the FAA, the FAA Administrator committed the FAA to support the harmonisation of the U.S. regulations with the Joint Aviation Regulations (JAR).
Harmonisation / ARAC

➤ In January 1991 FAA established the Aviation Rulemaking Advisory Committee (ARAC) to serve as a forum for the FAA to obtain input from outside the government on major regulatory issues facing the agency.
Harmonisation / The ARAC process...

- Was industry led;
- Task group membership was by invitation and consisted of experts drawn from industry and authorities;
- Groups met in closed session; but
- Recommendations were presented to ARAC Council in public forum before being forwarded to FAA for consideration.
The FAA tasked ARAC with noise certification issues. These issues involve:

- the harmonisation of FAA Part 36 with JAR 36;
- the harmonisation of associated guidance material including equivalent procedures; and
- interpretations of the regulations.
Harmonisation of Part 36 with JAR 36 or Annex 16?

- The initiative was to harmonise FARs with JARs.
- The publication of JAR 36 gave FAA the incentive to harmonise FAR 36 with JAR 36.
- JAR 36 is irrevocably linked with Annex 16.
- ...and so the effect of harmonising with JAR 36 was to harmonise with Annex 16.
- Any change to JAR 36 could only be made after a change to Annex 16.
Harmonisation / ARAC Task Groups

- Task groups established under ARAC on May 3, 1994 to look at:
  - Light propeller driven aeroplanes (Appendix G and Chapter 10)
  - Helicopters (Appendices H & J and Chapters 8 & 11)
  - Transport Category Large & Turbojet aeroplanes (Appendices A, B & C and Chapter 3)
Task group identified and resolved 10 substantive differences.

8 differences resolved by changes to FAR 36 (2 still in rulemaking process).

2 differences resolved by changes to Annex 16/JAR 36.

Light propeller driven aeroplanes

Substantive changes include:

➔ **Before** harmonisation FAR 36 required the microphone to be located 1.2 m above the ground.

➔ **After** harmonisation FAR 36 required an inverted ground plane microphone.
Light propeller driven aeroplanes
Substantive changes include:

❖ **Before** harmonisation FAR 36 allowed use of maximum continuous power in noise certification reference flight procedure.

❖ **After** harmonisation FAR 36 rulemaking proposal would require takeoff power throughout noise certification reference flight procedure.
Light propeller driven aeroplanes
Remaining difference...

- Aerobatic category airplanes are required to be certificated in the U.S. under FAR 36, however, such airplanes are exempt under ICAO Annex 16.
Task group identified and resolved 39 substantive differences.

35 differences resolved by changes to FAR 36.

4 differences resolved by changes to Annex 16/JAR 36.

Helicopters
Substantive changes include:

➔ **Before** harmonisation the variation of EPNL with weight was required for takeoff or flyover and approach when testing below the maximum certificated weight.

➔ **After** harmonisation the variation of EPNL with weight is not required. Instead measures within a weight range of 90% to 105% of maximum certification weight is required.
Helicopters
Substantive changes include:

Before harmonisation no anomalous wind conditions must exist before testing.

After harmonisation no anomalous meteorological conditions (including turbulence) must exist before testing.
Helicopters

Substantive changes include:

➔ Before harmonisation the upper weight limit for helicopter certification under Part 36, Appendix J was 6000 lbs.

➔ After harmonisation the upper weight limit for helicopter certification under Part 36, Appendix J is 7000 lbs and is consistent with FAA part 27 & Annex 16 Chapter 11.
Helicopters
Substantive changes include:

➔ **Before** harmonisation the speed criteria only applied $V_H$ (max continuous power).

➔ **After** harmonisation the speed criteria added an alternative $V_{NE}$ (Not to Exceed).
Helicopters

Remaining differences:

➔ Applicability provisions

➔ Sections 36.11 and H36.305 of part 36 prescribe a more lenient noise limit (Stage 1) for changes in the type design of certain helicopters; and

➔ Section 36.805(c) prescribes a more lenient noise limit for helicopters that the FAA finds to be the first civil version of a helicopter that was designed and constructed and accepted for operational use by an Armed Force of the United States.
Transport/Turbojet aeroplanes (Appendices A & B; Chapter 3)

- Total number of differences between FAR36/AC and Annex16/ETM was 151.
- 122 changes to Part36/AC (of which 38 are described as “substantive”).
- 25 changes to Annex16/ETM (no changes were deemed to impact stringency).
- Part 36 amendment published July 8, 2002.
Transport/Turbojet aeroplanes
Substantive changes include:

Before harmonisation an aircraft had to comply with the part 36 amendment that is in effect on the date of type certification.

After harmonisation an aircraft has to comply with the part 36 amendment that is in effect on the date of application for type certification.
Transport/Turbojet aeroplanes
Substantive changes include:

- **Before** harmonisation the minimum test temperature was set at 36°F (2.2°C).
- **After** harmonisation the minimum test temperature is set at 14°F (-10°C).
Transport/Turbojet aeroplanes
Substantive changes include:

➤ **Before** harmonisation for the measurement of sideline noise of propeller driven aeroplanes only one pair of microphones had to be symmetrical.

➤ **After** harmonisation symmetrical microphone positions are required at each sideline noise measurement location.
Propeller-Driven Aeroplanes
Lateral Measurement Positions

Lateral reference
distance 450 meters
Peak noise level
Transport/Turbojet aeroplanes
Substantive changes include:

- **Before** harmonisation a propeller driven aeroplane had to demonstrate full power noise levels at the sideline (lateral) position.

- **After** harmonisation (for propeller driven aeroplanes only) an alternative full power measurement at a fixed height underneath the aircraft may be used.

- ...after March 2002 this simplified method became mandatory (for propeller driven aeroplanes).
Propeller-Driven Aeroplanes
Fixed Height Lateral Measurement

Lateral reference
distance 450 meters
Peak noise level

Lateral - fixed
height procedure:
650 meters
Transport/Turbojet aeroplanes
Substantive changes include:

- **Before** harmonisation in the calculation of the reference procedure a particular “engine” was not specified.

- **After** harmonisation the requirements specify “average” engine thrust and define what an “average” engine is.
Transport/Turbojet aeroplanes
Substantive changes include:

- **Before** harmonisation both the flyover and lateral noise certification levels are determined using a single reference flight path that may include a thrust cutback.

- **After** harmonisation for tests conducted after August 7, 2002, the lateral noise level shall be demonstrated using full takeoff power throughout the takeoff flight path.
Transport/Turbojet aeroplanes

Substantive changes include:

Before harmonisation the reference takeoff speed was the minimum approved value of V2+10 knots or the all engines operating speed at 35 ft, whichever is greater.

After harmonisation the reference takeoff speed shall be at least V2+ 10 knots but not greater than V2+20 knots.
Transport/Turbojet aeroplanes
Substantive changes include:

- **Before** harmonisation the reference approach speed was \((1.3V_S + 10)\) kts or the speed used to establish approved landing distance, whichever is greater.

- **After** harmonisation the reference approach speed shall be \((V_{REF} + 10)\) kts” \((V_{REF}\) is the reference landing speed used for airworthiness certification).
Transport/Turbojet aeroplanes
Substantive changes include:

Before harmonisation the instant in time by which a SLOW time weighted sound pressure level shall be characterized shall be the mid-point of the average period.

After harmonisation the instant in time by which a SLOW time weighted sound pressure level shall be characterized shall be 0.75 seconds earlier than the actual readout time.
Transport/Turbojet aeroplanes

Substantive changes include:

- After harmonisation Part 36 requires that the following test parameters be reported:
  - Centre of gravity position
  - APU “ON” or “OFF”
  - Airbrake position
  - Propeller pitch angle
  - Condition of engine pneumatic bleeds and power take-offs
Transport/Turbojet aeroplanes

Remaining differences:

- Definition of wind speed.
- Procedure to correct for the effect of background (ambient) noise. (Resolved)
- Provision for design characteristics that require different reference procedures.
- Requirement for document attesting to noise certification be carried on board aircraft.
Harmonised guidance material?

- Many of the harmonisation issues were resolved via a change to the ETM.
- ETM version SGAR7 is appended to FAA Advisory Circular 36-4C.
The work continues….

ICAO CAEP Working Group 1 continues to:
- Resolve non-harmonised items
- Work on integration of ETM with AC.

The outcome of all this effort will be to facilitate mutual recognition of FAA and ICAO (i.e. JAA, EASA) approvals.
Thank you