COMMENT RESPONSE DOCUMENT (CRD) TO NOTICE OF PROPOSED AMENDMENT (NPA) 2010-13

for amending the Executive Director Decision No. 2003/1/RM of 17 October 2003 on acceptable means of compliance and guidance material for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisation ('AMC and GM to Part-21')

'Environmental protection – classification of changes to a type design'

Explanatory Note

I. General

1. The purpose of the Notice of Proposed Amendment (NPA) 2010-13, dated 23 November 2010, was to propose an amendment to Decision No. 2003/1/RM of the Executive Director of 17 October 2003[1] to develop Guidance Material for Appendix A to Paragraph GM 21A.91 of the AMC and GM to Part-21 concerning environmental protection issues.

II. Consultation

2. The draft text for amending the Executive Director Decision No. 2003/1/RM was published on the European Aviation Safety Agency's website (http://www.easa.europa.eu/) on 23 November 2010.

   By the closing date of 23 February 2011, the European Aviation Safety Agency ('the Agency') had received 38 comments from 17 National Aviation Authorities, professional organisations and private companies.

III. Publication of the CRD

3. All comments received have been acknowledged and incorporated into this Comment Response Document (CRD) with the responses of the Agency.

4. In responding to comments, a standard terminology has been applied to attest the Agency's acceptance of the comment. This terminology is as follows:

   - **Accepted** – The comment is agreed by the Agency and any proposed amendment is wholly transferred to the revised text.
   - **Partially Accepted** – Either the comment is only agreed in part by the Agency, or the comment is agreed by the Agency but any proposed amendment is partially transferred to the revised text.
   - **Noted** – The comment is acknowledged by the Agency but no change to the existing text is considered necessary.
   - **Not Accepted** - The comment or proposed amendment is not shared by the Agency.

   The resulting text highlights the changes as compared to the current rule.

5. The Executive Director Decision on Guidance Material for Appendix A to Paragraph GM 21A.91 of the AMC and GM to Part-21 concerning environmental protection issues will be issued at least two months after the publication of this CRD to allow for any possible reactions of stakeholders regarding possible misunderstandings of the comments received and the answers provided.

6. Such reactions should be received by the Agency not later than 8 June 2011 and should be submitted using the Comment-Response Tool at http://hub.easa.europa.eu/crt.

IV. Discussion and Conclusions

7. As mentioned above, the Agency received 38 comments in total regarding the NPA 2010-13. Six out of these comments received are classified as general comments. The majority of these comments (four) support the approach of the Agency, while the remaining two comments are to be considered neutral. Therefore, it can be concluded that amending the Guidance Material for Appendix A to Paragraph GM 21A.91 of the AMC

[1] Decision No 2003/1/RM of the Executive Director of the European Aviation Safety Agency of 17 October 2003 on acceptable means of compliance and guidance material for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisation ('AMC and GM to Part-21'). Decision as last amended by Decision 2010/001/R of the Executive Director of the Agency of 23 March 2010.

and GM to Part-21 concerning environmental protection issues is supported by the stakeholders.

8. In total ten comments were made on the explanatory note provided in NPA 2010-13. Seven out of these ten comments refer to the 'Content of the draft Decision'. Some of these comments are requests for clarification (e.g. explanation requested for the expression '… for which the applicant wishes to take credit …'), while other comment providers raise issues which are related to minor and major changes, and to no-acoustical changes and no-emissions changes. In this context, two comment providers propose to modify the wording concerning the decrease of emissions levels to be in line with the wording used for noise. Since the comments are very specific, the responses also have to be specific. Therefore, detailed responses are given in the 'response box' to the individual comments. General information can be given as follows:

- According to 21A.91, a minor change is a change that has no appreciable effect on noise, fuel venting and exhaust emissions (among others). All other changes are major.
- A major change classification for environmental protection reasons will not necessarily lead to a new investigation of the aircraft's airworthiness, and vice versa.
- An appreciable effect (which, therefore, might be classified as a major change) is considered to be one which exceeds the applicable ICAO criteria for a no-acoustical change or a no-emissions change.
- The ICAO definitions of a no-acoustical change and a no-emissions change are different. Hence changes regarding aircraft noise and engine emissions are treated differently.

In light of the comments received, the explanatory note at the beginning of the proposed Guidance Material has been revised to give additional information and to include a reference to a no-acoustical change and a no-emissions change, and the associated definitions in ICAO documents.

9. Three out of the ten comments provided on the explanatory note are related to the Regulatory Impact Assessment. Two of these comments are on economic impact vs. environmental benefit, while the third comment requests the Agency to adopt Option 1, the option "do nothing". This comment is the only comment not supporting the amendment of the Guidance Material (see above). It is the Agency's opinion, however, that this comment is likely to be based on a misinterpretation of the proposed Guidance Material. This Guidance Material does not introduce any new practice; it just describes current practice by providing specific examples (for details see the Agency's response to Comment No. 32).

10. Two general comments were provided on the examples of major changes per discipline. The first comment provider proposes to establish a list of changes which would be 'minor' for airworthiness, but 'major' because of the effect as regards environmental protection (see Comment No. 10). The Agency, however, does not see a major benefit of developing such a list as Guidance Material for Part-21. The second comment relates to 'major changes' that lead to 'no-acoustical changes' and therefore, do not require compliance demonstration (see Comment No. 24). Based on this comment, as well as other comments mentioned before, the Agency expanded the explanatory text in the proposed Guidance Material (see above).

11. The comment providers made 14 comments on the examples of major changes related to noise. Most of these comments propose changes to the envisaged Guidance Material. The Agency accepted or partly accepted eight comments leading to the following technical changes of the proposed Guidance Material[2]:

[2] The complete proposed text for the Guidance Material taking into consideration these changes is provided at the end of this CRD.

- Change ‘certification noise level’ to ‘noise certification level’;
- Clarification concerning the installation of small antennae;
- Changing ‘Any change …’ to ‘A change that alters the external profile of the aircraft …’;
- Changing ‘Any change …’ to ‘A change that introduces an open-ended hollow cavity …’;
- Changing ‘Any change …’ to ‘A change that effects the engine thermodynamic cycle …’;
- Clarification concerning a change to the Auxiliary Power Unit (APU);
- Including ‘A change of engine or propeller type’ as an example for a major change;
- Clarification concerning a change related to the angle at which air flows into the propeller.

12. Concerning emissions, five comments were provided on the examples of major changes. The Agency accepted or partly accepted four of these comments, which led to technical changes of the proposed Guidance Material as follows:

- Change ‘certification emissions level’ to ‘emissions certification level’ (as for noise);
- Deleting the examples for fuel venting;
- Changing ‘Any change …’ to ‘A change that effects the engine thermodynamic cycle …’.

V. CRD table of comments, responses and resulting text

(General Comments)	-

comment	*14* comment by: *Cessna Aircraft Company* Attachment #1 For details see attached file for Cessna Aircraft Company's comments. Cessna Aircraft Company has no comments on this issue at this time. Cessna Aircraft Company appreciates the EASA's consideration of our comments.
response	*Noted.* The Agency appreciates the comment of Cessna Aircraft Company.

comment	*23* comment by: *Boeing* **GENERAL COMMENT:** Boeing supports this NPA. **JUSTIFICATION:** The guidance material in this NPA is reasonable and generally consistent with the past and current practices within Boeing, as related to the noise certification processes.
response	*Noted.* The Agency appreciates the support of Boeing.

comment	*27* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)* The Swedish Transport Agency, Civil Aviation Department is supporting option 2 of the NPA 2010-13.
response	*Noted.* The Agency appreciates the support of the Swedish Transport Agency, Civil Aviation Department.

comment	*33* comment by: *Luftfahrt-Bundesamt* The LBA has no comments and supports the proposed AMC and GM amendment to Part-21.
response	*Noted.* The Agency appreciates the support of the Luftfahrt-Bundesamt

comment	*35* comment by: *FAA* General Comment - Please note, in US regulations (14 CFR Part 21.93), the US defines acoustical changes independently of the classification of "major changes" and only invokes the classification when the modifications cause increases in noise levels. We have no further comments from AEE.
response	*Noted.* The Agency appreciates the comment of the FAA. The Agency, however, deems it to be useful to also include in the proposed Guidance Material the possibility of a reduction in the certification noise levels, for which the applicant wishes to take credit.

comment	*37* comment by: *DGAC* DGAC is in favour of the proposed amendment.
response	*Noted.* The Agency appreciates the support of DGAC France.

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comment	*34* comment by: *FAA* General Comment - Please note, in US regulations (14 CFR Part 21.93), the US defines acoustical changes independently of the classification of "major changes" and only invokes the classification when the modifications cause increases in noise levels. We have no further comments from AEE.
response	*Noted.* The Agency appreciates the comment of the FAA. The Agency, however, deems it to be useful to also include in the proposed Guidance Material the possibility of a reduction in the certification noise levels, for which the applicant wishes to take credit.

A. Explanatory Note - IV. Content of the draft Decision p. 4-5

comment	*7* comment by: *Francis Fagegaltier Services* subparagraph 10 of para IV "For which the applicant wishes to take credit": could this be explained? Nowhere a reference is made to 21A.207 (related to amendment to noise certificate). Why should what would be solely a commercial advertisement become a reason for classifying a change as major?
response	*Noted.*

According to the Agency's proposal, a change that introduces an appreciable reduction in noise level, for which the applicant wishes to take credit, is a major change. This means that if an appreciable reduction in noise levels has been achieved, the applicant has two options:

- Option 1: Do nothing; or
- Option 2: Take credit for the noise reduction

If the applicant decides to choose Option 2, then and only then the Agency considers the reduction of noise levels a major change. This is a prerequisite for re-evaluating the noise levels. At the end the reduced noise levels will lead to an amendment of the EASA Type Certification Data Sheet for Noise (TCDSN) and by association to the Type Certificate. The Agency considers any reference to 21A.207 as not being relevant.

comment *8* comment by: *Francis Fagegaltier Services*

subparagraph 10 in para IV
"a decrease in emissions levels is also major". Contrary to noise, for which only "appreciable reduction" is considered, for engine emissions a 0.0001% decrease in emissions would make the change major. This is not reasonable. What is the rationale for considering that a decrease in emissions would affect the product airworthiness (see in 21A.91 definition of a minor change)?

response *Not accepted.*

The ICAO definitions of a no-acoustical change and a no-emissions change are different. Hence changes regarding aircraft noise and engine emissions are treated differently. A no-emissions change is one which affects the measured average emissions levels by less than ± 3 g/kN NOx, ±1 g/kN HC, ±5g/kN CO or ±2 SN. A decrease in emissions of 0.0001% would be considered as a no-emissions change and therefore, not as a major change.

The proposed Guidance Material has been modified to include explanatory text for no-acoustical changes (NAC) and no-emissions changes (NEC) and their relationship to major and minor changes.

comment *9* comment by: *Francis Fagegaltier Services*

subparagraph 9 of para IV
The quote of 21A.91 is wrong. 21A.91 reads as follows : a minor change is one with no appreciable effect ... affecting the airworthiness. Therefore, a change to noise and emissions becomes major only when it affects the airworthiness of the aircraft.
The basis of this NPA is not consistent with EU regulation 1702/2003.

response *Not accepted.*

21A.91 has to be read as follows: 'A minor change is one that has no appreciable effect on the

- mass,
- ...
- noise,
- fuel venting,

- exhaust emissions, or
- other characteristics affecting the airworthiness of the product.'

This means that the phrase "affecting the airworthiness of the product" only refers to "other characteristics". It does not refer to the complete listing. Consequently, the basis of this NPA is consistent with Commission Regulation (EC) No 1702/2003.

comment

15 comment by: *Dassault Aviation*

NAC and NEC should be defined for major or minor changes.

response

Accepted.

The Agency appreciates this comment. The proposed Guidance Material has been modified to include explanatory text for no-acoustical changes (NAC) and no-emissions changes (NEC) and their relationship to major and minor changes.

comment

16 comment by: *Dassault Aviation*

Paragraph IV
Emissions
The Paragraph IV 10. states the "However, **a decrease in emissions levels** is a also a major change" .
A decrease of emission level is environmentally beneficial but depending on the means of compliance, and the associated cost, the applicant may elect not to modify its product due to this additional cost and thus it will be counterproductive on an environmental point of view.
Therefore the proposed wording would be " However, **a change which introduces an appreciable reduction** in emission levels**, for which the applicant wishes to take credit,** is also a major change".

Noise
Dassault Aviation agree with this NPA: a reduction of noise levels which is taken into account in new AFM noise levels is always considered by DA as a Major Change with a demonstration dossier approved by authorities: eg. F50EX-M2984

response

Emissions: Partly accepted.

Whether or not a change has an appreciable effect on noise or emissions is related to the ICAO definitions of a no-acoustical change and no-emissions change. According to the definition of a no-emissions change, a decrease in the emissions certification levels by a certain amount would require the determination of new emissions certification levels.

The proposed Guidance Material has been modified to include explanatory text for no-acoustical changes (NAC) and no-emissions changes (NEC) and their relationship to major and minor changes.

Noise: *Noted.*

The Agency appreciates the comment of Dassault Aviation.

comment *31* comment by: *GAMA*

Paragraph IV (9) - Paragraph IV, Content of the draft decision, sub paragraph 9 states, "According to Paragraph 21A.91, a minor change is one that, as regards environmental protection, has no appreciable effect on noise, fuel venting and exhaust emissions." GAMA believes this statement is taken out of context with respect to the change classification in Paragraph 21A.91 of Part 21 of Commission Regulation (EC) No 1702/2003 (4) defines the classification of changes in type design as being "minor" or "major" with the focus and emphasis on characteristics of a change that effect the airworthiness (condition for safe operation) of the product and not characteristics of a change that effect noise, fuel venting and exhaust emissions as implied.

Paragraph IV (10) – The proposed NPA 2010-13 introduces requirements that are not supported by current rules and will impose additional unnecessary requirements on OEMs without improving safety or improving the environmental impact of an aircraft. These additional requirements could potentially result in having a negative impact to the environment; OEMS may simply decide not to introduce a certain change that would provide environmental benefit to avoid the additional burden associated with the classification of a major change.

Under current requirements, changes classified as minor that do not have an appreciable effect on the airworthiness of a product can have significant reductions in emissions or noise even if the intent of the change was not directed towards improving the environmental characteristics. Under the proposed verbiage of the NPA, many of these changes will now be classified as a major change which would introduce additional costly and time consuming processes. The additional requirements of a major change classification could result in an OEM choosing not to introduce the change which would ultimately cause any environmental benefits to be unrealized.

At the very least, certain minor changes would now require testing/evaluation to show they do not have an appreciable positive effect on the environment and therefore classified as minor only after a burdensome process, again risking the OEMs decision to not make the change.

Examples:

- A minor change such as a modified or replacement bleed air valve that helps decrease the emissions levels but would not have an appreciable effect on the airworthiness or the aircrafts performance characteristics should not be considered a major change or be subjected to additional costly and burdensome analysis/testing to prove otherwise. This situation could result in the OEM deciding to postpone or forgo this change due to the need to classify this as a major change therefore adoption of this NPA would be harmful to the environment.
- An addition of one or more antennas for an improved navigation and flight path management system may be found to not comply with this specification, but the improvements in environmental impact through more efficient routing and flight path management that produce a net environmental impact reduction for the operation would be denied.
- This requirement will make an OEMs ability to add antennas, or change suppliers with a model that may have a different shape or size much more complicated and burdensome.
- If the Part 33, or equivalent, approved thrust rating is higher than the level proposed for the change, there should be no additional effort

required to show compliance. The verbiage reads that if an OEM chooses to increase the thrust level from their original certified level, but is still under the highest level approved for that model engine, it could require additional work. This will create additional non value added burden to the OEM.
- What are today classified as minor changes in horse power extraction by generators, alternators, or hydraulic pumps will become more complicated in their approval process.

Paragraph IV (11) – GAMA disagrees with this statement and believes this NPA imposes additional unnecessary requirements as current practice requires only a change that introduces an increase in noise or emissions to be classified as "Major".

response

Comment on Paragraph IV (9): Not accepted.

21A.91 has to be read as follows: 'A minor change is one that has no appreciable effect on the

- mass,
- …
- noise,
- fuel venting,
- exhaust emissions, or
- other characteristics affecting the airworthiness of the product.'

This means that the phrase "affecting the airworthiness of the product" only refers to "other characteristics". It does not refer to the complete listing.

Comment on Paragraph IV (10): Not accepted.

The proposed Guidance Material does not introduce any new requirements. The examples given in the Guidance Material just describe current practice (please see Paragraph IV (11) of NPA 2010-13). The proposed Guidance Material will not result in a negative impact on the environment.

Comment on Paragraph IV (11): Not accepted.

As emphasised in Paragraph IV (11), the examples given do not introduce any new practice; they just describe current practice. The specific examples are intended to support manufacturers and owners of aircraft.

comment

41 comment by: *Turbomeca*

Page 4, - A. Explanatory Note – IV Content of the draft decision - § 10 :

For noise, only reduction in noise level for which the applicant wishes to take credit is considered a major change. This is understood.
For emissions, any reduction in emission level is considered as a major change even if the applicant does not wish to take credit. This is not understood why a reduction in emission level for which the applicant does not wish to take credit should be a major change. There is no explanation provided in the NPA related to this difference between noise and emissions.

Proposal:
- replace " a decrease in emissions levels" by "a decrease in emissions levels

	for which the applicant wishes to take credit" - or provide explanation as the target of this NPA is to provide clarification.
response	*Partly accepted.* Changes affecting aircraft noise are treated differently from those affecting emissions due to the different definitions of a no-acoustical change and a no-emissions change. The proposed Guidance Material has been modified to include explanatory text for no-acoustical changes (NAC) and no-emissions changes (NEC) and their relationship to major and minor changes.

A. Explanatory Note - V. Regulatory Impact Assessment p. 5-6

comment	*17* comment by: *Dassault Aviation* Paragraph V RIA The paragraph V 16. ii. economic states that "the economic impact for the industry is expected to be positive in some cases". As this NPA propose now to consider a decrease of emission as a major change, it should be highlighted that it will have a negative impact on the certification cost for this type of change.
response	*Not accepted.* The proposed Guidance Material does not introduce any new rule or any new practice; it just describes current practice. Therefore, the Agency does not agree that the proposed Guidance Material will have a negative impact on the certification costs. The concept of a no-acoustical change is well established. ICAO has only recently introduced the concept of a no-emissions change. One of the purposes of the proposed Guidance Material is to raise awareness of the differences in the change classification between noise and emissions arising from the differences in the definition of a no-acoustical change and a no-emissions change. The proposed Guidance Material has been modified to clarify these differences.

comment	*32* comment by: *GAMA* GAMA does not support this change as it imposes additional burdensome requirements that would restrict environmental improvements, therefore GAMA would request the EASA adopt Option 1, the option to do nothing.
response	*Not accepted.* The Agency emphasises that the proposed Guidance Material does not introduce any new practice; it just describes current practice by providing specific examples. These examples of changes are intended to clarify and to illustrate what changes might cause an appreciable change in the product's environmental characteristics. In the past, the lack of specific guidance material has led to misunderstandings in daily practice between applicant and the Agency leading to applicants having to undertake costly, last-minute,

unexpected activity. Following Option 1 would not lead to any improvement of the current situation.

comment

40 comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

In paragraph 13.b of the Regulatory Impact Assessment, it describes this NPA as "... not lead[ing] to a change of today´s situation", which prescribes no cost to the proposal. On the other hand, Paragraphs 16 and 17 describe environmental benefits (albeit small). Embraer believes that the RIA should be revised to more accurately assess any environmental benefits and the unavoidable associated costs, or alternatively do not attribute any environmental benefit to this proposal.

response

Not accepted.

Paragraph 13.b on the scale of the issue states that the proposed amendment to the Guidance Material does not lead to a change of the current situation. In this context, 'scale of the issue' means that today's practice in aircraft environmental protection certification is compared to the situation when the Guidance Material is in place. As the examples given do not introduce any new practice (they just describe current practice), the proposed Guidance Material will indeed not lead to a change of the current situation. It also means that the envisaged Guidance Material will not necessarily lead to "unavoidable associated costs" as stated by the comment provider.

In this context, 'scale of the issue' is used in the Regulatory Impact Assessment, there is no direct link between the 'scale of the issue' and the (minor) environmental benefits as described in Paragraphs 16 and 17. Therefore, even if the proposed Guidance Material does not lead to a change of the current situation, a (minor) positive environmental benefit can be expected as explained in Paragraphs 16 and 17.

B. Draft Decision - I. Draft Decision for amending AMC and GM to Part-21 - Appendix A to GM 21A.91: Examples of Major Changes per discipline - 8 Environment p. 7

comment

10 comment by: *Francis Fagegaltier Services*

Classification of changes is made according to 21A.91 on the basis of effect on airworthiness of the product. To produce here a list including many changes which would be in any case classified as major because of the effect on airworthiness does not seem to be really useful.

Putting aside for the time being the fundamental comment on definition of a major change because of effect on noise (see separate comment), a list of changes which would be "minor" for airworthiness but "major" because of the effect on noise would be much more useful.

response

Not accepted.

The Agency believes that this comment is likely the result of a misunderstanding of 21A.91 (see above Comment No. 9 and the Agency's response). Consequently, the Agency does not share the comment provider's opinion that a list of changes which would be 'minor' for airworthiness, but 'major' because of the effect on noise or emissions would be more useful.

comment	*24* comment by: *Boeing* Page:**7** Paragraph: I. Draft Decision for amending AMC and GM to Part-21 AMC and GM to Part-21; Appendix A to GM 21A.91: Examples of Major Changes per discipline; 8 - Environment **BOEING COMMENT:** It would be helpful if this paragraph were expanded to include clarification that “major changes” (as defined here) that do not result in a significant noise increase are classified as “non-acoustical change,” and that such changes do not require compliance demonstration with ICAO Annex 16, Vol. 1. **JUSTIFICATION:** This would make the text consistent with the provisions of Section 1.4 of the ICAO Annex 16, Environmental Technical Manual, regarding "non-acoustic change."
response	*Accepted.* The Agency appreciates this comment. Explanatory text has been included in the proposed Guidance Material.

B. Draft Decision - I. Draft Decision for amending AMC and GM to Part-21 - Appendix A to GM 21A.91: Examples of Major Changes per discipline - 8 Environment - (i) Noise p. 7-9

comment	*1* comment by: *AOPA-Sweden* Re. Small Piston Engine Aircraft: 1. For older aircraft without a noise type certificate there is no baseline noise level to compare to, so consequently there is no way to determine if the noise level is increased or decreased without costly tests. Therefore, for these aircraft, any change to mufflers, propellers etc. as listed in the proposed text 8.2 should not be in itself a reason to classify as a Major Modification. These older aircraft often experience spares availability problems. Pricing and/or leadtimes can sometimes be unacceptable. Not having to go through the expensive and complicated Major Modification procedure would be a great relief for the owner/operator if technically suitable spares for another aircraft can be found. This would be especially benefiting for SAS aircraft. Many General Aviation aircraft share the same or similar engines and propellers as well as exhausts, the noise and emissions impact from such a change would probably be minimal or non-existent. We wish to remind EASA of its requirement to be proportional regarding General Aviation when making rules.

2. It should be noted in the GM that where the aircraft Type Certificate lists several engine or propeller combinations, a change to any such approved combination is not normally a modification as the Type Certificate information is still valid for the individual aircraft.

3. The wording “A change that causes a change to the propeller inflow angle” should perhaps be clarified or exemplified, the meaning is not immediately obvious.

response *Partly accepted.*

The Agency’s treatment of changes affecting an aircraft’s noise characteristics is consistent with the ICAO Standards and Recommended Practices and associated ICAO guidance material. In this respect, the Agency is “proportional regarding General Aviation”, since the rules and demonstration procedures are proportionally more simple than those applied, e.g. to transport category aircraft.

The proposed Guidance Material has been revised to clarify the meaning of “A change that causes a change to the propeller inflow angle”.

comment *6* comment by: *LHT DO*

LHT acknowledges that "A change that increases the aircraft's drag" as well as the next item of significantly changing the external profile is valid for significant increases of the drag. However, changes as installation of small additional antenna or equivalent should be excluded.

response *Partly accepted.*

The proposed Guidance Material has been modified to consider the exclusion of small modifications to the aircraft.

comment *11* comment by: *Francis Fagegaltier Services*

21A.41 imposes the TCDS for noise only as part of the aircraft type certificate. Therefore, is it appropriate to introduce engine changes in that list? The engine change is certified as a change to the engine type certificate according to the certification basis included in this TC. Noise is not part of it.

This NPA would be more useful if it addressed the relationship between the certification of the change as a change to engine TC and certification of the same change as a change to aircraft TC (with effect on aircraft noise levels).

response *Not accepted.*

The type certification basis for an aircraft includes compliance with the noise certification requirements. The type certification basis for an engine does not include it. Since engine noise at source is a principal contributor to an aircraft’s noise levels, it is appropriate to include engine changes in the list of examples.

comment *18* comment by: *Dassault Aviation*

The example of noise related changes that might lead to a major change

	classification is not well addressed for **APU in Section 8 (i)(1).** A three-engines aircraft has not a in-flight APU and consequently it is not taken into account in the noise certification. It is the same case when the in flight APU is used only in Emergency situation. So this kind APU has not been used in the noise certification demonstration on Approach conditions. Dassault Aviation suggest that the "changes to APU will be defined to be classified as "Major Change" only if APU has been considered in the original noise certification or if APU functions are changed due to, for example APU type changes.
response	*Partly accepted.* The Agency is of the opinion that the wording as proposed in the Guidance Material (specifically “including associated operating limitations”) addresses the concern of the comment provider. However, in order to be more explicit, the text has been modified.

comment	*19* comment by: *Dassault Aviation* In Appendix A to GM21A.91 §8 (i) (1) [same comment as for §8 (ii) (2)]: "- **A** ~~Any~~ change that affects the engine thermodynamic cycle , ..." Comment : The ETM (ICAO Environmental Technical Manual) Vol II will define Guidelines on the use of procedures in the Emissions certification of aircraft engines. It provides some criteria for NEC and associated means of compliance. Some example of cycles changes that do not affect the emission level are also provided. The current wording that uses "Any change " is more stringent than the "ETM".
response	*Accepted.* The proposed Guidance Material has been modified.

comment	*20* comment by: *Dassault Aviation* Appendix A to GM21A.91 §8 (i) (1), item “any change that alters the external profile….” Remark : A winglet is an alteration of the external profile of the airframe with a reduction of the turbulence profile at the tip of the wing and consequently will reduce the noise levels. However, the installation of winglets is declared as "Major change" for airworthiness. Consequently, the “major change” characterization does not depend on noise level change benefits being taken credit for or not.
response	*Noted.* The example given by the comment provider is correct. The installation of winglets might well be a major change for airworthiness. However, it might also be that the winglets appreciably affect the aircraft’s noise characteristics.

comment 25 comment by: *UK CAA*

Page No: 9

Paragraph No: 8 (i) (3), 2nd Bullet

Comment: The definition of $V_{H:}$ " … airspeed in level flight obtained using the torque corresponding to minimum engine installed, maximum continuous power available, …" is not clear. There is a need for some additional wording to clarify the intent of the definition.

response *Not accepted.*

The definition of V_H is taken from the note in paragraph 8.6.3.1b) of ICAO Annex 16, Volume I, Part II, Chapter 8 with no further explanation given. Therefore, the definition provided in the proposed Guidance Material for V_H for noise certification purposes is considered to be sufficient.

comment 26 comment by: *KLM EASA DOA 21J.012*

- Any change that alters the external profile of the aircraft, including the installation or change of shape or size of any item on the external surface of the aircraft that might protrude into the airflow (e.g. winglets, vortex generators);

Comment:

Most of the examples provided above are already major based on the existing GM regardless of the Environmental Protection aspects. However the wording "any change that alters the external profile" can easily lead to misinterpretation resulting in all external changes becoming major. The examples should make clear that the installation of a single antenna or doubler does not become a major change solely because of the Environmental Protection impact. The new GM should identify such changes as no appreciable effect on Environmental Protection.

Note:
According to 21A.435 (a) *" Repair may be a 'major' or 'minor'* the classification shall be made in accordance with the criteria of 21A.91 for a change in the type design.

When not properly addressed the proposed GM will have a huge impact on airlines using the DOA privilege to approve minor repairs on the fuselage.

response *Not accepted.*

The examples in the proposed Guidance Material are examples of changes which might appreciably affect an aircraft's noise levels. 21A.91 means that their effect needs to be considered when making the change classification. In many cases a change to the external profile of an aircraft will not appreciably affect noise levels and will not, therefore, lead to a major classification.

comment 28 comment by: *AIRBUS*

Section:
Draft Decision for amending AMC and GM to Part-21

"8 Environment

Where a change is made to either an aircraft or aircraft engine, the effect of that change on the product's environmental characteristics should be taken into account. **Examples of changes that might have an appreciable effect on the product's environmental characteristics, and might therefore be classified as a major change, are listed below. The examples are not exhaustive and will not, in every case, result in a change to the product's environmental characteristics.**

(i) Noise: A change that introduces either:
- an increase in the certification noise level(s); or
- a reduction in the certification noise level(s) for which the applicant wishes to take credit.

Examples of noise-related changes that might lead to a major change classification are:
[...]"

Comment A:

The Guidance Material aims at explaining what is an "appreciable effect" as regards to the environmental characteristics of the product. Despite the use of the word "might" and the other wording precautions, the proposed update introduces confusion and discrepancy since the given examples for noise are only potential candidates for major classification as a result of environmental effects, whereas the other examples given in the existing other sections of the GM are typical examples of major changes. In addition, many of the examples given in the proposal will be already classified Major as a result of their impact on the airworthiness.
The text of the GM should stick only to its original intent that is to explain the meaning of the wording "appreciable effect" or "no appreciable effect" of a change on the environmental characteristics.

response *Partly accepted.*

Following this comment the Agency sees the need for further clarification. The proposed Guidance Material has been modified, as appropriate.

comment *29* comment by: *AIRBUS*

Section:
Draft Decision for amending AMC and GM to Part-21

"8 Environment

Where a change is made to either an aircraft or aircraft engine, the effect of that change on the product's environmental characteristics should be taken into account. Examples of changes that might have an appreciable effect on the product's environmental characteristics, and might therefore be classified as a major change, are listed below. The examples are not exhaustive and will not, in every case, result in a change to the product's environmental characteristics.

(i) Noise: A change that introduces either:

- an increase in the certification noise level(s); or
- a reduction in the certification noise level(s) for which the applicant wishes to take credit."

Comment B:
It would be more appropriate to refer to "certified noise level(s)" instead of "certification noise level(s)" since the impact has to be assessed on a certified product whereas "certification level(s)" rather refer to the reference levels included in the standards/regulations.

response

Partly accepted.

The comment is appreciated. However, in order to be consistent with the ICAO Guidance Material, the term 'noise certification level(s)' will be used in the proposed Guidance Material.

comment *30* comment by: *AIRBUS*

Section:
Draft Decision for amending AMC and GM to Part-21

"8 Environment

Where a change is made to either an aircraft or aircraft engine, the effect of that change on the product's environmental characteristics should be taken into account. Examples of changes that might have an appreciable effect on the product's environmental characteristics, and might therefore be classified as a major change, are listed below. The examples are not exhaustive and will not, in every case, result in a change to the product's environmental characteristics.

(i) Noise: A change that introduces either:
- **an increase in the certification noise level(s); or**
- **a reduction in the certification noise level(s) for which the applicant wishes to take credit.**"

Comment C:
The objective of the GM for the chapter Environment should be to illustrate the meaning of the wording "no appreciable effect" on the noise, fuel venting or exhaust emission characteristics of the product. For the noise aspects (Paragraph 8 (i)), the proposed GM does not provide enough guidance as regards to the definition of an "increase" in the certified noise level(s). This definition nevertheless exists in ICAO Annex 16, Volume I, Part I. Definitions, and is commonly used in the current practise:

"Derived version of a helicopter. A helicopter which, from the point of view of airworthiness, is similar to the noise certificated prototype but incorporates changes in type design which may affect its noise characteristics adversely.
[...]
Note 2.— "Adversely" refers to an increase of more than 0.30 EPNdB in any one of the noise certification levels for helicopters certificated according to Chapter 8 and 0.30 dB(A) in the certification level for helicopters certificated according to Chapter 11."
"Derived version of an aeroplane. An aeroplane which, from the point of view of airworthiness, is similar to the noise certificated prototype but incorporates changes in type design which may affect its noise characteristics adversely.

[...]
Note 2.— "Adversely" refers to an increase of more than 0.10 dB in any one of the noise certification levels unless the cumulative effects of changes in type design are tracked by an approved procedure in which case "adversely" refers to a cumulative increase in the noise level in any one of the noise certification levels of more than 0.30 dB or the margin of compliance, whichever is smaller."
The wording "affect adversely" has the same meaning as the wording "appreciable effect" in the considered context.
The GM should refer to this definition to explain what is an increase in the certified noise level(s).
There is no need to explain what is a decrease in the certified noise level(s) since the major change classification is linked in this case to the applicants' willingness to take benefit from this decrease, whatever its extent.

The following alternative text is proposed, taking into accounts comments A, B and C:

"8 Environment

Where a change is made to either an aircraft or aircraft engine, the effect of that change on the product's environmental characteristics should be taken into account. Changes that have an appreciable effect on the product's environmental characteristics, and shall therefore be classified as a major change, are listed below:

(i) Noise: A change that introduces either:
- an increase in the certified noise level(s)*; or
- a reduction in the certified noise level(s) for which the applicant wishes to take credit.

*: Refer to ICAO Annex 16, Volume I, Part I, Definitions, Derived version of a helicopter, Derived version of an aeroplane.

(ii) Emissions: A change that introduces an increase or decrease in the certified emissions levels.

Examples of changes that might have an appreciable effect on the product's environmental characteristics, and might therefore be classified as a major change, are listed below. The examples are not exhaustive and will not, in every case, result in a change to the product's environmental characteristics:
[...]"

response *Partly accepted.*

The proposed Guidance Material has been modified to take into consideration this comment.

comment *36* comment by: *Federal Office of Civil Aviation (FOCA), Switzerland*

Voluntary MTOW reduction

Dabei handelt es sich um eine operationelle Limitierung, welche von einigen Betreibern zwecks Verminderung Gebühren/Landetaxen eingeführt wird. Es wird lediglich das AFM mit dem neuen MTOW angepasst, ansonsten hat die Änderungen keinen technischen Einfluss. Es ist wenig sinnvoll, diese Änderung

als „Major“ zu klassieren. Vor allem da „Majors“ nur von DOA / ADOA Haltern beantragt werden kann.

Translation: This is an operational limitation, which is introduced by some operators in order to qualify for reduced airport fees. In such a case the new MTOM is just documented in the AFM; the change has no technical influence. Therefore, it does not make sense to classify this change as ‘major’. This is especially true, since ‘major’ changes can only be applied for by DOA/ADOA.

response *Noted.*

The noise certification levels are associated with the aircraft’s design maximum take-off mass. The aircraft’s noise certification levels will not change if a “voluntary” reduction in take-off mass is introduced for operational reasons and which is not implemented via a design change (i.e. via an amended TC, STC or the AFM limitations section). Consequently, such a voluntary operational mass reduction is not considered to be an acoustical change.

comment *38* comment by: *DGAC*

In paragraph (8)(i)(2), add:
"- a change of engine type"

response *Accepted.*

The comment is appreciated. The proposed Guidance Material has been changed according to the proposal. Furthermore, ‘propeller type’ has been added.

comment *39* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

Paragraph 8.(i)(2) of the proposed revision of Appendix A to GM 21A.91 refers to a change in the highest power in the normal operating range as a major change. Embraer believes that this change is relevant only to the level flyover noise measurement procedure of Chapter 6 of ICAO Annex 16, which has been superseded by Chapter 10 of Annex 16.

response *Noted.*

Indeed, Chapter 10 of ICAO Annex 16, Volume I has superseded Chapter 6. However, even today aircraft are still certified according to Chapter 6 depending on the date of application for Type Certificate. Consequently, the Agency is of the opinion that it is useful to keep the example ‘A change to the highest power in the normal operating rang’ in the proposed Guidance Material.

B. Draft Decision - I. Draft Decision for amending AMC and GM to Part-21 - Appendix A to GM 21A.91: Examples of Major Changes per discipline - (ii) Emissions p. 9

comment *12* comment by: *Francis Fagegaltier Services*

Fuel venting is an aircraft level matter. It is recommended to make it subject of a separate subparagraph (ii) and to place engine emissions in a new subparagraph (iii).

response

Partly accepted.

The Agency agrees that fuel venting is an aircraft level matter, while exhaust emissions are related to the engine. In order to be in line with ICAO Annex 16, Volume II (aircraft engine emissions, which also includes prevention of fuel venting), it was originally decided not to split up fuel venting and engine emissions. However, after further consideration, the Agency came to the conclusion that there is no need to list examples related to fuel venting. Consequently, these examples have been deleted from the proposed Guidance Material.

comment

13 comment by: *Francis Fagegaltier Services*

paragraph (ii)(1). A change to fuel drainage will obviously have an effect on compliance with the prevention of intentional fuel venting requirements (21A.18 (b)(1)). How can a change to fuel nozzles (if they are the engine fuel nozzles) be part of that list?

response

Partly accepted.

The Agency does not agree with the opinion of the comment provider. However, the Agency came to the conclusion that there is no need to list examples related to fuel venting (see response to Comments No. 12 and 42). Consequently, these examples have been deleted from the proposed Guidance Material.

comment

21 comment by: *Dassault Aviation*

In Appendix A to GM21A.91 §8 ii)
Dassault Aviation suggest this following wording for the first line
"Emissions : A change that introduces :
- an increase in the **engine** certification emission level; or
- a decrease in the **engine** certification emission level **for which the applicant wishes to take credit** "

response

Not accepted.

Whether or not a change has an appreciable effect on noise or emissions is related to the ICAO definitions of a no-acoustical change and no-emissions change. Responses provided to Comments No. 16 and 41 are relevant here as well.

Although the proposal of the comment provider is not accepted, the proposed Guidance Material has been modified to include explanatory text for no-acoustical changes (NAC) and no-emissions changes (NEC) and their relationship to major and minor changes.

comment

22 comment by: *Dassault Aviation*

In Appendix A to GM21A.91 §8 (ii) (2) [same comment as for §8 (i) (1)]:
"- **A** ~~Any~~ change that affects the engine thermodynamic cycle , ..."

Comment :
The ETM Vol II will define Guidelines on the use of procedures in the Emissions certification of aircraft engines. It provides some criteria for NEC and

	associated means of compliance. Some example of cycles changes that do not affect the emission level are also provided. The current wording that uses "Any change " is more stringent than the ETM.
response	*Accepted.* The proposed Guidance Material has been modified.

comment	*42* comment by: *Turbomeca* **Page 9, - B. Draft Decision – I. Draft Decision for amending AMC and GM to part 21 – AMC and GM to part 21 - Appendix A to GM 21A.91: Examples of Major Changes per discipline – 8 Environment (ii) and (ii)(1):** In (ii), is “certification emissions levels” the proper wording for fuel venting? In fact, there is no certification level for fuel venting. There is only a requirement to be met “design must prevent intentional fuel discharge”. Therefore, regarding fuel venting, an aircraft can only be compliant with CS-34 or not. No change may prevent CS34 to be met. Therefore the wording “A change that introduces an increase or decrease in the certification emissions levels.” is not clear. For fuel venting, it does not seem adequate and is confusing. It is proposed to transfer the text ”A change that introduces an increase or decrease in the certification emissions levels. Examples of emission-related changes that might lead to a major change classification are:” from § (ii) to § (ii)(2) and to put appropriate wording/explanation in (ii)(1).
response	*Partly accepted.* The comment provider is correct. Fuel venting cannot be characterised with emissions certification levels. After further consideration, the Agency came to the conclusion that from practical experience (daily practice) there is no need to list examples related to fuel venting. Consequently, these examples have been deleted from the proposed Guidance Material.

RESULTING TEXT:

AMC and GM to Part-21

...

Appendix A to GM 21A.91: Examples of Major Changes per discipline

...

8 Environment

~~A change that introduces an increase in noise or emissions.~~

The introductory text to Appendix A to GM 21A.91 describes how in Part-21 a negative definition is given of minor changes only. This philosophy is similar to the manner in which the ICAO Standards and Recommended Practices for environmental protection (ICAO Annex 16) and the associated Guidance Material (ICAO Environmental Technical Manual) define changes affecting a product's environmental characteristics in terms of "no-acoustical changes" and "no-emissions changes" (i.e. changes which do not appreciably affect the product's environmental characteristics).

Following the general philosophy of this Appendix, however, it is preferred to give examples of changes which might have an appreciable effect on a product's environmental characteristics (i.e. the effect might be greater than the no-acoustic change and no-emissions change criteria) and might therefore lead to a major change classification.

Where a change is made to an aircraft or aircraft engine, the effect of the change on the product's environmental characteristics should be taken into account. Examples of changes that might have an appreciable effect on the product's environmental characteristics, and might therefore be classified as a major change, are listed below. The examples are not exhaustive and will not, in every case, result in an appreciable change to the product's environmental characteristics, and therefore, will not per se and in every case result in a major change classification.

An appreciable effect is considered to be one which exceeds the ICAO criteria for a no-acoustical change or a no-emissions change. For the definition of a no-acoustical change refer to the section of the ICAO Environmental Technical Manual, Volume I (ICAO Doc 9501, Volume I – Procedures for the Noise Certification of Aircraft) concerning changes to aircraft type designs involving no-acoustical changes (see also the definitions of a 'derived version' in ICAO Annex 16, Volume I). For the definition of a no-emissions change refer to the section of the ICAO Environmental Technical Manual, Volume II (ICAO Doc 9501, Volume II – Procedures for the Emissions Certification of Aircraft Engines) concerning no-emissions changes.

(i) Noise: A change that introduces either:
- an increase in the noise certification level(s); or
- a reduction in the noise certification level(s) for which the applicant wishes to take credit.

Examples of noise-related changes that might lead to a major change classification are:

(1) For jet and heavy propeller-driven aeroplanes:

- A change that might affect the aircraft's take-off performance including:
  - a change to the maximum take-off mass;
  - a change to the take-off safety speed (V_2); or
  - a change to the lift augmentation devices, including their deployment under normal take-off operating conditions.
- A change that might affect the aircraft's landing performance including:
  - a change to the maximum landing mass;
  - a change to the reference landing speed (V_{REF}); or
  - a change to the lift augmentation devices, including their deployment under normal landing operating conditions.
- A change to the Centre of Gravity (CG) limits;
- A change that increases the aircraft's drag;
- A change that alters the external profile of the aircraft, including the installation or change of shape or size of any item on the external surface of the aircraft that might protrude into the airflow such as winglets and vortex generators; generally the installation of small antennae does not represent an acoustical change;
- A change that introduces an open-ended hollow cavity at more or less right angles to the airflow (e.g. hollow pins in undercarriage assemblies);
- A change of engine or, if fitted, propeller type;
- A change in engine thrust rating;
- A change to the engine rotating parts or stators, such as geometry, blade profile or blade number;
- A change to the aerodynamic flow lines through the engine;
- A change that affects the engine thermodynamic cycle, including a change to the engine's bypass ratio;
- A change to the engine nacelle acoustic liners;
- A change to the engine exhaust configuration;
- A change to the engine bleed valves, including bleed valve scheduling;
- A change in the operation of power off-takes, including the Environmental Control System (ECS);
- A change to the Auxiliary Power Unit (APU), including associated operating limitations (e.g. a change that allows the APU to be operated during a normal approach when previously it was not allowed);
- A change to the propeller pitch and/or propeller speed during a normal take-off or approach;
- A change that causes a change to the angle at which air flows into the propeller.

(2) For light propeller-driven aeroplanes:

- A change that might affect the aircraft's take-off performance including:
  - a change to the take-off mass;
  - a change to the take-off distance;
  - a change to the rate of climb; or
  - a change to the best rate of climb speed (V_v).
- A change that increases the aircraft's drag (e.g. the installation of external cargo pods, external fuel tanks, larger tyres to a fixed undercarriage, floats etc.);
- A change of engine or propeller type;

- A change in take-off power including a change in engine speed (tachometer “red line”) or, for piston engines, a change to the manifold pressure limitations;
- A change to the highest power in the normal operating range (“top of green arc”);
- In the case of an aircraft where take-off power/engine speed is time limited, a change in the period over which take-off power/engine speed may be applied;
- A change to the engine inlet or exhaust including, if fitted, the inlet or exhaust muffler;
- A change in propeller diameter;
- A change to the propeller tip shape;
- A change in the propeller blade thickness;
- A change in the number of propeller blades;
- The installation of a variable pitch propeller in place of a fixed pitch propeller and vice versa;
- A change that causes a change to the angle at which air flows into the propeller.

(3) For helicopters:

- A change that might affect the take-off and/or landing performance, including a change in take-off mass and best rate of climb speed (V_Y);
- A change to the never-exceed airspeed (V_{NE}) or the airspeed in level flight obtained using the torque corresponding to minimum engine installed, maximum continuous power available, 25°C ambient conditions at the relevant maximum certificated mass (V_H);
- A change to the maximum take-off engine power or maximum continuous power;
- A change to the gearbox torque limits;
- A change of engine type;
- A change to the engine intake or exhaust;
- A change in the maximum normal operating speed of the main or tail rotors;
- A change to the main or tail rotors, including a change in diameter, blade thickness or blade tip profile.

Note: The effect of either carrying external loads or the installation of external equipment on the helicopter’s noise characteristics need not be considered.

(ii) Emissions: A change that introduces an increase or decrease in the emissions certification levels. Examples of smoke and gaseous engine emission-related changes that might lead to a major change classification are:

- A change in engine thrust rating;
- A change to the aerodynamic flow lines through the engine;
- A change that affects the engine thermodynamic cycle, specifically relevant engine cycle parameters (e.g. combustor pressure P3, combustor entry temperature T3, Air Fuel Ratio (AFR));
- A change to the compressor that might influence the combustor inlet conditions and engine overall pressure ratio;
- A change to the combustor design (geometry);
- A change to the cooling of the combustor;
- A change to the air mass flow through the combustor;
- A change that affects the fuel spray characteristics.

Appendix A - Attachments

L390-11-0393 Comments_1065_.pdf
Attachment #1 to comment #14