



ADVANCE NOTICE OF PROPOSED AMENDMENT (A-NPA) No 2008-21

"Review and Analysis of Certification Noise Levels for Subsonic Jet and Heavy Propeller-driven Aeroplanes"

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A. EXPLANATORY NOTE

I. General

1. The purpose of this Advance Notice of Proposed Amendment (A-NPA) is to solicit comments on an envisaged study in order to review and analyse certification noise levels for subsonic jet and heavy propeller-driven aeroplanes to understand the current state-of-the-art of aircraft noise technology. The final report on this study has to be provided at the eight meeting of the ICAO Committee of Aviation Environmental Protection (CAEP/8) in February 2010. The scope and the content of this report are described in more detail below.
2. The European Aviation Safety Agency (hereinafter referred to as the Agency) is directly involved in the rule-shaping process. It assists the Commission in its executive tasks by preparing draft regulations, and amendments thereof, for the implementation of the Basic Regulation¹ which are adopted as "Opinions" (Article 19(1)). It also adopts Certification Specifications, including Airworthiness Codes and Acceptable Means of Compliance and Guidance Material to be used in the certification process (Article 19(2)).
3. When developing rules, the Agency is bound to following a structured process as required by Article 52(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board and is referred to as "The Rulemaking Procedure"².
4. This rulemaking activity is included in the Agency's 2009 advance planning. It implements part of the rulemaking task BR.008(a).
5. The text of this A-NPA has been developed by the Agency. It is submitted for consultation of all interested parties in accordance with Article 52 of the Basic Regulation and Articles 5(3) and 14 of the Rulemaking Procedure.

II. Consultation

6. To achieve optimal consultation, the Agency is publishing the A-NPA on its internet site. Comments should be provided within 3 months in accordance with Article 6(4) of the Rulemaking Procedure. Comments on this proposal should be submitted by one of the following methods:

CRT: Send your comments using the Comment-Response Tool (CRT) available at <http://hub.easa.europa.eu/crt/>

E-mail: Only in case the use of CRT is prevented by technical problems these should be reported to the [CRT webmaster](mailto:CRT_webmaster@easa.europa.eu) and comments sent by email to NPA@easa.europa.eu.

Correspondence: If you do not have access to internet or e-mail you can send your comment by mail to:
Process Support
Rulemaking Directorate
EASA
Postfach 10 12 53
D-50452 Cologne
Germany

Comments should be submitted by 14 January 2009. If received after this deadline they might not be taken into account.

¹ Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.03.2008, p. 1).

² Management Board decision concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material (Rulemaking Procedure), EASA MB 08-2007, 13.6.2007.

III. Comment response document

7. All comments received in time will be responded to and incorporated in a Comment Response Document (CRD). This may contain a list of all persons and/or organisations that have provided comments. The CRD will be available on the Agency's website and in the Comment Response Tool (CRT).

IV. Content of the advance notice of proposed amendment

Background

8. ICAO Standards and Recommended Practices for aircraft noise were first adopted by the ICAO Council in 1971 pursuant to the provision of Article 37 of the Chicago Convention³ and designated as Annex 16, Volume I to the Convention. On 20 November 2008 the Fifth Edition, Amendment 9 of Annex 16, Volume I to the Chicago Convention will become applicable. Aircraft noise certification Standards and Recommended Practices for jet aeroplanes, propeller-driven aeroplanes and helicopters are dealt with in Part II of Annex 16, Volume I to the Chicago Convention.
9. Nowadays noise certification of subsonic jet and heavy propeller-driven aeroplanes is dealt with in the same chapters of Annex 16, Volume I to the Chicago Convention, namely Chapters 3 and 4. Chapter 3 is applicable to subsonic jet aeroplanes for which the application for a type certificate was submitted on or after 6 October 1977 and before 1 January 2006. Chapter 3 is also applicable to heavy propeller-driven aeroplanes for which the application for a type certificate was submitted on or after 1 January 1985 and before 1 January 2006. During its fifth meeting in February 2001 the ICAO Committee on Aviation Environmental Protection (CAEP/5) decided to propose an increase of stringency for subsonic jet and heavy propeller-driven aeroplanes by introducing Chapter 4 of Annex 16, Volume I to the Chicago Convention. Subsequently this proposal was adopted by the ICAO Council and Chapter 4 became applicable for subsonic jet and heavy propeller-driven aeroplanes for which application for a type certificate was submitted on or after 1 January 2006. Compared to Chapter 3, the noise measurement and evaluation procedures to be applied remain the same, but the cumulative noise limit as laid down in Chapter 4 is 10 EPNdB⁴ lower than the cumulative limit of Chapter 3⁵.
10. ICAO noise standards should reflect the state of the art. Therefore, at the seventh meeting of the ICAO Committee on Aviation Environmental Protection (CAEP/7) in February 2007, CAEP was invited to consider proposals for keeping source noise certification standards up-to-date in a simple and efficient manner and more in particular, CAEP was invited to task ICAO/CAEP Working Group 1 ("Noise Technical") to examine the need of possible future noise reduction on a regular basis⁶. Following this proposal, in the course of the discussion during CAEP/7, general agreement was reached that further work on assessing the need for additional increase noise stringency for subsonic jet and heavy propeller-driven aeroplanes should go forward. Some difficulty was experienced during that meeting, however, in specifying exactly how the task should be tackled. Finally CAEP/7 decided to request Working Group 1 to "Provide a report to CAEP/8⁷ on the results of a review and analysis of certification noise levels for subsonic jet and heavy propeller-driven aeroplanes⁸ to understand the current state-of-the-art of aircraft noise technology". This work item was assigned to Working Group 1 as Project N.24.

³ The Convention on International Civil Aviation on 7 December 1944.

⁴ Effective Perceived Noise Level (EPNL) in decibels (dB) as defined in Appendix 2 of Annex 16, Volume I to the Chicago Convention.

⁵ A cumulative noise level is the algebraic sum of the lateral full-power, the flyover and the approach noise level. The Chapter 4 maximum noise levels are laid down in Section 4.4 of Chapter 4 of Annex 16, Volume I to the Chicago Convention. The reference noise measurement points (lateral full-power, flyover and approach) are defined in Section 3.3.1 of Chapter 3 of Annex 16, Volume I to the Chicago Convention.

⁶ European Commission and the European CAEP Members: Keeping noise at source standards up-to-date. CAEP/7 meeting, Montreal, Canada, 5-16 February 2007, working paper CAEP/7-WP/64.

⁷ Eight meeting of the ICAO Committee on Aviation Environmental Protection to be held in February 2010.

⁸ At the second ICAO/CAEP/8 Steering Group meeting in September 2008 the original wording ("transport category jet aircraft") was changed to "subsonic jet and heavy propeller-driven aeroplanes".

Question 1:

The Agency is interested in knowing whether stakeholders consider it useful to assess the need for increased noise stringency for subsonic jet and heavy propeller-driven aeroplanes at this stage and if so, consider a state-of-the-art analysis as an appropriate approach.

11. In order to make progress concerning this work item ICAO/CAEP Working Group 1 at its third meeting towards CAEP/8 in March 2008 decided to establish a N.24 drafting group⁹. During the fourth meeting of Working Group 1 in May 2008 the N.24 drafting group, as a first step, presented a so called draft "skeleton" of the state-of-the-art analysis report to be presented at CAEP/8, including an extended table of contents. Following this the N.24 drafting group envisages providing a draft report to be approved by Working Group 1 in spring 2009, which will then be presented at the CAEP Steering Group meeting in June 2009 where feedback from CAEP members and observers is expected. This then will lead to the final report to be provided at CAEP/8 in February 2010.
12. The aim of this A-NPA is to present the concept of the state-of-the-art analysis report as developed by Working Group 1 at the present state in order to solicit comments and to get input from national authorities, professional organisations, private companies and others, thereby enabling the Agency to take such comments into account when this report will be finalised.

State-of-the-art analysis report

13. An initial and limited analysis of cumulative noise levels for recently and soon-to-be certificated two-engine jet aeroplanes showed that the margin relative to the noise certification limits of Chapter 4 of Annex 16, Volume I to the Chicago Convention is rather small. The same, however, cannot be said for recently and soon-to-be certificated four-engine jet aeroplanes: According to the initial analysis for these aeroplanes some margin compared to the Chapter 4 noise limits can be observed.
14. Following this initial result ICAO/CAEP Working Group 1 came to the conclusion that during the course of the analysis special attention has to be given to the number of engines. Consequently Working Group 1 decided to define the number of engines as the parameter to be analysed at the highest level, where this is considered appropriate. Below that level other parameters such as certification conditions (cumulative, flyover, lateral and approach conditions) are intended to be analysed.
15. A draft extended table of contents of the state-of-the-art analysis report is presented in the appendix of this A-NPA. Chapter 1 ("Introduction") of the envisaged report is supposed to provide some information on the purpose of noise certification, to describe the CAEP/7 decision leading to the state-of-the-art analysis and to describe the intent of the report. Chapter 2 ("Background information on noise certification of subsonic jet and heavy propeller-driven aeroplanes") is intended to give a brief historic overview on noise certification and to review the rationales used to establish the original Annex 16, Volume I, Chapter 3 noise limits for two-, three- and four-engine aeroplanes.
16. As one can see from the draft table of contents the most extensive part of the intended report will be Chapter 3 describing the analysis of noise certification data. First, in Section 3.1 of Chapter 3, general aspects of the analysis are intended to be described. This will include the description of the validity of the difference between two-, three- and four-engine aeroplanes noise limits established when Chapter 3 of Annex 16, Volume I to the Chicago Convention was introduced in the 1970s. It will also include the factors contributing to the difference between two-, three- and four-engine aeroplanes noise levels and the description of the situation regarding each of the three certification points. In addition, among others, typical source noise component contributions for all certification points will be described.

⁹ Members are from EASA (focal point), FAA U.S., DGAC France, CAA UK, ICCAIA (aircraft manufacturers organisation), ACI (airports organisation).

17. A prerequisite for a detailed state-of-the-art analysis is an appropriate and agreed upon database. Working Group 1 decided to use the latest version of the so called "Best Practice database", which was provided by aircraft manufacturers (ICCAIA) and which has to be approved by Working Group 1. The Best Practice database first was developed in the late 1990s. The latest version contains more than 600 entries (i.e., aeroplane configurations including noise levels) representing today's state-of-the-art subsonic jet and heavy propeller-driven aeroplanes certificated according to Chapter 3 or 4 of Annex 16, Volume I to the Chicago Convention. In addition to already certificated aeroplanes the database contains - when noise data are available - project aeroplanes, expected to enter service within the next five years. Aside from the Best Practice database additional data are to be used in order to carry out additional analysis (see below).

Question 2:

The Agency is interested in knowing whether stakeholders consider the use of an aeroplane database representing today's technology, such as the Best Practice database, to be an appropriate tool in order to analyse the noise of modern aeroplanes.

18. Following the approach of applying the Best Practice database and using additional data, where appropriate, Section 3.2 of Chapter 3 of the state-of-the-art analysis report is intended to provide information on the data used for the analysis. Concerning the Best Practice database this will include some historical information on the database itself, a description of the latest version and a reasoning why this database mainly fulfils the needs.
19. Section 3.3 of Chapter 3, as can be seen from the draft extended table of contents, is intended to contain an overall analysis of all data from the Best Practice database in order to give an overview of the state of the art. Section 3.4 then is supposed to provide specific data analysis using selected data from the Best Practice database. This on the one hand will include recently certificated aeroplanes and project aeroplanes, as appropriate, in order to demonstrate the state of the art of the latest technology available. On the other hand this will include the analysis of the effect of increasing aeroplane mass for the same type of aeroplane by analysing e.g. derived versions of the same aeroplane type. The parameters, which will be analysed are, at the highest level, the number of engines and below that level the certification conditions. The certification conditions include cumulative, flyover, lateral and approach conditions.
20. Finally, in Section 3.5 of Chapter 3 of the state-of-the-art analysis report, it is planned to describe additional analysis using additional data. This will include the effect of time (decreasing of noise levels over the last decades), technological developments (bypass ratio, exhaust mixing devices, liners, wide chord fan blades) and engine thrust rating. This will also cover the analysis of the effect of introducing Chapter 4 of Annex 16, Volume I to the Chicago Convention in 2006 and the influence of local rules on design and operations (fees and curfews, the London airport quota count system).

Question 3:

The Agency is interested in knowing whether stakeholders consider the analysis as described above for Sections 3.3 to 3.5 of Chapter 3 of the state-of-the-art report a useful approach.

Question 4:

The Agency is interested in knowing whether stakeholders are of the opinion that additional elements have to be added to the above mentioned sections of Chapter 3 of the report in order to gain an even more complete picture. If the answer is "yes" the Agency is interested in knowing, which elements stakeholders consider to be missing.

21. It is intended to compare and summarise the results in Chapter 4 of the report and to draw final conclusions in Chapter 5 (compare the draft extended table of contents in the appendix of this A-NPA).

Question 5:

The Agency is interested in knowing whether stakeholders consider the envisaged report to provide sufficient information as regard of the state-of-the-art analysis.

Question 6:

If the response to the last question is "no", the Agency is interested in knowing, which information stakeholders consider to be missing.

Question 7:

The Agency is interested in knowing whether stakeholders have any other comments, data, views and proposals in order to improve the analysis and/or have any alternative ideas on how to tackle the problem.

Need to increase noise stringency for subsonic jet and heavy propeller-driven aeroplanes?

22. As described above, it is the aim of ICAO/CAEP Working Group 1 to provide a report to CAEP/8 in February 2010 on the review and analysis of certification noise levels for subsonic jet and heavy propeller-driven aeroplanes. Concerning the overall result and by applying a simplified approach, three different scenarios are possible: The analysis shows that the margins to the noise limits (1) are small for all cases/configurations, (2) are small for some cases/configurations, but reasonable large for others and (3) are reasonable large for all cases/configurations analysed. Depending on the outcome of the report the CAEP/8 meeting then has to come to a conclusion on how to proceed concerning the increase of noise stringency. While it is too early to speculate on such a decision to be made in early 2010 it is useful to ask stakeholders about their opinion as of today.

Question 8:

The Agency is interested in knowing whether stakeholders are in favour of:

- (a) a stringency increase for subsonic jet and heavy propeller-driven aeroplanes regardless of the margins to the present noise limits;*
- (b) a stringency increase for all cases/configurations where the margin to the present noise limits is reasonable large, but no stringency increase for all cases/configurations where the margin is small;*
- (c) no stringency increase regardless of the margins to the present noise limits; or*
- (d) a different approach (please specify).*

B. Appendix

Draft extended table of contents of the report “Review and analysis of certification noise levels for subsonic jet and heavy propeller-driven aeroplanes” to understand the current state-of-the-art of aircraft noise technology”

Section	Title	Content
1.	INTRODUCTION	<ul style="list-style-type: none"> • Purpose of noise certification • CAEP/7 decision leading to the work item • Describe Project N.24 • Describe the intent of this report
2.	BACKGROUND INFORMATION ON NOISE CERTIFICATION OF SUBSONIC JET AND HEAVY PROPELLER-DRIVEN AEROPLANES	<ul style="list-style-type: none"> • Give a brief historic overview on noise certification • Review the rationales used to establish the original Chapter 3 noise limits for two-, three- and four-engine aeroplanes • Historic trends having lead to this situation
3.	ANALYSIS OF NOISE CERTIFICATION DATA	
3.1	<u>General aspects</u>	<ul style="list-style-type: none"> • Describe the validity of the difference between two-, three- and four-engine aeroplanes noise limits that was established with Annex 16, Volume I, Chapter 3 • Describe factors contributing to difference between two-, three- and four-engine aeroplanes noise levels • Describe the situation regarding each of the three certification points • Describe typical source noise component contribution for all certification points • Describe the influence of number of engines on test flight track • Describe wing vs. tail mounting effects • Describe the effect of shielding from wing for tail mounted configurations
3.2	<u>Data used</u>	
3.2.1	Best Practice database	<ul style="list-style-type: none"> • Give (historical) information on the Best Practice database • Describe the latest version of the Best Practice database • Describe why this database mainly fulfils the needs
3.2.2	Additional data	<ul style="list-style-type: none"> • Describe what additional data are used for e.g. the additional analysis as described below (see Section 3.5)
3.3	<u>Overall data analysis</u>	<ul style="list-style-type: none"> • Analysis of all data from Best Practice database • Analysis of flyover (to distinguish between two-, three- and four-engine aeroplanes), lateral and approach

Section	Title	Content
		<ul style="list-style-type: none"> Show margins to limits Show average margins?
3.4	<u>Specified data analysis</u>	<p>Describe the content of this section: Analysis of selected aeroplanes using the following principles:</p> <ul style="list-style-type: none"> Describe which parameters will be analysed <ul style="list-style-type: none"> Level 1: number of engines Level 2: certification conditions (cumulative, flyover, lateral, approach) Describe what will be analysed (recently certificated aeroplanes, effect of mass)
3.4.1	Analysis of two-engine aeroplanes	
3.4.1.1	<u>Analysis of cumulative noise</u>	<p>Analysis of cumulative noise</p> <ul style="list-style-type: none"> For recently certificated and project aeroplanes For selected aeroplane types demonstrating the influence of increase of mass (including, but not limited to derived versions)
3.4.1.2	<u>Analysis of flyover noise</u>	<p>Analysis of flyover noise</p> <ul style="list-style-type: none"> For recently certificated and project aeroplanes For selected aeroplane types demonstrating the influence of increase of mass (including, but not limited to derived versions)
3.4.1.3	<u>Analysis of lateral noise</u>	<p>Analysis of lateral noise</p> <ul style="list-style-type: none"> For recently certificated and project aeroplanes For selected aeroplane types demonstrating the influence of increase of mass (including, but not limited to derived versions)
3.4.1.4	<u>Analysis of approach noise</u>	<p>Analysis of approach noise</p> <ul style="list-style-type: none"> For recently certificated and project aeroplanes For selected aeroplane types demonstrating the influence of increase of mass (including, but not limited to derived versions)
3.4.2	Analysis of three-engine aeroplanes	Analysis as for two-engine aeroplanes
...	...	
3.4.3	Analysis of four-engine aeroplanes	Analysis as for two-engine aeroplanes
...	...	
3.5	<u>Additional analysis</u>	Describe the content of this section
3.5.1	Effect of time	<ul style="list-style-type: none"> Consider the most appropriate time markers (e.g. TC date, Entry Into Service (EIS) date) to denote the technology standard of an aeroplane type or variant Trace the evolution of noise margins vs. Chapter 3 limits at each control point as a function of the most appropriate time marker Search for evidence of factors (performance and design feature) that show a significant degree of

Section	Title	Content
		<p>correlations with the observed evolution of individual margins</p> <ul style="list-style-type: none"> Analysis to be carried out where data are available
3.5.2	Technology	
3.5.2.1	<u>Bypass ratio</u>	Analyse the effect of bypass ratio
3.5.2.2	<u>Exhaust mixing devices</u>	Analyse the effect of installation of exhaust mixing devices including chevrons
3.5.2.3	<u>Liners</u>	Analyse the effect of liners (design and treatment area, seamless inlet treatment)
3.5.2.4	<u>Wide chord fan blades</u>	Analyse the effect of wide chord fan blades
3.5.3	Engine thrust rating	Analyse the effect of engine thrust rating (includes engine de-rating and increase of rating)
3.5.4	Implementation of Chapter 4 of Annex 16, Volume I	Analyse the effect of the implementation of Chapter 4
3.5.5	Influence of local rules on design and operations	
3.5.5.1	<u>Fees and curfews</u>	Analyse the effect of fees and curfews on design and operations
3.5.5.2	<u>The London QC system</u>	Analyse the effect of the London airport QC system on design of new aeroplanes
4	COMPARISON AND SUMMARY OF RESULTS	
4.1	Comparison of results for two-, three- and four-engine aeroplanes	Compare the results for two-, three- and four-engine aeroplanes
4.2	Summarizing the main results	Highlight the main results of this report
5	CONCLUSIONS	