



Noise Certification Workshop

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SESSION 3: AIRCRAFT NOISE RE-CERTIFICATION

HISTORY

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SUMMARY

This paper presents the history of aircraft noise re-certification. It compares the different Standards developed by ICAO, US FAA, Russian Civil Aviation, and European Authorities (JAA and EASA).

Attention is directed at difficulties encountered in the noise re-certification process due to the complexity of equivalent procedures and the lack of appropriate expertise.

1. NOISE RE-CERTIFICATION BEGINNING OF PROCESS

1.1 Noise re-certification was first introduced when the Chapter 2 aircraft phase-out was defined. It began in US with the Stage 2 phase-out, and was followed by Europe. At this time aircraft manufacturers presented to Authorities new noise certification demonstrations to show compliance of aircraft certificated originally as Chapter 2 aircraft with Chapter 3 limits.

1.2 Some re-certifications were also conducted to satisfy local rules when reduction of tenth of dB became necessary. At the beginning of the process, this situation was seen as re-certification. Today, it is considered to be a re-evaluation of the noise levels (when such evaluation is conducted within same Chapter).

1.3 In the beginning, with regard to aircraft noise certification, the goal of the manufacturers was to satisfy a Standard (not necessary with the lowest noise levels). With the intensification of the economic competition, the interest in obtaining the lowest possible noise levels for an aircraft was important, and the re-certification process developed.

1.4 Re-certifications that were conducted in the case of an aircraft/engine modification led to difficulties arising from the modifications introduced by the evolution of

noise measurement techniques between the time of the measurement of the parent aircraft/engine and the modified version.

1.5 First re-certifications were conducted with no specific ICAO rules or guidelines. To face difficulties created in Europe by the introduction of re-certification demonstrations for modified aircraft or non modified aircraft, the JAR 36 Study Group and ECAC developed technical guidelines to harmonise the decision procedures established by different European Authorities.

2. ICAO STANDARDS FOR AIRCRAFT NOISE RE-CERTIFICATION

2.1 With the European experience of re-certification from Chapter 2 to chapter 3, and with the Chapter 4 approval by ICAO, CAEP decided to develop technical material for a re-certification of heavy aeroplanes to chapter 4.

2.2 The first action was to define precisely the word “re-certification”. Agreement was reached on the following definition: “re-certification: certification of an aircraft with or without a revision to its certification noise levels, to a Standard different to that to which it was originally certificated ”.

2.3 Before ICAO re-certification work was conducted, any new calculation of certificated noise levels within same Chapter was considered as a re-certification. After agreement on the re-certification definition was reached, ICAO considered that if a new calculation method is applied to recalculate certificated noise levels within same Chapter it is not a re-certification, but only a new evaluation of noise levels.

2.4 The administrative steps for Re-certification are included in the Annex 16, Amendment 7 (for noise re-certification to Chapter 4), and technical guidelines are developed in the Environmental Technical Manual (ETM).

2.5 When re-certification to Chapter 3 was first introduced, some people considered that the level of accuracy could be less than for an initial certification due to the small number of aircraft concerned. In fact, the accuracy of demonstration would have to be even better, as the margins to Chapter 3 limits are small.

2.6 CAEP agreed to the following principle for re-certification regarding the level of accuracy. “It shall be granted or validated by the State of registry of an aircraft on the basis of satisfactory evidence that the aircraft complies with requirements which are at least equal to the applicable Standards specified in the Annex 16”.

2.7 Another principle was defined for the application for re-certification: “the date used by a certificating Authority to determine the re-certification basis shall be the date of acceptance of the first application for re-certification”.

3. **CHAPTER 2 PHASE-OUT**

3.1 In Europe, the Chapter 2 phase out of aeroplanes with Maximum Take-off Weight (MTOW) of 34t or more, or more than 19 passenger seats became applicable on 1 April 2002.

3.2 Manufacturers have modified Chapter 2 aeroplanes to meet Chapter 3 Standards. Aircraft re-engined with engines having a by-pass ratio of three or more were not considered as re-certificated aeroplanes.

3.3 Among the solutions for re-certification to Chapter 3 available to “no modified aircraft”, the reduction of MTOW, MLW, flap deflection, thrust de-rate. For modified aircraft, demonstrations were generally conducted with flight tests but systems were not accurate on the ones used in the original noise certification demonstration. Some new demonstration procedures were applied such as cutback power in sideline measurements, the development of speeds over V_2 which were accepted by some certifying authorities. This disparity in the certification process contributed to difficult problems and a distortion of competition

4. **RE-CERTIFICATION PROBLEMS.**

4.1 Basic difficulties were encountered in defining the technical regulations for re-certification. There were big differences between the regulations in force at the time of the re-certification application and the regulations in place when the noise certification of the parent aircraft was undertaken. On top, initial data were obtained with techniques which were rejected a few years later. Decisions on the process varied among the certifying Authorities.

4.2 In some cases for the same aircraft type the re-certification to Chapter 3 resulted in different decisions from different authorities. This situation, led to competition among airlines. Generally, airlines from countries that had the benefit of having noise specialists in their civil aviation authority received a more strict assessment, a situation that is not acceptable.

4.3 For some of these re-certificated aircraft, noise monitoring systems around the airports have recorded noise level, not very well correlated with certificated noise levels, raising suspicion about the reliability of the noise re-certification process. Also, the impact of the Chapter 2 phase out was not as effective as anticipated, and some aircraft previously expected to stop operating have remained in service.

5. **RE-CERTIFICATION EXPERIENCE**

5.1 In general, significant differences in the margins to the new Chapter limits are verified between new certificate aircraft type and re-certificated aircraft. For example in the case of re-certification to chapter 3, modern aircraft certified as Chapter 3 demonstrated average margins from 12 to 25 EPNdB, and re-certificated aircraft only 0.1 to 3 EPNdB. This experience lead to the establishing the basic principle for re-certification to Chapter 4. The work conducted for noise re-certification will be at same level of accuracy as that for an initial noise certification.

5.2 An initial step was the need to differentiate between a modified aircraft and a non modified aircraft. Is an aircraft with a flap deflection limitation a modified aircraft?

5.3 In general, for a non-modified aircraft, the original noise certification demonstration was conducted by flight tests. In the case of re-certification and new data analysis, this procedure is to be conducted in line with the requirements in effect at the time of the application for re-certification.

5.4 When the original demonstration was conducted under the ‘family concept’, many items needed to be checked, e.g if the technical procedures for flight tests of the parent aircraft were different of current practices, and if the noise engine static test was conducted for 3, 4 5 engine changes. Significant differences exist between initial engine noise static tests and later tests such as the lack of use of Inflow Control Devices (ICD or TCS), different (not concrete) ground quality and a different height of the microphones (at 8m height and not in grazing incidence on the ground)

5.5 Certificated noise levels are an average of at least 6 values, associated with an interval of confidence to 90%. This IC 90% is limited in Annex 16 to +/- 1.5 EPNdB. If a good calculation was applied during IC calculation for combining one flight test and 4 or 5 different engine noise static tests, the IC value would have been certainly outside of the authorised limits.

5.6 Experience on these first re-certifications showed that uncertainty on re-certificated noise levels was larger than the margin between noise levels and Chapter 3 limits, (not very accurate).

5.7 In conclusion, the first re-certification experiences showed that re-certification could be more difficult to conduct than initial certification. Therefore noise specialists involved in noise re-certification must have considerable experience in noise certification.

7. RE-CERTIFICATION TO CHAPTER 4

7.1 Experience in the past on re-certification to chapter 3 was taken into account in ICAO guidelines developed for re-certification to Chapter 4.

7.2 Note that no Chapter 3 phase-out is established, but voluntary re- certification to chapter 4 will be applied due to economic constraints and the development of local rules.