European Union Aviation Safety Agency

# Notice of Proposed Amendment 2023-101(#3)

**in accordance with Article 6 of MB Decision No 01-2022**

# Acceptable means of compliance and guidance material to Subparts D, E, F, M and N of Annex Ib (Part 21 Light)

*Package #3*

RMT.0727


**EXECUTIVE SUMMARY**

The objective of the proposed acceptable means of compliance (AMC) and guidance material (GM) to Subparts D, E, F, M and N of Annex Ib (Part 21 Light) is to provide affected stakeholders with cost-efficient and proportionate means to comply with the regulatory requirements in the field of the initial airworthiness of aircraft intended primarily for sports and recreational use.

Compared to Part 21, Part 21 Light provides a lighter approach to the certification of those general aviation aircraft, and introduces the possibility for a declaration of design compliance to be submitted as an alternative to certification. The Part 21 Light also provides for the possibility to demonstrate design and production capabilities through a declaration, instead of an approval, and for certain production activities the demonstration of production capabilities is not required at all.

These AMC and GM are expected to support the application of the new requirements and contribute towards reducing the regulatory burden for the designers and manufacturers of aircraft intended primarily for sports and recreational use while continuing to ensure a high level of safety as intended by Part 21 Light.


| | | | |
|---|---|---|---|
| **Domain:** | Design and production | | |
| **Related rules:** | Commission Regulation (EU) No 748/2012 | | |
| **Affected stakeholders:** | Aircraft manufacturers and designers; GA operators; national competent authorities, including EASA | | |
| **Driver:** | Efficiency and proportionality | **Rulemaking group:** | No |
| **Impact assessment:** | Light | | |

**EASA rulemaking procedure milestones**

| **Start**<br>Terms of Reference | **Advisory Body consultation**<br>*Package #3* | **Decision**<br>Certification Specifications, Detailed Specifications, Acceptable Means of Compliance, Guidance Material |
|---|---|---|
| 28.8.2019 | 5.4.2023 | 2023/Q2 |

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# 1. About this NPA

## 1.1. How this NPA was developed

The European Union Aviation Safety Agency (EASA) developed this Notice of Proposed Amendment (NPA) in line with Regulation (EU) 2018/1139[1] (the Basic Regulation) and the Rulemaking Procedure[2]. Rulemaking task (RMT) 0727 is included in Volume II of the European Plan for Aviation Safety (EPAS) for 2023–2025[3]. The scope and timescales of the task were defined in the related Terms of Reference (ToR)[4].

The NPA shall be consulted with the EASA Advisory Bodies (ABs) in accordance with Article 6(3) of MB Decision No 01-2022.

The AMC and GM to Part 21 Light will be consulted in thematic packages based upon Part 21 Light subparts in order to allow stakeholders to focus their review based upon their interest in the topics.

| Package number | Generic title | AMC and GM to Part 21 Light subparts |
|---|---|---|
| #1 | Initial Airworthiness | A, B, C and P |
| #2 | Design and Production Organisations | G, J and R |
| #3 | Design changes and repair designs | D, E, F, M and N |
| #4 | Airworthiness and Noise Certificates and Parts and Markings | H, I, K and Q |

The major milestones of this RMT are presented on the cover page.

1 Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91 (OJ L 212, 22.8.2018, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1535612134845&uri=CELEX:32018R1139).

2 EASA is bound to follow a structured rulemaking process as required by Article 115(1) of Regulation (EU) 2018/1139. Such a process has been adopted by the EASA Management Board (MB) and is referred to as the 'Rulemaking Procedure'. See MB Decision No 01-2022 of 2 May 2022 on the procedure to be applied by EASA for the issuing of opinions, certification specifications and other detailed specifications, acceptable means of compliance and guidance material ('Rulemaking Procedure'), and repealing Management Board Decision No 18-2015 (https://www.easa.europa.eu/the-agency/management-board/decisions/easa-mb-decision-01-2022-rulemaking-procedure-repealing-mb).

3 https://www.easa.europa.eu/en/document-library/general-publications/european-plan-aviation-safety-2023-2025

4 ToR RMT.0727 'Alignment of Part 21 of Regulation (EU) No 748/2012 with Regulation (EU) 2018/1139 (including simple and proportionate rules for GA)' (https://www.easa.europa.eu/en/document-library/terms-of-reference-and-group-compositions/tor-rmt0727).

## 1.2. How to comment on this NPA

Please submit your comments via email to **IAConsultation@easa.europa.eu**.

The deadline for the submission of comments is **5 May 2023**.

## 1.3. The next steps

Following the consultation of the draft AMC and GM (Package #3), EASA will review all the comments received and will duly consider them in the further progress of this RMT.

When issuing the decision to amend the AMC and GM to Regulation (EU) No 748/2012, EASA will also provide feedback to the commentators that were engaged and/or provided comments during the consultation of the draft regulatory material, which comments were received, how such engagement and/or consultation was used in rulemaking, and how their contributions were considered.

# 2. In summary — why and what

## 2.1. Why we need to amend the AMC and GM — issue/rationale

The current Part 21 does not provide sufficient proportionality with regard to the nature and risks associated with certain products and activities, such as aircraft primarily used for sports and recreational purposes. As a consequence, the certification costs and the associated administrative burden are high for the small-aircraft community, which is the least able to bear them.

For this reason, the European Commission adopted Commission Implementing Regulation (EU) 2022/1361[5] and Commission Delegated Regulation (EU) 2022/1358[6] for Part 21 Light based upon EASA's Opinion No 05/2021[7].

The proposed AMC and GM will provide the means of compliance with these simplified requirements for aircraft primarily used for sports and recreational purposes.

## 2.2. What we want to achieve — objectives

The overall objectives of the EASA system are defined in Article 1 of the Basic Regulation. This NPA will contribute to achieving the overall objectives by addressing the issues described in Section 2.1.

The specific objective of this proposal is to introduce AMC and GM to the simplified rules that will enable the application of a proportionate approach for products that are considered to pose less risk when compared to other, more complex products. This proposal intends to achieve an overall reduction in the administrative burden and its associated costs, while at the same time supporting innovation in the GA sector.

## 2.3. What are the expected benefits and drawbacks of the proposed amendments

The expected benefits and drawbacks of the proposed amendments are summarised below. For the full impact assessment of the amendments to Regulation (EU) No 748/2012 as regards the introduction of Part 21 Light, please refer to Chapter 4 of NPA 2021-102.

There are no additional benefits or drawbacks from the AMC and GM to Part 21 Light compared to the benefits and drawbacks expected in the context of the adoption of the amendments to Regulation (EU) No 748/2012 as regards Part 21 Light.

The AMC and GM contained in Chapter 3 are not expected to have any additional impact to those that were already described in NPA 2021-102, and the only purpose they serve is to provide greater clarity of what is required by the introduction of the new requirements contained in Annex Ib (Part 21 Light) to Regulation (EU) No 748/2012.

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5 Commission Implementing Regulation (EU) 2022/1361 of 28 July 2022 amending Regulation (EU) No 748/2012 as regards the certification, oversight and enforcement tasks of the competent authorities in the implementation of the rules concerning the organisations involved in the design and production of aircraft used for sport and recreational aviation (OJ L 205, 5.8.2022, p. 127) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022R1361&qid=1678272149669).

6 Commission Delegated Regulation (EU) 2022/1358 of 2 June 2022 amending Regulation (EU) No 748/2012 as regards the implementation of more proportionate requirements for aircraft used for sport and recreational aviation (OJ L 205, 5.8.2022, p. 7) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022R1358&qid=1678272247617).

7 Opinion 05/2021 'Part 21 Light — Certification and declaration of design compliance of aircraft used for sport and recreational aviation and related products and parts, and declaration of design and production capability of organisations' (https://www.easa.europa.eu/en/document-library/opinions/opinion-052021).

# 3. Proposed amendments

The amendment is arranged to show deleted, new and unchanged text as follows:

— deleted text is ~~struck through~~;

— new or amended text is highlighted in blue;

— an ellipsis '[…]' indicates that the rest of the text is unchanged.

Where necessary, the rationale is provided in *italics.*

## 3.1. Draft acceptable means of compliance and guidance material (draft EASA decision)

# SECTION A

## *TECHNICAL REQUIREMENTS*

## SUBPART D — CHANGES TO TYPE CERTIFICATES

### GM1 21L.A.61 Scope

The term 'changes to the type certificate' is consistently used in Subparts D and E of Part 21 Light, as well as in the related AMC and GM. This term does not refer to changing the document that reflects the type certificate (TC) but to changing the elements of the TC as defined in point 21L.B.47(b). Therefore, the processes contained in Subparts D and E of Part 21 Light should be used for the approval of changes to the elements listed in point 21L.B.47(b).

### GM1 21L.A.62 Standard changes

**APPLICABLE CERTIFICATION SPECIFICATIONS**

CS-STAN[8] contains the certification specifications referred to in point 21L.A.62. Guidance on the implementation of Standard Changes and Standard Repairs may be found in AMC M.A.801 of the AMC to Part-M.

### AMC1 21L.A.63(c) Classification of changes to a type certificate

Major changes that are classified as being 'substantial' will require a new application for a type certificate in accordance with Subpart B of Part 21 Light.

Examples of major changes that are considered substantial may be found in Appendix B to GM1 21L.A.63.

[8] https://www.easa.europa.eu/en/certification-specifications/cs-stan-standard-changes-and-standard-repairs

# GM1 21L.A.63 Classification of changes to a type certificate

(a) PURPOSE OF CLASSIFICATION

The purpose of classification of changes to a type certificate (TC) into 'minor' or 'major' is to determine the approval route to be followed in accordance with Part 21 Light Subpart D, i.e. either point 21L.A.67 or point 21L.A.68, or alternatively whether application and approval have to be made in accordance with Part 21 Light Subpart E.

(b) INTRODUCTION

(1) Point 21L.A.63 proposes criteria for the classification of changes to a TC as 'minor' or 'major'.

(i) This GM is intended to provide guidance on the term 'appreciable effect' that affects the airworthiness of the product, the certified noise or emissions levels or affects any of the other characteristics mentioned in point 21L.A.63, where 'airworthiness' is interpreted in the context of a product that is in conformity with type design and in condition for safe operation. It provides complementary guidelines to assess a change to the TC in order to meet the requirements of points 21L.A.63 and 21L.A.91 where classification is the first step of a procedure.

Characteristics that affect the environmental compatibility of the product are characteristics that affect the compliance of the product with the applicable environmental-protection requirements.

*Note:* For the classification of repairs, see GM 21L.A.203(a).

(ii) Although this GM provides guidance on the classification of major changes, as opposed to minor changes as defined in point 21L.A.63, the GM and point 21L.A.63 are deemed entirely compatible.

Appendix A to GM1 21L.A.63 provides examples of major changes and a classification process.

(c) ASSESSMENT OF A CHANGE FOR CLASSIFICATION

(1) Changes to the TC

Point 21L.A.63 addresses all changes to any of the aspects of a TC. This includes changes to a type design, as defined in point 21L.A.26, as well as to the other constituents of a TC, as defined in point 21L.B.47(b).

(2) Reserved

(3) Classification process (see also the flow chart 'Classification process' in Appendix A to GM 21L.A.63)

Point 21L.A.63 requires all changes to be classified as either 'major' or 'minor', using the criteria of point 21L.A.63.

Wherever there is doubt as to the classification of a change, EASA should be consulted for clarification.

When the strict application of the point (c)(4) criteria results in a major classification, the applicant may request reclassification, if justified, and EASA could take the responsibility for reclassifying the change.

A simple design change planned to be mandated by an airworthiness directive may be reclassified as minor due to the involvement of EASA in the continued airworthiness process when this is agreed between EASA and the design organisation.

The reasons for a classification decision should be recorded.

(4) General guidance on the classification of major changes

A change to the TC that is judged to have an 'appreciable effect on the mass, balance, structural strength, reliability, certified noise or emissions levels, operational characteristics, or other characteristics affecting the airworthiness or the environmental compatibility' is classified as major, in particular, but not only, when one or more of the following conditions are met:

(i) where the change requires an adjustment of the type-certification basis (special conditions or equivalent safety findings) other than electing to comply with later certification specifications or an adjustment to the applicable environmental-protection requirements (e.g. when a new requirement becomes applicable after the type certification);

(ii) where the applicant proposes a new interpretation of the certification specifications used for the type-certification basis that has not been published as AMC material or otherwise agreed with EASA;

(iii) where the demonstration of compliance uses methods that have not been previously accepted as appropriate for the nature of the change;

(iv) where the extent of new substantiation data necessary to comply with the applicable certification specifications and the degree to which the original substantiation data has to be reassessed and re-evaluated is considerable;

(v) where the change alters the airworthiness limitations or the operating limitations;

(vi) where the change is made mandatory by an airworthiness directive or the change is the terminating action of an airworthiness directive (ref. point 21L.A.4), see *Note 1*; and

(vii) where the design change introduces or affects functions where the failure effect is classified as catastrophic or hazardous.

*Note 1:* A change previously classified as minor and approved prior to the decision to issue an airworthiness directive needs no reclassification. However, EASA retains the right to review the change and reclassify/reapprove it if found necessary.

*Note 2:* The conditions listed in points (i) through (vii) above are an explanation of the criteria noted in point 21L.A.63, and of point 21L.A.103 that refers to this point for the classification of changes in Subpart F.

For an understanding of how to apply the above conditions, it is useful to take note of the examples given in Appendix A to GM 21L.A.63.

(5) Guidance on the classification of changes to aircraft flight manuals (AFMs)

The following changes to the AFM are deemed to be minor:

(i) revisions to the AFM associated with changes to the type design that are classified as minor in accordance with point 21L.A.63;

(ii) revisions to the AFM that are not associated with changes to the type design (also identified as stand-alone revisions) which fall into one of the following categories:

(A) changes to limitations or procedures that remain within already certified limits (e.g. weight, structural data, etc.);

(B) consolidation of two or more previously approved and compatible AFMs into one, or the compilation of different parts taken from previously approved and compatible AFMs that are directly applicable to the individual aircraft (customisation); and

(C) the introduction into a given AFM of compatible and previously approved AFM amendments, revisions, appendices or supplements; and

(D) changes that affect the certified noise or emissions levels of the product; and

(iii) administrative revisions to the AFM, defined as follows:

(A) for the AFMs issued by the TC holder:

(a) editorial revisions or corrections to the AFM;

(b) changes to parts of the AFM that do not require approval by EASA;

(c) conversions of previously Federal Aviation Administration (FAA)- or EASA-approved combinations of units of measurement added to the AFM in a previously approved manner;

(d) the addition of aircraft serial numbers to an existing AFM where the aircraft configuration, as related to the AFM, is identical to the configuration of the aircraft already covered by that AFM;

(e) the removal of references to aircraft serial numbers no longer applicable to that AFM; and

(f) the translation of an EASA-approved AFM into the official language of the State of design or State of registry;

(B) for AFM supplements issued by STC holders:

(a) editorial revisions or corrections to the AFM supplement;

(b) changes to parts of the AFM supplement that are not required to be approved by EASA;

(c) conversions of previously FAA- or EASA-approved combinations of units of measurement added to the AFM supplement in a previously approved manner;

(d) the addition of aircraft serial numbers to an existing AFM supplement where the aircraft configuration, as related to the AFM supplement, is identical to that of the aircraft already in that AFM supplement; 'identical' means here that all aircraft must belong to the same type and model/variant;

(e) the addition of a new STC to an existing AFM supplement, when this supplement is fully applicable to the new STC;

(f) the removal of references to aircraft serial numbers that are no longer applicable to that AFM supplement;

(g) the translation of an EASA-approved AFM supplement into the official language of the State of design or State of registry.

(6) Guidance on the classification of changes to certified aircraft noise levels and aircraft engine emissions levels

Volumes I and II of ICAO Doc 9501 'Environmental Technical Manual' define 'no-acoustical changes' and 'no-emissions changes' respectively as changes that would result in very small

changes in the certified levels and provide criteria for their determination. These changes have 'no appreciable effect' on the certified levels. Consequently, they are classified as minor changes and the certified levels remain unchanged. Nevertheless, if 'no-acoustical change' or 'no-emissions change' are demonstrated using the procedures in ICAO Doc 9501, the applicant should seek the agreement of EASA on the classification of the change.

All other changes to the certified aircraft noise levels and aircraft engine emissions levels are classified as major changes.

Examples of major changes are provided in Appendix A to GM1 21L.A.63.

## Appendix A to GM1 21L.A.63 Classification of changes to a type certificate

**EXAMPLES OF MAJOR CHANGES PER DISCIPLINE**

The information below is intended to provide a few examples of major changes per discipline, resulting from the application of point 21L.A.63 and point 3.3 below. It is not intended to present a comprehensive list of all major changes. Examples are categorised per discipline and are applicable to all products (aircraft, engines, propellers). However, a particular change may involve more than one discipline, e.g. a change to engine controls may be covered in engines and systems (software).

Those involved in the classification of changes should always be aware of the interaction between disciplines and the consequences this will have when assessing the effects of a change (i.e. operations and structures, systems and structures, systems and systems, etc.).

Specific rules may exist which override the guidance of these examples.

In Part 21 Light, a negative definition is given of minor changes only. However, in the following list of examples, it was preferred to give examples of major changes.

Where in this list of examples the words 'has effect' or 'affect(s)' are used, they have always to be understood as being the opposite of 'no appreciable effect' as in the definition of minor change in point 21L.A.63. Strictly speaking, the phrases 'has appreciable effect' and 'appreciably affect(s)' should have been used, but this has not been done to improve readability.

1. Structure

(i) Changes such as a change of dihedral, addition of floats.

(ii) Changes to materials, processes or methods of manufacture of primary structural elements, such as spars, frames and critical parts.

(iii) Changes that adversely affect fatigue or damage tolerance or life-limit characteristics.

(iv) Changes that adversely affect aeroelastic characteristics.

2. Cabin safety

(i) Changes which introduce a new cabin layout of sufficient change to require a reassessment of the emergency evacuation capability, or changes which adversely affect other aspects of passenger or crew safety.

Items to consider include but are not limited to:

— changes to or introduction of dynamically tested seats;

— change to the pitch between seat rows;

— change of distance between seat and adjacent obstacle, like a divider;

— changes to cabin layouts that affect evacuation path or access to exits.

3. Flight

Changes which adversely affect the approved performance or brake changes that affect braking performance.

Changes which adversely affect the flight envelope.

Changes which adversely affect the handling qualities of the product, including changes to the flight controls function (gains adjustments, functional modification to software), or changes to the flight protection or warning system.

4. Systems

For systems assessed under CS 23.2510, the classification process is based on the functional aspects of the change and its potential effects on safety.

(i) Where the failure effect is 'catastrophic' or 'hazardous', the change should be classified as 'major'.

(ii) Where the failure effect is 'major', the change should be classified as 'major' if:

— aspects of the compliance demonstration will use a means that has not been previously accepted for the nature of the change to the system; or

— the change affects the pilot–system interface (displays, controls, approved procedures); or

— the change introduces new types of functions/systems such as GPS primary, TCAS, predictive windshear, HUD.

The assessment of the criteria for software changes to systems should also be performed.

When software is involved, account should be taken also of the following guidelines:

Where a change is made to software produced in accordance with the guidelines of the latest edition of AMC 20-115 (see AMC-20 document), the change should be classified as 'major' if either of the following applies, and the failure effect is 'catastrophic', 'hazardous' or 'major':

(i) the executable code for software, determined to be Level A or Level B in accordance with the guidelines, is changed unless that change involves only a variation of a parameter value within a range already verified for the previous certification standard; or

(ii) the software is upgraded to or downgraded from Level A, Level B or Level C; or

(iii) the executable code, determined to be level C, is deeply changed, e.g. after a software re-engineering process accompanying a change of processor.

For software developed to guidelines other than the latest edition of AMC 20-115, the applicant should assess the changes in accordance with the foregoing principles.

For other codes, the principles noted above may be used. However, due consideration should be given to specific certification specifications/interpretations.

*For example:*

— Opening and listening on a User Datagram Protocol (UDP) port in an end system of an already certified topology.

— Activating a protocol in a point-to-point communication channel.

— The modification of a service between a system of a more closed, controlled security domain and a system of a more open, less controlled security domain.

— The modification of a security control between a system of a more closed, controlled information security domain and a system of a more open, less controlled security domain.

5. Propellers

Changes to:

— diameter,

— aerofoil,

— planform,

— material,

— blade retention system, etc.

6. Engines

Changes:

(i) that adversely affect operating speeds, temperatures, and other limitations;

(ii) that affect or introduce parts identified by CS E-510 where the failure effect has been shown to be 'hazardous';

(iii) that affect or introduce engine critical parts (CS E-515) or their life-limits.

(iv) to a structural part which requires a resubstantiation of the fatigue and static load determination used during certification;

(v) to any part of the engine which adversely affects the existing containment capability of the structure;

(vi) that adversely affect the fuel, oil and air systems, which alter the method of operation, or require reinvestigation against the type-certification basis;

(vii) that introduce new materials or processes, particularly on critical components.

7. Rotors and drive systems

Changes that:

(i) adversely affect fatigue evaluation unless the service life or inspection interval is unchanged; this includes changes to materials, processes or methods of manufacture of parts, such as

— rotor blades,

— rotor hubs including dampers and controls,

— gears,

— drive shafts,

— couplings;

(ii) affect systems whose failure may have 'hazardous' or 'catastrophic' effects; the design assessment should include:

— the cooling system,

— the lubrication system,

— rotor controls;

(iii) adversely affect the results of the rotor drive system endurance test, the rotor drive system being defined in CS 27.917;

(iv) adversely affect the results of the shafting critical speed analysis required by CS 27.931.

8. Noise and emissions

The examples provided below are not exhaustive and will not, in every case, result in an appreciable effect on the certified noise or emissions levels and, therefore, will not per se and in every case result in a major change classification.

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

(1) for 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 distance;

— a change to the rate of climb; or

— a change to $V_Y$ (best rate of climb speed);

— 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, tip shape, blade thickness or the number of blades;

— the installation of a variable or adjustable 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;

(2) for helicopters:

— a change that might affect the take-off and/or landing performance, including a change in take-off mass and $V_Y$ (best rate of climb speed);

— a change to VNE (never-exceed airspeed) or to VH (airspeed in level flight obtained using the torque corresponding to minimum engine installed, maximum continuous power available for sea level pressure, 25°C ambient conditions at the relevant maximum certified mass);

— 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 to the maximum normal operating rpm 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 on the helicopter's noise characteristics of either carrying external loads or the installation of external equipment need not be considered.

(ii) Examples of smoke-engine-emissions-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.

9. Power plant installation

Changes which include:

(i) control system changes which affect the engine/propeller/airframe interface;

(ii) new instrumentation displaying operating limits;

(iii) modifications to the fuel system and tanks (number, size and configuration);

(iv) change of engine/propeller type.

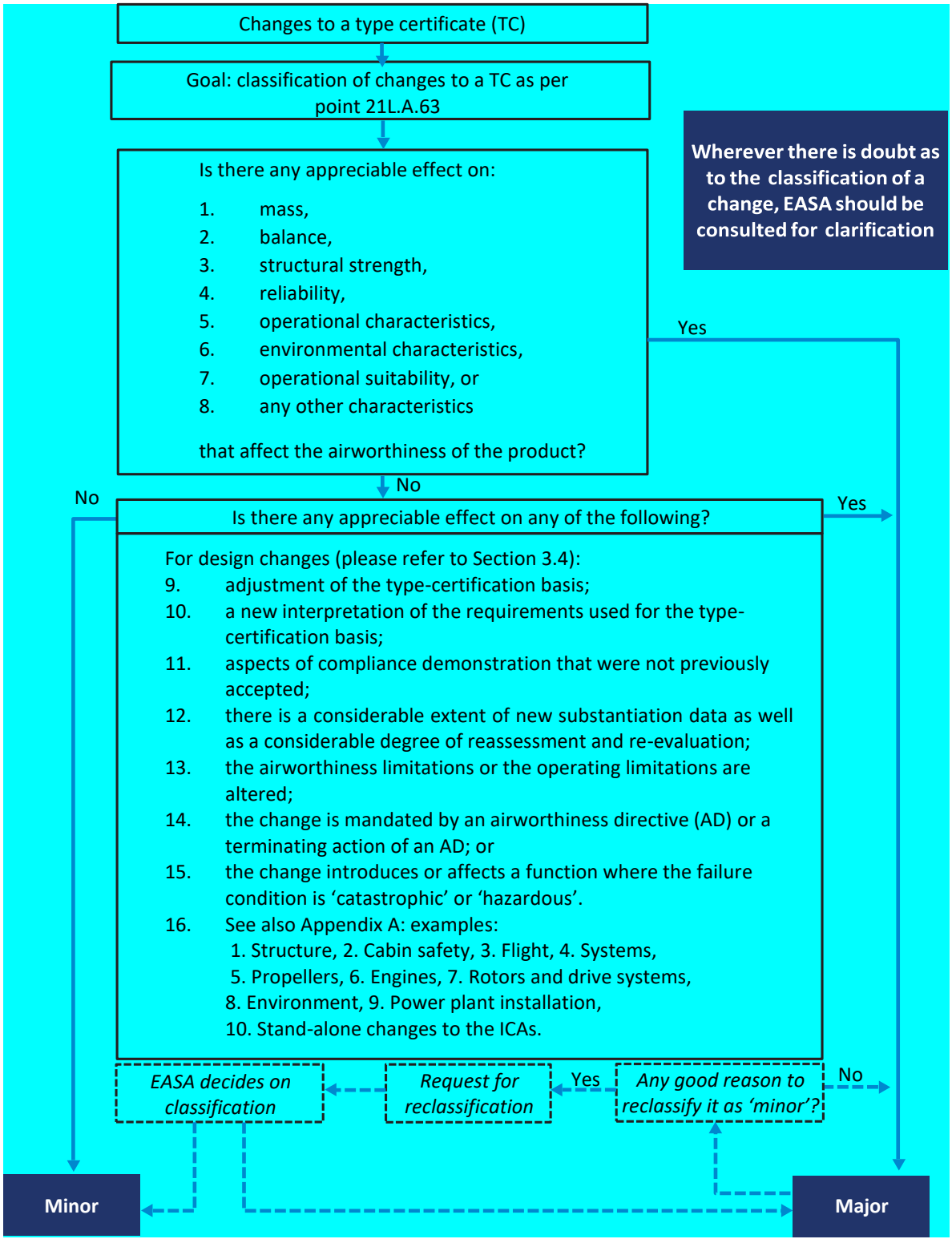
10. Stand-alone changes to non-ALS ICAs that require additional work to demonstrate compliance with the applicable certification basis as follows:

(i) changes related to accomplishment instructions (e.g. to the aircraft maintenance manual (AMM)) related to critical design configuration control limitations (CDCCL), or the electrical wiring interconnection systems (EWIS) ICAs, for which the technical content (e.g. gaps, steps) of the procedures is changed;

(ii) the introduction of novel technology for inspection purposes related to an ALS task;

(iii) changes that adversely affect the certification assumptions: e.g. some specific inspection procedures, such as inspection procedures for use after a hard landing, may include a decision-making chart based on the level of exceedance of the load in comparison with the certified limit loads; such criteria, and adverse changes, should be agreed with EASA.

***Classification process***



# Appendix B to GM 21L.A.63 Classification of changes to a type certificate

The following tables provide examples of 'substantial' changes. The classification may change due to cumulative effects and/or combinations of individual changes.

## A.1 Examples of 'substantial' changes for small aeroplanes (CS-23)

A.1.1 *Table A-1* contains examples of changes that are 'substantial' for small aeroplanes (CS-23).

***Table A-1 — Examples of 'substantial' changes for small aeroplanes (CS-23)***

| Example | Description of change | Notes |
|---|---|---|
| 1. | Change to wing location (tandem, forward, canard, high/low). | Proposed change to the design is so extensive that a substantially complete investigation of compliance with the applicable type-certification basis is required. |
| 2. | Fixed wing to tilt wing. | Proposed change to the design is so extensive that a substantially complete investigation of compliance with the applicable type-certification basis is required. |
| 3. | A change to the number of engines. | Proposed change to the design is so extensive that a substantially complete investigation of compliance with the applicable type-certification basis is required. |
| 4. | Replacement of piston or turboprop engines with turbojet or turbofan engines. | Proposed change to the design is so extensive that a substantially complete investigation of compliance with the applicable type-certification basis is required. |
| 5. | Change to engine configuration (tractor/pusher). | Proposed change to the design is so extensive that a substantially complete investigation of compliance with the applicable type-certification basis is required. |
| 6. | Change from an all-metal to all-composite aeroplane. | Proposed change to the design is so extensive that a substantially complete investigation of compliance with the applicable type-certification basis is required. |

## A.2 Examples of 'substantial' changes for rotorcraft (CS-27)

A.2.1 *Table A-2* contains examples of changes that are 'substantial' for rotorcraft (CS-27).

***Table A-2 — Examples of 'substantial' changes for rotorcraft (CS-27)***

| Example | Description of change | Notes |
|---|---|---|
| 1. | Change to the number and/or configuration of rotors (e.g. main and tail rotor system to two main rotors). | Proposed change to the design is so extensive that a substantially complete investigation of compliance with the applicable type-certification basis is required. |
| 2. | Change from an all-metal rotorcraft to all-composite rotorcraft. | Proposed change to the design is so extensive that a substantially complete investigation of compliance with the applicable type-certification basis is required. |

## A.3 Examples of 'substantial' changes for propellers (CS-P)

A.3.1 *Table A-3* contains an example of a change that is 'substantial' for propellers (CS-P).

***Table A-3 — Example of a 'substantial' change for propellers (CS-P)***

| Example | Description of change | Notes |
|---|---|---|
| 1. | Change to the number of blades. | Proposed change to the design is so extensive that a substantially complete investigation of compliance with the applicable type-certification basis is required. |

## AMC1 21L.A.65 Application for a change to a type certificate

**FORM AND MANNER**


FO.CERT_.00032-00 3 - Application for A

Part 21 Light Application for majc

The applicant should file an application using the web-based 'EASA Applicant Portal'[9] or the application forms for the approval of major changes/major repair designs (FO.CERT.00031)[10] or for the approval of minor changes/minor repair designs (FO.CERT.00032)[11], which may be downloaded from the EASA website.

The forms should be completed in accordance with the instructions embedded at the bottom of the application forms, and sent to EASA by fax, email or regular mail following the information provided on the EASA website[12].

## AMC1 21L.A.65(b) Application for a change to a type certificate

**CERTIFICATION BASIS**

Point 21L.A.65(b) 'a proposal for the type-certification basis and the applicable environmental-protection requirements, prepared in accordance with the requirements and options specified in point 21L.B.81'.

The proposed type-certification basis should include applicable certification specifications, proposed special conditions, proposed equivalent safety findings, as well as a proposed 'elect to comply' and proposed deviations, as applicable.

## AMC1 21L.A.66 Demonstration of compliance

**DEMONSTRATION OF COMPLIANCE FOR A CHANGE TO A TYPE CERTIFICATE**

The description of the change should include an explanation of the purpose of the change, the pre-modification and post-modification configuration(s) of the product, schematics/pictures, and any other detailed features and boundaries of the physical change (this may be supplemented by drawings or outlines of the design, if this helps to understand the design change), as well as the identification of the changes in areas of the product that are functionally affected by the change, and the identification of any changes to the approved manuals.

The applicant should identify any reinvestigations that are necessary to demonstrate compliance. This is a list of affected items of the applicable type-certification basis for which a new demonstration is

9 https://ap.easa.europa.eu (accessed: DD.MM.2023)

10 https://www.easa.europa.eu/document-library/application-forms/focert00031 (accessed: DD.MM.2023)

11 https://www.easa.europa.eu/document-library/application-forms/focert00032 (accessed: DD.MM.2023)

12 https://www.easa.europa.eu/document-library/application-forms/certificates-and-approvals (accessed: DD.MM.2023)

necessary, together with the means (e.g. calculation, test or analysis) by which it is proposed to demonstrate compliance.

Before submitting the application for a change, the analysis and classification activities under point 21L.A.63 should be performed using the corresponding GM. For repair designs, the analysis under point 21L.A.63 should be performed using GM 21L.A.203.

For a major change, AMC1 21L.A.24(b)(4) should be used as applicable to the change for the development of the compliance-demonstration plan.

Compliance documentation for the demonstration of compliance under point 21L.A.66(a) comprises one or more test or inspection programmes/plans, reports, drawings, design data, specifications, calculations, analyses, etc., and provides a record of the means by which compliance with the applicable type-certification basis and environmental-protection requirements is demonstrated.

Each compliance document should typically contain:

— the reference of the certification specifications, special conditions or environmental-protection requirements addressed by the document;

— substantiation data demonstrating compliance (except test or inspection programmes/plans);

— a statement by the applicant declaring that the document provides the proof of compliance for which it has been created; and

— the appropriate authorised signature.

Each compliance document should be unequivocally identified by its reference and issue date. The various issues of a document should be controlled and comply with point 21L.A.7.

The level of detail of the compliance documentation that is referred to in point 21L.A.66(a) should be the same regardless of whether the change is approved by EASA or under a design organisation approval (DOA) privilege, to allow the change to be assessed in the frame of the DOA surveillance.

The compliance-demonstration process always takes into account the specific configuration(s) in the type certificate (TC) to which the major change under approval is applied. This (these) configuration(s) may be defined by type models/variants or by design changes to the type design. The demonstration of compliance covers this (these) applicable specific configuration(s). Consequently, the approval of the major change excludes any other configurations, in particular those that already exist but are not considered in the compliance-demonstration process, as well as those that may be certified in the future.

For major changes approved by a design organisation approval (DOA) holder on the basis of its privilege as per point 21.A.263(c)(8) of Annex I (Part 21), the process described under AMC No 2 to 21.A.263(c)(5), (8) and (9) applies.

## AMC1 21L.A.66(c) Demonstration of compliance

**INSPECTIONS AND TESTS**

Proposed type design: this term defines the type design (or the portion of the type design) as it is determined at the time when the testing and inspections are carried out.

Verification document (also known as ‘statement of conformity’): before each testing and inspection, the verification document must confirm that the test specimen conforms with the proposed design, the test and measuring equipment is adequate for the test, and the sensors and measuring system are appropriately calibrated.

Conformity of the test specimen: the documented verification is intended to ensure that the manufactured test specimen adequately represents the proposed type design. Possible types of non-conformity may be the following:

— Non-conformity between the design of the test specimen and the proposed type design at the time of the test. These are typically identified in the early stage of the testing and inspection planning, and should be addressed as early as possible (e.g. in the test plan). There may be several reasons for such a non-conformity: to account for interfaces with the test equipment, to conservatively cover several or future design configurations, etc.

— Non-conformity between the manufactured test specimen and the design of the test specimen. Such a non-conformity may be the result of the manufacturing of the test specimen.

While it is convenient to define any possible non-conformity in as early as possible, the applicant does not need to make the distinction between the two types of non-conformity above as long as they are explicitly addressed, justified in the verification document or by cross reference to the test plan or other documents. However, testing for the demonstration of compliance with the applicable environmental-protection requirements should be conducted in the final design of the product having incorporated the change.

Certification is typically an iterative process in which the design is under continuous evolution. If the type design evolves after the time of the testing and inspections, then the final type design should be checked against the proposed type design (as it was at the time of the testing and inspections), and the differences (if any) should be analysed to ensure that the testing and inspections' results are representative of the final configuration. However, such changes made to the type design may lead to the invalidation of the testing and inspections' results and the need to repeat the testing and inspections. It is recommended that the design organisation should have a thorough configuration management process to track the evolving type design.

Conformity of test and measuring equipment: the configuration of the test and measuring equipment should be defined in the test plan and should include the following:

— definition/design of the test equipment (relevant tools, mechanical parts, electronic components used to execute the test); and

— definition of the measuring equipment:

  — type/model of sensors, together with their technical characteristics;

  — position and orientation of exciters and sensors; and

  — electronic measuring equipment (in some cases, this may also include the acquisition and post-processing of data).

The configuration of the test and measuring equipment should be defined and controlled through certification test plans and supporting documentation, according to the design assurance system, if applicable. The test plan should also include the following elements:

– the test cases, methods, and procedures for test execution;

– the pass–fail criteria; and

– pre-, during- and post-test inspections.

The verification document should confirm that the test and measuring equipment conforms to its purpose, and that the sensors and measuring system are appropriately calibrated. Any non-conformity should be assessed, and it should be justified that it will not compromise the test purpose and results. This may be done either in the verification document or by cross reference to other documents (test minutes of meetings, test notes, etc.).

Use of the term 'adequate': the test specimen, as well as the test and measuring equipment, is considered 'adequate' as long as the test execution on the manufactured test specimen (including any non-conformity) and the use of the installed test set-up do not compromise the test purpose and results (for example, by providing better performance than the proposed type design, or masking any potential failure mode or behaviour).

Changes that affect the validity of the verification document: if changes need to be introduced to the test specimen or to the test and measurement equipment after the verification is documented (and before the test is undertaken), then the verification document must be updated. The updated verification document must be made available to EASA before the test if EASA has informed the applicant that it will witness or carry out the tests or inspections.

Development versus certification tests: sometimes, tests on specimens that conform to a preliminary design, but are not intended for certification (known as development tests), are performed as part of a risk control strategy and to develop knowledge of a subject. Problems and failures found during development are part of the process of increasing the understanding of the design, including its failure modes and the potential for optimisation. Such development tests do not need to meet the requirements of point 21L.A.66(c).

Any planned test event should be classified in advance as either a development test or a certification test. Tests that support the compliance demonstration should be classified as certification tests.

It is acceptable for a development test to finally form part of the compliance demonstration, and it may be declared afterwards to be a certification test as long as it meets the requirements of point 21L.A.66(c). For this reason, it is important to keep the configuration of such tests under control.

If the test specimen used for a certification test has already undergone a series of previous tests that may affect or ultimately invalidate its acceptance as required by point 21L.A.66(c), this aspect should be considered when documenting the verification, and specific analyses or inspections may be required.

Because of the above aspects, EASA advises applicants to inform EASA if they intend to conduct a campaign of development tests that may eventually be used as certification tests to establish whether EASA would wish to witness the test(s).

## GM1 21L.A.66(d) Demonstration of compliance

**FLIGHT TESTING**

Detailed material on flight testing for compliance demonstration is included in the applicable CSs and GM. Information on flight testing for compliance demonstration with the applicable environmental-protection requirements may be found in Volumes I, II and III of Annex 16 to the Chicago Convention and in ICAO Doc 9501 'Environmental Technical Manual'.

## AMC1 21L.A.66(e)(1) Demonstration of compliance

**DATA AND INFORMATION REVIEW**

Availability of compliance data (see point 21L.A.66(e)): data and information required to be provided by the applicant should be made available to EASA in a reliable and efficient way.

## AMC1 21L.A.66(e)(2) Demonstration of compliance

**TESTS AND INSPECTIONS**

The applicant should inform EASA sufficiently in advance about the execution of tests and inspections that:

— are used for compliance-demonstration purposes; and

— have been identified as being of particular interest to EASA during the review and approval of the compliance-demonstration plan

in order to permit EASA the opportunity to witness or carry out these inspections or tests.

The applicant may propose to EASA to witness or carry out flight or other tests of particular aspects of the product during its development and before the type design is fully defined.

However, in case of flight tests, the applicant should perform the tests before EASA witnesses or performs them to ensure that no feature of the product precludes the safe conduct of the evaluation requested. EASA may require any such tests to be repeated once the type design is fully defined to ensure that subsequent changes have not adversely affected the conclusions from any earlier evaluation.

A verification document as per point 21L.A.66(c) is required for the above tests.

## AMC1 21L.A.66(e)(3) Demonstration of compliance

**FIRST-ARTICLE PHYSICAL INSPECTION**

The applicant should be prepared for any additional investigations as notified by EASA according to point 21L.B.83(c).

Refer to AMC1 21L.A.25(e)(3) for an explanation of the activities performed under the first-article inspection.

## GM1 21L.A.66(f) Demonstration of compliance

**DECLARATION OF COMPLIANCE**

All compliance demonstrations in accordance with the compliance-demonstration plan, including all the testing and inspections in accordance with point 21L.A.66(c) and all flight testing in accordance with point 21L.A.66(d) and those necessary to determine compliance with the applicable environmental-protection requirements, should be completed before the issuance of the final declaration of compliance.

'No feature or characteristic' that may make the changed product unsafe under point 21L.A.66(f)(2) means the following: while every effort is made to address in the applicable certification basis all the risks to product safety that may be caused by the product, experience shows that safety-related events may occur with products in service, even though compliance with the certification basis is fully demonstrated. One of the reasons may be that some existing risks are not properly addressed in the certification basis. Therefore, the applicant should declare that it has not identified any such feature or characteristic.

'No feature or characteristic' that may make the changed product environmentally incompatible under point 21L.A.66(f)(2):

It is assumed that environmental compatibility is demonstrated when the changed product complies with the applicable environmental-protection requirements. Therefore, the applicant, when declaring that the changed product complies with the applicable environmental-protection requirements under point 21L.A.66(f)(1), should also declare that it has not identified any such feature or characteristic.

## AMC1 21L.A.67 Requirements for the approval of a minor change to a type certificate

(a) Applicability of point 21L.A.67

Point 21L.A.67 should be complied with by applicants for the approval of a minor change to a type certificate (TC), and by design organisation approval (DOA) holders that approve minor changes under their own privileges.

Point 21L.A.67(c), however, only applies to projects for which an application is submitted to EASA. For DOA holders that approve minor changes under their privileges, the justification of compliance and the declaration of compliance required by point 21L.A.67(b) should be produced but do not need to be submitted to EASA. They should be, however, kept on record and submitted to EASA on request during its DOA continued surveillance process.

(b) The approval process

The approval process comprises the following steps:

*Note:* Steps 1, 2 and 4 should be followed only by applicants for minor changes approved by EASA. DOA holders that approve minor changes under their privileges should refer to AMC No 1 to 21.A.263(c)(2) or AMC No 2 to 21.A.263(c)(2), as applicable to their approval process.

(1) Application

When the minor change is approved by EASA, an application should be submitted to EASA as described in point 21L.A.65 and in AMC 21L.A.65.

(2) Certification basis

(3) Justification of compliance

(4) Declaration of compliance

(c) Certification basis

The certification basis for a minor change consists of a subset of the elements of the product's certification basis 'incorporated by reference in the type certificate'.

The certification basis 'incorporated by reference in the type certificate' is the certification basis for the product as recorded in the type certificate data sheet (TCDS) for the product type/model in the applicable configuration(s).

The certification basis contains the applicable airworthiness and environmental-protection requirements specified by reference to their amendment level, as complemented by special conditions, equivalent safety findings, deviations, a proposed 'elect to comply', etc., as applicable.

By way of derogation from the above, CSs that became applicable after those incorporated by reference in the TC may be used for the approval of a minor change (see the guidance below on certification specifications that became applicable after those 'incorporated by reference in the type certificate').

If other changes are required for the embodiment of the minor change, the certification basis corresponding to the product modified by these other changes should also be considered when determining the certification basis for the minor change.

(d) Justification of compliance required by point 21L.A.67(c)

The applicant should justify compliance with the certification basis under point 21L.A.67(a) for all areas that are either physically changed or functionally affected by the minor change.

(1) Means of compliance: the applicant should define and record the means (calculation, test or analysis, etc.) by which compliance is demonstrated. Appendix A to AMC1 21L.A.24(b) may be used to describe how compliance is demonstrated.

(2) Compliance documents: the compliance demonstration should be recorded in compliance documents. For minor changes, one comprehensive compliance document may be sufficient, provided that it contains evidence of all aspects of the compliance demonstration.

See also the additional guidance in point (e) below.

(3) Aircraft manuals: where applicable, supplements to manuals (e.g. aircraft flight manual (AFM), aircraft maintenance manual (AMM), etc.) may be issued.

See also additional guidance in point (f) below on embodiment/installation instructions.

(e) Definition of the change to the type certificate

The change to the type certificate should be defined in accordance with GM 21L.A.61.

(f) Embodiment/installation instructions

The instructions for the embodiment/installation of the change (e.g. service bulletin, modification bulletin, production work order, etc.) should be defined. This may include the installation procedure, the required material, etc.

(g) Certification specifications that are applicable to the product on the date of the application for the change

(1) Minor changes are those changes that do not affect the airworthiness of the product. This means that the certification basis for the minor change may consist of the items of the certification basis incorporated by reference in the TCDS of the product type/model, and normally it should not be necessary for a minor change to use certification specifications that became applicable after those that are incorporated by reference in the type certificate.

(2) On the other hand, the applicant may elect to use the certification specifications that are applicable to the product on the date of the application for the change for the compliance demonstration. This does not affect the classification of the change.

(h) Feature or characteristic that affects the airworthiness or environmental compatibility of the changed product

The term 'no feature or characteristic' applies to a minor change, in which case the effect of the change on the product safety or environmental compatibility is quite low. Minor changes should not be approved if either the design organisation approval (DOA) holder approving minor changes under its privileges or EASA is aware of a feature or characteristic that may make the

changed product unsafe or environmentally incompatible for the uses for which the approval is requested.

## GM1 21L.A.67(c) Requirements for the approval of a minor change to a type certificate

The level of detail of the justification that is referred to in point 21L.A.67(c) should be the same regardless of whether the change is approved by EASA or under a design organisation approval (DOA) privilege, to allow the change to be assessed in the frame of the DOA surveillance.

## AMC1 21L.A.68 Requirements for the approval of a major change to a type certificate

(a) For major changes approved by EASA, the applicant should use all the AMC and GM to point 21L.A.25.

(b) For major changes approved by the design organisation approval (DOA) holder on the basis of its privileges under point 21.A.263(c)(8) of Annex I (Part 21), the process described in AMC No 2 to 21.A.263(c)(5), (8) and (9) applies.

## AMC1 21L.A.68(c) Requirements for the approval of a major change to a type certificate

For the demonstration by the applicant that there are no unresolved issues, see AMC1 21L.A.27(d).

# SUBPART E — SUPPLEMENTAL TYPE CERTIFICATES

## GM1 21L.A.81 Scope

The term ‘changes to the type certificate’ is consistently used in Subparts D and E of Part 21 Light, as well as in the related AMC and GM. This term does not refer to changing the document that reflects the type certificate (TC) but to changing the elements of the TC as defined in point 21L.B.47(b). Therefore, the processes contained in Subparts D and E of Part 21 Light should be used for the approval of changes to the elements listed in point 21L.B.47(b).

## GM1 21L.A.83(a) Demonstration of design capability

**TERMS OF APPROVAL COVERING THE RESPECTIVE CATEGORY OF THE PRODUCT**

If an applicant has a design organisation approval (DOA) issued under Subpart J of Annex I (Part 21) and it wishes to use this approval to meet the eligibility criteria of point 21L.A.83, it will need to apply for a change to the Terms of Approval to include the new aircraft type within the list of products.

## GM1 21L.A.83(b) Demonstration of design capability

**DECLARATION OF PRODUCT CATEGORY**

Organisations that have declared their design capability under Subpart J of Annex Ib (Part 21 Light) should update their declaration of design capability to include the new product when submitting a new application for a type certificate (see point 21L.A.173(c) 'Declaration of design capability').

## AMC1 21L.A.84(a) Application for a supplemental type certificate

**FORM AND MANNER**

The applicant should file an application using the web-based 'EASA Applicant Portal'[13] or the application form for a supplemental type certificate (STC) (FO.CERT.000xxx)[14], which may be downloaded from the EASA website.


Part 21 Light
Application for a Su

If the form is filled in offline, it should be completed in accordance with the instructions embedded at the bottom of the application form and sent to EASA by email or regular mail following the information provided on the EASA website[15].

## AMC1 21L.A.84(b)(1) Application for a supplemental type certificate

**CERTIFICATION BASIS**

Point 21L.A.65(b) 'a proposal for the type-certification basis and the applicable environmental-protection requirements, prepared in accordance with the requirements and options specified in point 21L.B.101'.

The proposed type-certification basis should include applicable certification specifications, proposed special conditions, proposed equivalent safety findings, as well as a proposed 'elect to comply' and proposed deviations, as applicable.

## AMC1 21L.A.85 Demonstration of compliance

**DEMONSTRATION OF COMPLIANCE FOR A SUPPLEMENTAL TYPE CERTIFICATE**

The description of the design change should include an explanation of the purpose of the change, the pre-modification and post-modification configuration(s) of the product, schematics/pictures, and any other detailed features and boundaries of the physical change (this may be supplemented by drawings or outlines of the design, if this helps to understand the design change), as well as the identification

[13] https://ap.easa.europa.eu (accessed: DD.MM.2023)
[14] https://www.easa.europa.eu/document-library/application-forms/focert00033 (accessed: DD.MM.2023)
[15] https://www.easa.europa.eu/document-library/application-forms/certificates-and-approvals (accessed: DD.MM.2023)

of the changes in areas of the product that are functionally affected by the change, and the identification of any changes to the approved manuals.

The applicant should identify any reinvestigations that are necessary to demonstrate compliance. This is a list of any affected items of the applicable certification basis for which a new demonstration is necessary, together with the means (e.g. calculation, test or analysis) by which it is proposed to demonstrate compliance.

(a) Compliance documentation for the demonstration of compliance under point 21L.A.85(a) comprises one or more test or inspection programmes/plans, reports, drawings, design data, specifications, calculations, analyses, etc., and provides a record of the means by which compliance with the applicable type-certification basis and environmental-protection requirements is demonstrated.

(b) Each compliance document should typically contain:

— the reference of the certification specifications, special conditions or environmental-protection requirements addressed by the document;

— substantiation data demonstrating compliance (except test or inspection programmes/plans);

— a statement by the applicant declaring that the document provides the proof of compliance for which it has been created; and

— the appropriate authorised signature.

(c) Each compliance document should be unequivocally identified by its reference and issue date. The various issues of a document should be controlled and comply with point 21L.A.7.

The level of detail of the compliance documentation that is referred to in point 21L.A.85(a) should be the same regardless of whether the change is approved by EASA or under a design organisation approval (DOA) privilege, to allow the change to be assessed in the frame of the DOA surveillance.

For major changes (STCs) approved by a design organisation approval (DOA) holder on the basis of its privileges as per point 21.A.263(c)(8) of Annex I (Part 21), the process described in AMC No 2 to 21.A.263(c)(5), (8) and (9) applies.

## AMC1 21L.A.85(b) Demonstration of compliance

**COMPLIANCE-DEMONSTRATION PLAN**

The compliance-demonstration plan is a document that allows the applicant and EASA to manage and control the evolving supplemental type certificate design, as well as the process of compliance demonstration by the applicant and its verification by EASA when required.

In particular, the following information should typically be expected:

— identification of the relevant personnel that make decisions affecting airworthiness and environmental protection, and that will interface with EASA during the critical design review prior to issuance of the flight conditions and during the first-article inspection (if required), unless otherwise identified to EASA (e.g. within the design organisation procedures);

— a project schedule, including major milestones;

— subcontracting arrangements for design, environmental protection and/or production.

The applicant should provide detailed information about the proposed means of compliance with the applicable airworthiness and environmental-protection requirements identified under point 21L.B.101. The information provided should be sufficient for EASA to easily determine the means of compliance used.

This should include the following:

— a compliance checklist addressing each requirement, the proposed means of compliance (see Appendix A to AMC1 21L.A.85 below for the relevant codes), and the related compliance document(s);

— identification of industry standards (Society of Automotive Engineers (SAE), American Society for Testing and Materials (ASTM), European Organisation for Civil Aviation Equipment (EUROCAE), AeroSpace and Defence Industries Association of Europe (ASD), etc.), methodology documents, handbooks, technical procedures, technical documents and specifications specified in the type certificate data sheet, certification memoranda, policy statements, guidance material, etc., that are proposed in the demonstration of compliance;

— when the compliance demonstration involves testing (point 21L.A.85(c) and (d)), a description of the ground- and flight-test article(s), test method(s), test location(s), test schedule, test house(s), test conditions (e.g. limit load, ultimate load), as well as of the intent/objective(s) of the testing; and

— when the compliance demonstration involves analyses/calculations, a description/identification of the tools (e.g. name and version/release of the software programs) and methods used, the associated assumptions, limitations and/or conditions, as well as of the intended use and purpose; furthermore, the validation and verification of such tools and methods should be addressed.

For every aspect mentioned above, the applicant should clearly identify whether the demonstration of compliance involves any method (analysis or test) which is novel or unusual for the applicant. In addition, the applicant should identify any deviations from the published AMC to the relevant CSs.

# Appendix A to AMC1 21L.A.85 Demonstration of compliance

**MEANS-OF-COMPLIANCE CODES**

| Type of compliance | Means of compliance | Associated compliance documents |
|---|---|---|
| Engineering evaluation | MC0:<br>(a) compliance statement<br>(b) reference to design data<br>(c) election of methods, factors, etc.<br>(d) definitions | (a) Design data<br>(b) Recorded statements |
| | MC1: design review | (c) Descriptions<br>(d) Drawings |
| | MC2: calculation/analysis | (e) Substantiation reports |
| | MC3: safety assessment | (f) Safety analyses |
| Tests | MC4: laboratory tests | (g) Test programmes<br>(h) Test reports<br>(i) Test interpretations |
| | MC5: ground tests on related product(s) | |
| | MC6: flight tests | |
| | MC8: simulation | |
| Inspection | MC7: design inspection/audit | (j) Inspection or audit reports |
| Equipment qualification | MC9: equipment qualification | *Note:* Equipment qualification is a process that may include all previous means of compliance at equipment level. |

# AMC1 21L.A.85(a);(b) Demonstration of compliance

**COMPLIANCE DOCUMENTATION**

(a) Compliance documentation comprises one or more test or inspection programmes/plans, reports, drawings, design data, specifications, calculations, analyses, etc., and provides a record of the means by which compliance with the applicable type-certification basis and environmental-protection requirements is demonstrated.

(b) Each compliance document should typically contain:

— the reference of the certification specifications, special conditions or environmental-protection requirements addressed by the document;

— substantiation data demonstrating compliance (except test or inspection programmes/plans);

— a statement by the applicant declaring that the document provides the proof of compliance for which it has been created; and

— the appropriate authorised signature.

(c) Each compliance document should be unequivocally identified by its reference and issue date. The various issues of a document should be controlled and comply with point 21L.A.7.

# AMC1 21L.A.85(c) Demonstration of compliance

**INSPECTIONS AND TESTS**

Proposed type design: this term defines the type design (or the portion of the type design) as it is determined at the time when the testing and inspections are carried out.

Verification document (also known as 'statement of conformity'): before each testing and inspection, the verification document must confirm that the test specimen conforms with the proposed design, the test and measuring equipment is adequate for the test, and the sensors and measuring system are appropriately calibrated.

Conformity of the test specimen: the documented verification is intended to ensure that the manufactured test specimen, even in the presence of non-conformities, adequately represents the proposed type design. Possible types of non-conformity may be the following:

— Non-conformity between the design of the test specimen and the proposed type design at the time of the test. These are typically identified in the early stage of the testing and inspection planning, and should be addressed as early as possible (e.g. in the test plan). There may be several reasons for such a non-conformity: to account for interfaces with the test equipment, to conservatively cover several or future design configurations, etc.

— Non-conformity between the manufactured test specimen and the design of the test specimen. Such a non-conformity may be the result of the manufacturing of the test specimen.

While it is convenient to define any possible non-conformity as early as possible, the applicant does not need to make the distinction between the two types of non-conformity above as long as they are explicitly addressed, justified in the verification document or by cross reference to the test plan or other documents. However, testing for the demonstration compliance with the applicable environmental-protection requirements should be conducted in the final design of the product having incorporated the change.

Type certification is typically an iterative process in which the design is under continuous evolution. If the type design evolves after the time of the testing and inspections, then the final type design should be checked against the proposed type design (as it was at the time of the testing and inspections), and the differences (if any) should be analysed to ensure that the testing and inspection results are representative of the final configuration. However, such changes made to the type design may lead to the invalidation of the testing and inspection results and the need to repeat the testing and inspections. It is recommended that the design organisation should have a thorough configuration management process to track the evolving type design.

Conformity of test and measuring equipment: the configuration of the test and measuring equipment should be defined in the test plan and include the following:

— definition/design of the test equipment (relevant tools, mechanical parts, electronic components used to execute the test); and

— definition of the measuring equipment:

  — type/model of sensors, together with their technical characteristics;

  — position and orientation of exciters and sensors; and

  — electronic measuring equipment (in some cases, this may also include the acquisition and post-processing of data).

The configuration of the test and measuring equipment should be defined and controlled through certification test plans and supporting documentation, according to the design assurance system, if applicable. The test plan should also include the following elements:

— the test cases, methods, and procedures for test execution;

— the pass–fail criteria; and

— pre-, during- and post-test inspections.

The verification document should confirm that the test and measuring equipment conforms to its purpose, and that the sensors and measuring system are appropriately calibrated. Any non-conformity should be assessed, and it should be justified that it will not compromise the test purpose and results. This may be done either in the verification document or by cross reference to other documents (test minutes of meetings, test notes, etc.).

Use of the term 'adequate': the test specimen, as well as the test and measuring equipment, is considered 'adequate' as long as the test execution on the manufactured test specimen (including any non-conformity) and the use of the installed test set-up do not compromise the test purpose and results (for example, by providing better performance than the proposed type design, or masking any potential failure mode or behaviour).

Changes that affect the validity of the verification document: if changes need to be introduced to the test specimen or to the test and measurement equipment after the verification is documented (and before the test is undertaken), then the verification document must be updated. The updated verification document must be made available to EASA before the test if EASA has informed the applicant that it will witness or carry out the tests or inspections.

Development versus certification tests: sometimes, tests of specimens that conform to a preliminary design, but are not intended for certification (known as development tests), are performed as part of a risk control strategy and to develop knowledge of a subject. Problems and failures found during development are part of the process of increasing the understanding of the design, including its failure modes and the potential for optimisation. Such development tests do not need to meet the requirements of point 21L.A.85(c).

Any planned test event should be classified in advance as either a development test or a certification test. Tests that support the compliance demonstration should be classified as certification tests.

It is acceptable for a development test to finally form part of the compliance demonstration, and it may be declared afterwards to be a certification test as long as it meets the requirements of point 21L.A.85(c). For this reason, it is important to keep the configuration of such tests under control.

If the test specimen used for a certification test has already undergone a series of previous tests that may affect or ultimately invalidate its acceptance as required by point 21L.A.85(c), this aspect should be considered when documenting the verification, and specific analyses or inspections may be required.

Because of the above aspects, EASA advises applicants to inform EASA if they intend to conduct a campaign of development tests that may eventually be used as certification tests to establish whether EASA would wish to witness the tests.

## GM1 21L.A.85(d) Demonstration of compliance

**FLIGHT TESTING**

Detailed material on flight testing for compliance demonstration is included in the applicable CSs and GM. Information on flight testing for compliance demonstration with the applicable environmental-protection requirements, especially in terms of aircraft noise, may be found in Volumes I, II and III of Annex 16 to the Chicago Convention and in ICAO Doc 9501 'Environmental Technical Manual'.

## AMC1 21L.A.85(e)(1) Demonstration of compliance

**REVIEW OF DATA AND INFORMATION RELATED TO THE DEMONSTRATION OF COMPLIANCE**

Availability of compliance data (see point 21L.A.85(e)): data and information required to be provided by the applicant should be made available to EASA in a reliable and efficient way as agreed with EASA.

## AMC1 21L.A.85(e)(2) Demonstration of compliance

**TESTS AND INSPECTIONS**

The applicant should inform EASA sufficiently in advance about the execution of tests and inspections that:

— are used for compliance demonstration purposes; and

— have been identified as being of particular interest to EASA during the review and approval of the compliance demonstration plan

in order to permit EASA the opportunity to witness or carry out these inspections or tests.

The applicant may propose to EASA to witness or carry out flight or other tests of particular aspects of the product during its development and before the type design is fully defined.

However, in case of flight tests, the applicant should perform the tests before EASA witnesses or performs them to ensure that no features of the product preclude the safe conduct of the evaluation requested. EASA may require any such tests to be repeated once the type design is fully defined to ensure that subsequent changes have not adversely affected the conclusions from any earlier evaluation.

A verification document as per point 21L.A.85(c) is required for the above tests.

## AMC1 21L.A.85(e)(3) Demonstration of compliance

**PHYSICAL INSPECTION OF THE FIRST ARTICLE**

The applicant should be prepared for any additional investigations as notified by EASA according to point 21L.B.102(c).

Refer to AMC1 21L.A.25(e)(3) for the description of the compliance activities of the first-article inspection.

## GM1 21L.A.85(f) Demonstration of compliance

**DECLARATION OF COMPLIANCE**

All compliance-demonstration activities conducted in accordance with the compliance-demonstration plan, including all the testing and inspections conducted in accordance with point 21L.A.85(c) and all flight testing conducted in accordance with point 21L.A.85(d) and those necessary to determine compliance with the applicable environmental-protection requirements should be completed before the issuance of the final declaration of compliance.

'No feature or characteristic' that may make the product unsafe in point 21L.A.85(f)(2) means the following: while every effort is made to address in the applicable certification basis all the risks to product safety that may be caused by the product, experience shows that safety-related events may occur with products in service, even though compliance with the certification basis is fully demonstrated. One of the reasons may be that some existing risks are not properly addressed in the certification basis. Therefore, the applicant should declare that it has not identified any such feature or characteristic.

'No feature or characteristic' that may make the changed product environmentally incompatible (point 21L.A.85(f)(2)):

It is assumed that environmental compatibility is demonstrated when the changed product complies with the applicable environmental-protection requirements. Therefore, the applicant, when declaring that the changed product complies with the applicable environmental-protection requirements under point 21L.A.85(f)(1), should also declare that they have not identified any such feature or characteristic.

## AMC1 21L.A.86 Requirements for approval of a supplemental type certificate

(a) For supplemental type certificates (STCs) approved by EASA, the AMC and GM to point 21L.A.25 should be followed by the applicant.

(b) In accordance with point 21L.A.86(b), the compliance-demonstration process must always cover the specific configuration(s) in the type certificate (TC) to which the STC under approval is applied. This (these) configuration(s) should be defined by the change to the type certificate considering the type certificate data sheet (TCDS) and the relevant optional installations. The demonstration of compliance covers this (these) applicable specific configuration(s). Consequently, the approval of the STC excludes any other configurations, in particular those that already exist, but are not considered in the compliance-demonstration process, as well as those that may be certified in the future.

(c) For STCs approved by the design organisation approval (DOA) holder under its privilege as per point 21.A.263(c)(9) of Annex I (Part 21), the process described under AMC No 2 to 21.A.263(c)(5), (8) and (9) applies.

## AMC1 21L.A.86(a)(5) Requirements for approval of a supplemental type certificate

For the demonstration by the applicant that there are no unresolved issues, see AMC1 21L.A.27(d).

# SUBPART F — CHANGES TO AIRCRAFT FOR WHICH DESIGN COMPLIANCE HAS BEEN DECLARED

## GM1 21L.A.101 Scope

The term 'change to the design of an aircraft which was subject to a declaration' is used in Part 21 Subpart F, as well as in the related AMC and GM, to refer to any changes to the elements of the aircraft design data as defined in point 21L.A.46. Therefore, a declaration of design compliance should be required for any changes to the aircraft design data defined in point 21L.A.46.

## GM1 21L.A.102 Standard changes

**APPLICABLE CERTIFICATION SPECIFICATIONS**

CS-STAN[16] contains the certification specifications referred to in point 21L.A.102(a)(1). Guidance on the implementation of Standard Changes and Standard Repairs may be found in AMC M.A.801 of the AMC to Part-M.

## GM1 21L.A.103 Classification of changes to the design of an aircraft for which design compliance has been declared

Major changes that are classified as being 'substantial' should require a new declaration of design compliance to be submitted in accordance with Subpart C of Annex Ib (Part 21 Light).

Examples of major changes that are considered substantial may be found in Appendix B to GM1 21L.A.103.

(a) PURPOSE OF CLASSIFICATION

The purpose of the classification of changes to the design of an aircraft that was subject to a declaration made in accordance with point 21L.A.63 of Subpart C is to allow the declarants to determine the route to be followed for the declaration and whether they need to submit the declaration to EASA (major change) or to maintain it in order to make it available to EASA upon request (minor change).

Point 21L.A.63, as referenced by point 21L.A.103(a), requires that all changes be classified as either 'major' or 'minor' using the criteria in point 21L.A.63.

(b) INTRODUCTION

(1) Point 21L.A.63(b) and (c), as referenced by point 21L.A.103(a), proposes criteria for the classification of design changes as either 'minor' or 'major'.

This GM is intended to provide guidance on the term 'appreciable effect' affecting the airworthiness of the product, the declared noise or emissions levels or affecting any of the other characteristics mentioned in point 21L.A.63, where 'airworthiness' is

[16] https://www.easa.europa.eu/en/certification-specifications/cs-stan-standard-changes-and-standard-repairs

interpreted in the context of a product in conformity with the applicable detailed technical specifications and is in condition for safe operation. It provides complementary guidelines to assess a change to the declared aircraft in order to meet the requirements of point 21L.A.103 where classification is the first step of a procedure.

Characteristics affecting the environmental compatibility of the product are characteristics affecting the compliance of the product with the applicable environmental-protection requirements.

*Note:* For classification of repairs, see GM 21L.A.223.

Although this GM provides guidance on the classification of major changes, as opposed to minor changes as defined in point 21L.A.103, the GM and point 21L.A.103 are deemed entirely compatible.

Appendix A to GM1 21L.A.103 provides examples of major changes and a classification process.

(c) ASSESSMENT OF A CHANGE FOR CLASSIFICATION

(1) Changes to the declared design

Point 21L.A.103 addresses all changes to any of the aspects of a declaration of design compliance that was submitted under Subpart C.

(2) Reserved

(3) Classification process (see also the flow chart 'Classification process' in Appendix A to GM 21L.A.103)

Point 21L.A.103 requires all changes to be classified as either 'major' or 'minor', using the criteria of point 21L.A.63.

Wherever there is doubt as to the classification of a change, EASA should be consulted for clarification.

When the strict application of the point (c)(4) criteria results in a major classification, the declarant may request reclassification by EASA.

A simple design change planned to be mandated by an airworthiness directive may be reclassified as minor due to the involvement of EASA in the continued airworthiness process when this is agreed between EASA and the declarant.

The reasons for a classification decision should be recorded.

(4) General guidance on the classification of major changes

A change that is judged to have an 'appreciable effect on the mass, balance, structural strength, reliability, declared noise or emissions levels, operational characteristics, or other characteristics affecting the airworthiness or the environmental compatibility' is classified as major, in particular, but not only, when one or more of the following conditions are met:

(i) where the change requires an adjustment of the detailed technical specifications other than electing to comply with later certification specifications;

(ii) where the declarant proposes a new interpretation of the certification specifications used to define the applicable detailed technical specifications;

(iii) where the demonstration of compliance uses methods that have not been previously determined as appropriate for the nature of the change;

(iv) where the extent of new substantiation data necessary to comply with the applicable detailed technical specifications and the degree to which the original substantiation data has to be reassessed and re-evaluated is considerable;

(v) where the change alters the airworthiness limitations or the operating limitations;

(vi) where the change is made mandatory by an airworthiness directive or the change is the terminating action of an airworthiness directive (ref. point 21L.A.4), see *Note 1*; and

(vii) where the design change introduces or affects functions where the failure effect is classified as 'catastrophic' or 'hazardous'.

*Note 1:* A change previously classified as minor and approved prior to the decision to issue an airworthiness directive needs no reclassification. However, EASA retains the right to review the change and reclassify/reapprove it if found necessary.

*Note 2:* The conditions listed in points (i) through (vii) above are an explanation of the criteria noted in point 21L.A.63 as referenced by point 21L.A.103.

For an understanding of how to apply the above conditions, it is useful to take note of the examples given in Appendix A to GM 21L.A.103.

(5) Guidance on the classification of changes to aircraft flight manuals (AFMs)

The following changes to the AFM are deemed to be minor:

(i) revisions to the AFM associated with changes to the design that are classified as minor in accordance with point 21L.A.103;

(ii) revisions to the AFM that are not associated with changes to the design (also identified as stand-alone revisions) which fall into one of the following categories:

(A) changes to limitations or procedures that remain within already declared limits (e.g. weight, structural data, etc.);

(B) consolidation of two or more previously declared and compatible AFMs into one, or the compilation of different parts taken from previously declared and compatible AFMs that are directly applicable to the individual aircraft (customisation); and

(C) the introduction into a given AFM of compatible and previously declared AFM amendments, revisions, appendices or supplements; and

(iii) administrative revisions to the AFM, defined as follows:

(A)

(a) editorial revisions or corrections to the AFM;

(b) conversions of previously Federal Aviation Administration (FAA)- or EASA-approved combinations of units of measurement added to the AFM in a previously approved manner;

(c) the addition of aircraft serial numbers to an existing AFM where the aircraft configuration, as related to the AFM, is identical to the configuration of aircraft already covered by that AFM;

(d) the removal of references to aircraft serial numbers no longer applicable to that AFM; and

(e) the translation of an AFM into the official language of the State of design or State of registry.

(6) Guidance on the classification of changes to declared aircraft noise levels

(i) Volume I of ICAO Doc 9501 'Environmental Technical Manual' defines 'no-acoustical changes' as changes that would result in very small changes in the declared noise level(s) and provide criteria for their determination. These changes have 'no appreciable effect' on the declared noise levels. Consequently, they are classified as minor changes and the declared noise level(s) remain unchanged.

(ii) All other changes to the declared aircraft noise levels are classified as major changes.

(iii) Examples of major changes are provided in Appendix A to GM1 21L.A.103.

## Appendix A to GM1 21L.A.103 Classification of changes to the design of an aircraft for which design compliance has been declared

**EXAMPLES OF MAJOR CHANGES PER DISCIPLINE**

The information below is intended to provide a few examples of major changes per discipline, resulting from the application of point 21L.A.103. It is not intended to present a comprehensive list of all major changes. Examples are categorised per discipline and are applicable to all products (aircraft, engines, propellers). However, a particular change may involve more than one discipline, e.g. a change to engine controls may be covered in engines and systems (software).

The persons that assess the change for its classification should always be aware of the interaction between disciplines and the consequences this will have when assessing the effects of a change (i.e. operations and structures, systems and structures, systems and systems, etc.).

Specific rules may exist which override the guidance of these examples.

In Part 21 Light, a negative definition is given of minor changes only. However, in the following list of examples, it was preferred to give examples of major changes.

Where in this list of examples the words 'has effect' or 'affect(s)' are used, they should always be understood as being the opposite of 'no appreciable effect' as in the definition of minor change in point 21L.A.63. Strictly speaking, the phrase 'has appreciable effect' and 'appreciably affect(s)' should have been used, but this has not been done to improve readability.

1. Structure

(i) Changes such as a change of dihedral, addition of floats.

(ii) Changes to materials, processes or methods of manufacture of primary structural elements, such as spars, frames and critical parts.

(iii) Changes that adversely affect fatigue or damage tolerance or life-limit characteristics.

(iv) Changes that adversely affect aeroelastic characteristics.

2. Cabin safety

(i) Changes which introduce a new cabin layout of sufficient change to require a reassessment of the emergency evacuation capability, or changes which adversely affect other aspects of passenger or crew safety.

Items to consider include but are not limited to:

— changes to or introduction of dynamically tested seats;

— change to the pitch between seat rows;

— change of distance between seat and adjacent obstacle, like a divider;

— changes to cabin layouts that affect evacuation path or access to exits.

3. Flight

Changes which adversely affect the approved performance or brake changes that affect braking performance.

Changes which adversely affect the flight envelope.

Changes which adversely affect the handling qualities of the product, including changes to the flight controls function (gains adjustments, functional modification to software), or changes to the flight protection or warning system.

4. Systems

For systems assessed under CS 23.2510, the classification process is based on the functional aspects of the change and its potential effects on safety.

(i) Where the failure effect is 'catastrophic' or 'hazardous', the change should be classified as 'major'.

(ii) Where the failure effect is 'major', the change should be classified as 'major' if:

— aspects of the compliance demonstration will use a means that has not been previously utilised for the nature of the change to the system; or

— the change affects the pilot–system interface (displays, controls, approved procedures); or

— the change introduces new types of functions/systems such as GPS primary, TCAS, predictive windshear, HUD.

The assessment of the criteria for software changes to systems should also be performed.

When software is involved, account should be taken also of the following guidelines:

Where a change is made to software produced in accordance with the guidelines of the latest edition of AMC 20-115 (see AMC-20 document), the change should be classified as 'major' if either of the following applies, and the failure effect is 'catastrophic', 'hazardous' or 'major':

(i) the executable code for software, determined to be Level A or Level B in accordance with the guidelines, is changed unless that change involves only a variation of a parameter value within a range already verified for the previous certification standard; or

(ii) the software is upgraded to or downgraded from Level A, Level B or Level C; or

(iii) the executable code, determined to be level C, is deeply changed, e.g. after a software re-engineering process accompanying a change of processor.

For software developed to guidelines other than the latest edition of AMC 20-115, the declarant should assess the changes in accordance with the foregoing principles.

For other codes the principles noted above may be used. However, due consideration should be given to specific certification specifications/interpretations.

5. Propellers

Changes to:

(i) diameter,

(ii) aerofoil,

(iii) planform,

(iv) material,

(v) blade retention system, etc.

6. Engines

Changes:

(i) that adversely affect operating speeds, temperatures, and other limitations;

(ii) that affect or introduce parts identified by CS E-510 where the failure effect has been shown to be 'hazardous';

(iii) that affect or introduce engine critical parts (CS E-515) or their life-limits;

(iv) to a structural part which requires a resubstantiation of the fatigue and static load determination used during certification;

(v) to any part of the engine which adversely affects the existing containment capability of the structure;

(vi) that adversely affect the fuel, oil and air systems, which alter the method of operation, or require reinvestigation against the type-certification basis;

(vii) that introduce new materials or processes, particularly on critical components.

7. Noise

The examples provided below are not exhaustive and will not, in every case, result in an appreciable effect on the declared noise levels and, therefore, will not per se and in every case result in a major change classification.

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

(i) 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 distance;

— a change to the rate of climb; or

— a change to $V_Y$ (best rate of climb speed);

(ii) 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.);

(iii) a change of engine or propeller type;

(iv) 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;

(v) a change to the highest power in the normal operating range ('top of green arc');

(vi) 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;

(vii) a change to the engine inlet or exhaust including, if fitted, the inlet or exhaust muffler;

(viii) a change in propeller diameter, tip shape, blade thickness or the number of blades;

(ix) the installation of a variable or adjustable pitch propeller in place of a fixed pitch propeller and vice versa;

(x) a change that causes a change to the angle at which air flows into the propeller.

8. Power plant installation

Changes which include:

(i) control system changes which affect the engine/propeller/airframe interface;

(ii) new instrumentation displaying operating limits;

(iii) modifications to the fuel system and tanks (number, size and configuration);

(iv) change of engine/propeller type.

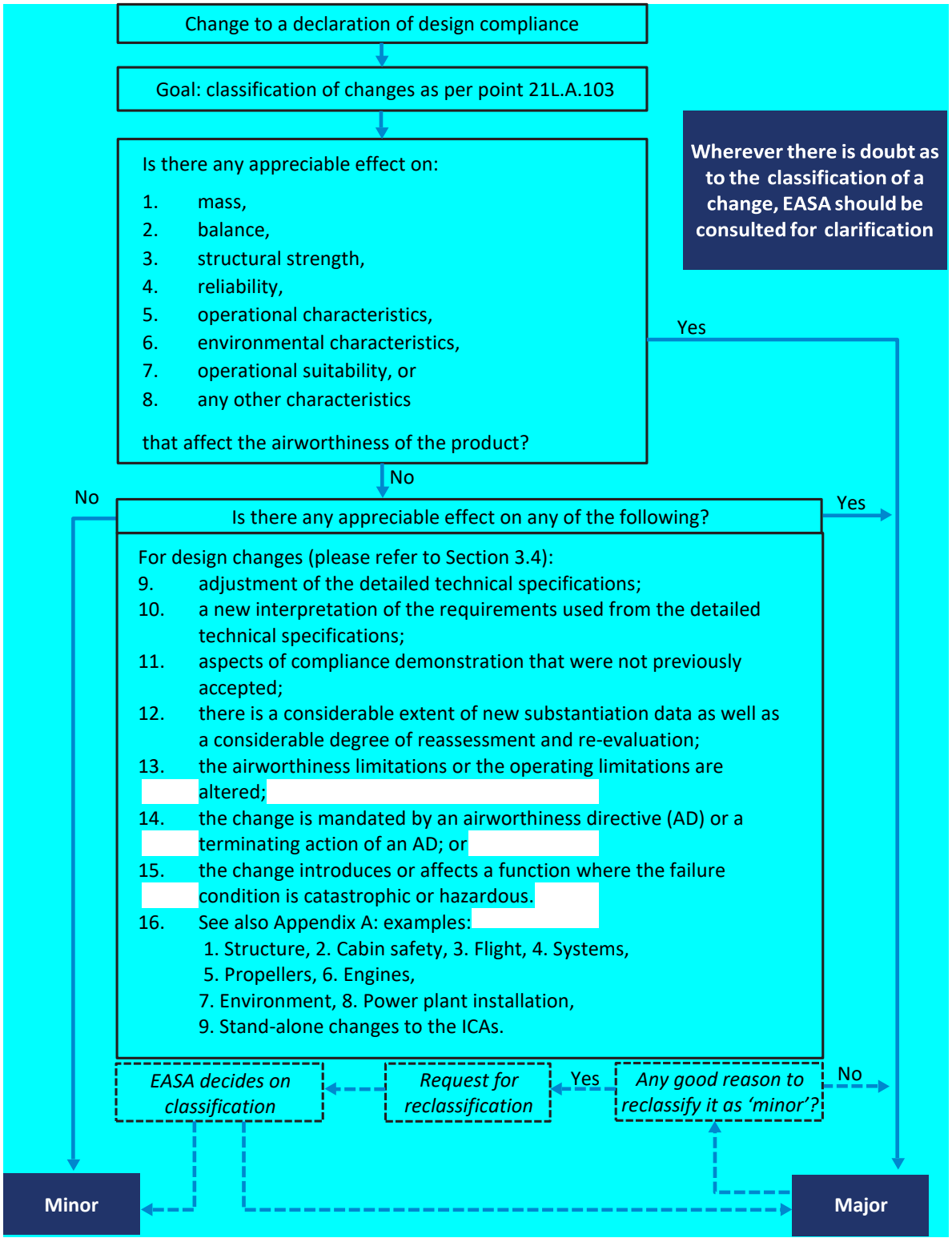
9. Stand-alone changes to non-ALS ICAs that require additional work to demonstrate compliance with the applicable certification basis as follows:

(i) changes related to accomplishment instructions (e.g. to the aircraft maintenance manual (AMM)) related to critical design configuration control limitations (CDCCL), or the electrical wiring interconnection systems (EWIS) ICAs, for which the technical content (e.g. gaps, steps) of the procedures is changed;

(ii) the introduction of novel technology for inspection purposes related to an ALS task;

(iii) changes that adversely affect the certification assumptions: e.g. some specific inspection procedures, such as inspection procedures for use after a hard landing, may include a decision-making chart based on the level of exceedance of the load in comparison with the certified limit loads; such criteria, and adverse changes, should be agreed with EASA.

***Declaration process***



# Appendix B to point 21L.A.103 Classification of changes to the design of an aircraft for which design compliance has been declared

The following tables provide examples of 'substantial' changes. The classification may change due to cumulative effects and/or combinations of individual changes.

## A.1 Examples of 'substantial' changes for small aeroplanes (CS-23)

A.1.1 Table A-1 contains examples of changes that are 'substantial' for small aeroplanes (CS-23).

***Table A-1 — Examples of when a new declaration of design compliance would be required under Subpart C for substantial changes for small aeroplanes (CS-23)***

| Example | Description of change | Notes |
|---|---|---|
| 1. | Change to wing location (tandem, forward, canard, high/low). | Proposed change to the design is so extensive that a substantially complete investigation of compliance with the applicable type-certification basis is required. |
| 2. | Change to engine configuration (tractor/pusher). | Proposed change to the design is so extensive that a substantially complete investigation of compliance with the applicable type-certification basis is required. |
| 3. | Change from an all-metal to all-composite aeroplane. | Proposed change to the design is so extensive that a substantially complete investigation of compliance with the applicable type-certification basis is required. |

# AMC1 21L.A.105(a) Declaration of design compliance for minor changes

**REQUIREMENTS FOR THE DECLARATION OF A MINOR CHANGE**

(a) Applicability of point 21L.A.105

Point 21L.A.105 should be complied with by declarants for the declaration of compliance of a minor change, including design organisation approval (DOA) holders that declare compliance of minor changes under their privileges as per point (c)(3) of point 21.A.263 of Annex I (Part 21).

In accordance with point 21L.A.105(c) for declarations of compliance for minor changes, the substantiating data and the declaration of compliance required by point 21L.A.105(a) should be produced but does not need to be submitted to EASA. They should be, however, kept on record and made available to EASA upon request during any oversight visit.

(b) The declaration process

The declaration process comprises the following steps:

(1) classification of the change;

(2) applicable detailed technical specifications;

(3) determination of compliance;

(4) declaration of design compliance.

(c) Detailed technical specifications

The detailed technical specifications for a minor change consist of the detailed technical specifications that were incorporated by reference in the declaration of design compliance that was submitted for the particular aircraft under Subpart C unless EASA has determined that these

are no longer appropriate, and the latest detailed technical specifications should be complied with or the declarant elects to comply with these detailed technical specifications.

(d) Determination of compliance required by point 21L.A.105(a)

The declarant should determine compliance with the applicable detailed technical specifications established for the minor change for all areas that are either physically changed or functionally affected by the minor change.

(1) Means of compliance: the declarant should define and record the means (calculation, test or analysis, etc.) by which compliance is determined. Appendix A to AMC1 21L.A.108(a) may be used for this purpose.

(2) Compliance documents: the compliance determination should be recorded in compliance documents. For minor changes, one comprehensive compliance document may be sufficient, provided that it contains evidence of all aspects for compliance. AMC1 21L.A.108(b) may also be used, where applicable.

(3) Aircraft manuals: where applicable, supplements to manuals (e.g. aircraft flight manual (AFM), aircraft maintenance manual (AMM), etc.) may be issued.

See also additional guidance below (point (e)) on embodiment/installation instructions.

(e) Embodiment/installation instructions

The instructions for the embodiment/installation of the change (e.g. service bulletin, modification bulletin, production work order, etc.) should be defined. This may include the installation procedure, the required material, etc.

## AMC1 21L.A.105(b) Declaration of design compliance for minor changes

**FORM AND MANNER**

The declarant should complete and file a declaration of compliance for the minor change using the applicable form below (which can also be downloaded from the EASA website) for the declaration of minor changes/minor repair designs.

If there are any changes to the data (e.g. propeller or engine designation) that was provided in the EASA Part 21 Light database of declared noise levels as a result of the minor change, then this data should be added by the declarant.


Declaration of Compliance for Min

The justification of the classification of the change should also be recorded.

## AMC1 21L.A.105(c) Declaration of design compliance for minor changes

**REGISTER OF DECLARATIONS FOR MINOR CHANGES**

The register that is used by the declarant to record the declarations of design compliance for minor changes should also comply with point 21L.A.7 and be easily accessible in case EASA requests the details of a specific minor change during oversight.

## AMC1 21L.A.107(b) Declaration of design compliance for a major change

**FORM AND MANNER**

The declarant should use the form below for the declaration of design compliance for a major change:

Draft Declaration of Compliance for Majo

The declarant should submit the declaration of design compliance through the web-based 'EASA Applicant Portal'[17] using the request for registration of a declaration of design compliance form (FO.CERT.xxxxx), which may be downloaded from the EASA website.

The form should be completed along with the declaration of design compliance and sent to EASA by email or regular mail following the information provided on the EASA website[18].

If the data sheet for airworthiness needs to be adapted, then an amended version should also be provided.

If there are any changes to the data that was provided in the EASA Part 21 Light database of declared noise levels as a result of the major change, then this data should be added by the declarant as a new record within the EASA Part 21 Light database identifying that it is applicable after the major change.

## GM1 21L.A.107(c) Declaration of design compliance for a major change

**INFORMATION TO BE PROVIDED TO EASA**

The documents and information that are required to be provided to EASA under point 21L.A.107(c) may be provided to EASA by the declarant in advance of the submission of the declaration of design compliance for the major change. This would be advantageous for the declarant to facilitate EASA's investigations and to determine the need for the first-article inspection under point 21L.B.121(b).

[17] https://ap.easa.europa.eu (accessed: DD.MM.2023).

[18] https://www.easa.europa.eu/document-library/application-forms/certificates-and-approvals (accessed: DD.MM.2023).

## AMC1 21L.A.107(e) Declaration of design compliance for a major change

**SPECIFIC CONFIGURATION(S)**

The compliance-demonstration process always takes into account the specific configuration(s) in the declaration of design compliance to which the major change relates. This (these) configuration(s) may be defined by product models/variants or by design changes to the declaration. The demonstration of compliance applies to this (these) applicable specific configuration(s). Consequently, the declaration of the major change excludes any other configurations, in particular those that already exist but are not considered in the compliance-demonstration process, as well as those that may be declared in the future.

## GM1 21L.A.108 Compliance activities for declaring compliance of a major change

**VOLUNTARY INVOLVEMENT OF EASA PRIOR TO THE SUBMISSION OF DECLARATION**

The declarant may choose to involve EASA prior to submitting the declaration of design compliance for a major change. This would allow EASA to:

(a) check the scope of the product is still within the scope of Subpart C;

(b) provide guidance on the completeness of the compliance-demonstration plan and the selection of means of compliance;

(c) advise on the selection of the applicable detailed technical specifications and applicable noise requirements;

(d) provide guidance about noise tests (if applicable) and witness them;

(e) avoid any issues or delays during the first-article inspection (after submission of the declaration of design compliance and if considered to be necessary under point 21L.B.121(b)).

The initiation of the project may occur before starting the compliance activities or during those activities. The assignment of a dedicated project number would facilitate any subsequent communication with EASA. This will facilitate the provision of compliance documentation required by point 21L.A.107(d), which may be provided by the declarant to EASA at key stages in the compliance demonstration prior to the submission of the declaration of design compliance for the major change.

## AMC1 21L.A.108(a) Compliance activities for declaring compliance of a major change

**COMPLIANCE-DEMONSTRATION PLAN FOR A MAJOR CHANGE**

The compliance-demonstration plan for a major change is a document that allows the declarant to manage and control the design of the major change, as well as the process of compliance demonstration, and that enables EASA to investigate the root cause(s) in the event of a safety issue being discovered.

The description of the change should include an explanation of the purpose of the change, the pre-modification and post-modification configuration(s) of the aircraft, schematics/pictures, and any other detailed features and boundaries of the physical change (this may be supplemented by drawings or outlines of the design, if this helps to understand the design change), as well as the identification of the changes in areas of the aircraft that are functionally affected by the change, and the identification of any changes to the approved manuals.

The items of the declaration of aircraft design compliance made in accordance with Subpart C that are affected by the change and for which a new demonstration of compliance is necessary should be identified together with the means (e.g. calculation, test or analysis) by which it is proposed to demonstrate compliance.

The compliance demonstration should include the analysis for the classification of the change in accordance with GM1 21L.A.103.

In particular, the following information should typically be expected:

— identification of the relevant personnel that make decisions affecting airworthiness and environmental compatibility, and that will interface with EASA during any physical inspection and assessment of the changed product if required under point 21L.B.121(b);

— subcontracting arrangements for design, environmental compatibility and/or production (if applicable).

Point 21L.A.107(d)(1) 'Description of the major change'

An overview of the:

— architecture, functions, systems;

— dimensions, design weights, payloads, design speeds;

— engines and power/thrust rating;

— materials and technologies;

— cabin configuration aspects;

— options (e.g. weight variants, power/thrust rating variants, optional avionics equipment items, brake options, tyre options, floats, skids).

Point 21L.A.107(d)(2) 'Operating characteristics, design features and limitations'

— operating speed limitations;

— service ceiling, maximum airfield elevation;

— cabin pressure;

— limit load factors;

— number of passengers, minimum crew, payload, range;

— weight and centre-of-gravity (CG) envelope and fuel loading;

— performance;

— environmental envelope;

— runway surface conditions;

— other items, if considered to be more appropriate, which address the specific aeronautical product.

The declarant should provide detailed information about the means of compliance with the applicable requirements identified under point 21L.A.107(a). This should include the following:

— a compliance checklist addressing each requirement, the proposed means of compliance (see Appendix A to AMC1 21L.A.107(a) below for the relevant codes), and the related compliance document(s);

— identification of industry standards, methodology documents, handbooks and any other acceptable means of compliance, specified in the airworthiness or noise data sheet, which have been followed in the demonstration of compliance;

— when the compliance demonstration involves testing, a description of the ground- and flight-test article(s), test method(s), test location(s), test schedule, test house(s), test conditions (e.g. limit load, ultimate load), as well as of the intent/objective(s) of the testing; and

— when the compliance demonstration involves analyses/calculations, a description/identification of the tools (e.g. name and version/release of the software programs) and methods used, the associated assumptions, limitations and/or conditions, as well as of the intended use and purpose.

For every aspect mentioned above, the declarant should clearly identify whether the demonstration of compliance involves different means than those contained in the published AMC to the relevant CSs and any method (analysis or test) which is novel or unusual for the declarant.

For every aspect related to compliance with the applicable environmental-protection requirements mentioned above, the declarant should clearly identify whether the demonstration of compliance involves means that are described in ICAO Doc 9501 'Environmental Technical Manual'.

## Appendix A to AMC1 21L.A.108(a) Compliance activities for declaring compliance of a major change

**MEANS-OF-COMPLIANCE CODES**

| Type of compliance | Means of compliance | Associated compliance documents |
|---|---|---|
| Engineering evaluation | MC0:<br>(a) compliance statement<br>(b) reference to design data<br>(c) election of methods, factors, etc.<br>(d) definitions | (a) Design data<br>(b) Recorded statements |
| | MC1: design review | (c) Descriptions<br>(d) Drawings |
| | MC2: calculation/analysis | (e) Substantiation reports |
| | MC3: safety assessment | (f) Safety analyses |
| Tests | MC4: laboratory tests | (g) Test programmes<br>(h) Test reports<br>(i) Test interpretations |
| | MC5: ground tests on related product(s) | |
| | MC6: flight tests | |
| | MC8: simulation | |
| Inspection | MC7: design inspection/audit | (j) Inspection or audit reports |
| Equipment qualification | MC9: equipment qualification | *Note:* Equipment qualification is a process that may include all previous |

| | | |
|---|---|---|
| | | means of compliance at equipment level. |

## AMC1 21L.A.108(b) Compliance activities for declaring compliance of a major change

**COMPLIANCE DOCUMENTATION**

(a) Compliance documentation comprises one or more test or inspection programmes/plans, reports, drawings, design data, specifications, calculations, analyses, etc., and provides a record of the means by which compliance with the applicable detailed technical specifications and environmental-protection requirements has been demonstrated.

(b) Each compliance document should typically contain:

— the reference of the detailed technical specifications or environmental-protection requirements addressed by the document;

— substantiation data demonstrating compliance (except test or inspection programmes/plans);

— a statement by the declarant declaring that the document provides the proof of compliance for which it has been created; and

— the declarant's signature.

(c) Each compliance document should be unequivocally identified by its reference and issue date. The various issues of a document should be controlled and comply with point 21L.A.7.

## AMC1 21L.A.108(c);(d);(e) Compliance activities for declaring compliance of a major change

**INSPECTIONS AND TESTS**

In accordance with point 21L.A.108(d), the declarant must address the conformity of the test specimen, as well as of the test and measuring equipment.

Conformity of the test specimen

The recorded justification of the conformity of the test articles is intended to ensure that the manufactured test specimen adequately represents the declared applicable design data. Possible types of non-conformity may be the following:

— Non-conformity between the design of the test specimen and the originally intended design data at the time of the test. These are typically identified in the early stage of the test planning, and should be addressed as early as possible (e.g. in the test plan). There may be several reasons for such a non-conformity: to account for interfaces with the test equipment, to conservatively cover several or future design configurations, etc.

— Non-conformity between the manufactured test specimen and the design of the test specimen. Such a non-conformity may be the result of the manufacturing of the test specimen.

While it is convenient to define any possible non-conformity as early as possible, the declarant does not need to make the distinction between the two types of non-conformity above as long as they are explicitly addressed and justified by cross reference to the test plan or other documents. However, testing for the demonstration compliance with the applicable environmental-protection requirements should be conducted with the final design of the product having incorporated the change.

Compliance demonstration is typically an iterative process in which the design is under continuous evolution. If the aircraft design evolves after the time of the inspection or test, then the final major change design should be checked against the originally intended design (as it was at the time of the inspection or test), and the differences (if any) should be analysed to ensure that the inspection or test results are representative of the final configuration. However, such changes made to the design may lead to the invalidation of the inspection or test results and the need to repeat the inspection or test. It is recommended that the declarant should have a thorough configuration management process to track the evolving design of the major change.

Conformity of the test and measuring equipment: the configuration of the test and measuring equipment should be defined in the test plan and include the following:

— definition/design of the test equipment (relevant tools, mechanical parts, electronic components used to execute the test); and

— definition of the measuring equipment:

  — type/model of sensors, together with their technical characteristics;

  — position and orientation of exciters and sensors; and

  — electronic measuring equipment (in some cases, this may also include the acquisition and post-processing of data).

The configuration of the test and measuring equipment should be defined and controlled through test plans and supporting documentation. The test plan should also include the following elements:

— the test cases, methods, and procedures for test execution;

— the pass–fail criteria; and

— pre-, during- and post-test inspections.

The declarant should confirm that the test and measuring equipment conforms to its definition in the test plan, and that the sensors and measuring system are appropriately calibrated. Any non-conformity should be assessed, and it should be justified that it will not compromise the test purpose and results. This may be done either in the recorded justification of the conformity of the test articles and equipment or by cross reference to other documents (test minutes of meetings, test notes, etc.).

Use of the term ‘adequate’: the test and measuring equipment is considered ‘adequate’ as long as the test execution on the manufactured test specimen (including any non-conformity) and the use of the installed test set-up do not compromise the test purpose and results (for example, by providing better performance than the proposed type design, or by masking any potential failure mode or behaviour).

Changes that affect the validity of the recorded justification of the conformity of the test articles and equipment: if changes need to be introduced to the test specimen or to the test and measurement equipment after the justification has been recorded (and before the test is undertaken), then it must be updated.

Development versus compliance-demonstration tests: sometimes, tests of specimens that conform to a preliminary design, but are not intended for demonstration of compliance (known as development tests), are performed as part of a risk control strategy and to develop knowledge of a subject. Problems and failures found during development are part of the process of increasing the

understanding of the design, including its failure modes and the potential for optimisation. Such development tests do not need to meet the requirements of point 21L.A.108(d) and (e).

Any planned test event should be classified in advance as either a development test or a compliance-demonstration test.

It is acceptable for a development test to finally form part of the compliance demonstration, and it may be declared afterwards to be a compliance-demonstration test as long as it meets the requirements of point 21L.A.108(d) and (e). For this reason, it is important to keep the configuration of such tests under control.

If the test specimen used for a compliance-demonstration test has already undergone a series of previous tests that may affect or ultimately invalidate its validity due to potential non-conformity to 21L.A.108(d) as required by point 21L.A.107(d)(6), this aspect should be considered when justifying the conformity, and specific analyses or inspections may be required to support such a statement.

Because of the above aspects, declarants may wish to inform EASA if they intend to conduct a campaign of development tests that may eventually be used as demonstration-of-compliance tests to establish whether EASA would wish to witness the tests.

## AMC1 21L.A.108(f) Compliance activities for declaring compliance of a major change

**PHYSICAL INSPECTION OF THE FIRST ARTICLE**

The declarant should be prepared for any additional investigations as notified by EASA according to point 21L.B.121(b).

Refer to AMC 21L.A.47(a) for an explanation of the activities performed under the first-article inspection.

## GM1 21L.A.108(f) Compliance activities for declaring compliance of a major change

**INSPECTIONS AND TESTS PERFORMED BY EASA**

The declarant should inform EASA sufficiently in advance about the execution of significant inspections and tests that are used for compliance-demonstration purposes in order to permit EASA the opportunity to perform or witness these inspections or tests in advance of any physical inspection and assessment of the changed product if required by point 21L.B.121(b).

This would be advantageous for the declarant to avoid any issues or delays if a physical inspection and assessment of the changed product is required (see point 21L.B.121(b)).

Additionally, the declarant may propose to EASA to perform or witness flight or other tests of particular aspects of the product during its development and before the design of the major change is fully defined. However, before EASA performs or witnesses any flight test, the declarant should perform these tests and should ensure that no features of the product preclude the safe conduct of the evaluation requested.

A recorded justification of the conformity of the test articles and equipment as per point 21L.A.107(d)(6) is required for the above tests.

# SUBPART M — DESIGN OF REPAIRS TO TYPE-CERTIFIED PRODUCTS

## GM1 21L.A.201 Scope

Manuals and other instructions for continued airworthiness (such as the manufacturer's structural repair manual, maintenance manuals and engine manuals provided by the type-certificate holder or the supplemental type-certificate holder, as applicable) for operators contain useful information for the development and approval of repairs.

When that data is explicitly identified as approved, it may be used by operators without further approval to cope with anticipated in-service problems arising from normal usage provided that it is used strictly for the purpose for which it has been developed.

Approved data is data which is approved either by EASA or by an appropriately approved design organisation.

## GM1 21L.A.202 Standard repairs

CS-STAN[19] contains the certification specifications referred to in point 21L.A.202(a)(1). Guidance on the implementation of Standard Changes and Standard Repairs may be found in AMC M.A.801 of the AMC to Part-M.

## GM1 21L.A.203(a) Classification of repair designs to a type-certified product

(a) Clarification of the terms 'Major/Minor'

In line with the definitions given in point 21L.A.203, a new repair is classified as 'major' if the result on the approved type design has an appreciable effect on structural performance, weight, balance, systems, operational characteristics, certified noise or emissions levels, or other characteristics affecting the airworthiness or the environmental compatibility of the product or part. In particular, a repair is classified as 'major' if it requires extensive static, fatigue and damage tolerance strength justification and/or testing in its own right, or if it requires methods, techniques or practices that are unusual (i.e. unusual material selection, heat treatment, material processes, jigging diagrams, etc.).

Repairs that require a reassessment and re-evaluation of the original certification substantiation data to ensure that the aircraft continues to comply with all the relevant requirements should be considered 'major' repairs.

Repairs whose effects are considered minor and require minimal or no assessment of the original certification substantiation data to ensure that the aircraft continues to comply with all the relevant requirements should be considered 'minor'.

It is understood that not all the certification substantiation data will be available to those persons/organisations classifying repairs. A qualitative judgement of the effects of the repair will, therefore, be acceptable for the initial classification. The subsequent review of the design of the repair may lead to it being reclassified, owing to early judgements being no longer valid.

[19] https://www.easa.europa.eu/en/certification-specifications/cs-stan-standard-changes-and-standard-repairs

(b) Airworthiness and environmental-protection concerns for 'Major/Minor' classification

The following should be considered for the magnitude of their effect when classifying repairs. Should the effect be considered significant, then the repair should be classified as 'major'. The repair may be classified as 'minor' where the effect is known to be without appreciable consequence.

(1) Structural performance

The structural performance of the product includes static strength, fatigue, damage tolerance, flutter and stiffness characteristics. Repairs to any element of the structure should be assessed for their effect upon the structural performance.

(2) Weight and balance

The weight of the repair may have a greater effect upon smaller aircraft as opposed to larger aircraft. The effects to be considered are related to overall aircraft centre of gravity and aircraft load distribution. Control surfaces are particularly sensitive to the changes due to the effect upon the stiffness, mass distribution and surface profile which may have an effect upon flutter characteristics and controllability.

(3) Systems

Repairs to any elements of a system should be assessed for the effect intended on the operation of the complete system and for the effect on system redundancy. The consequence of a structural repair on an adjacent or remote system should also be considered as above (for example, airframe repair in the area of a static port).

(4) Operational characteristics

Changes may include:

— stall characteristics,

— handling,

— performance and drag,

— vibration.

(5) Other characteristics:

— changes to load path and load sharing,

— fire protection/resistance,

— characteristics affecting the environmental compatibility of the product are characteristics affecting the compliance of the product with the applicable environmental-protection requirements

*Note:* Considerations for classifying repairs as 'Major/Minor' should not be limited to those listed above.

(c) Examples of 'major' repairs

(1) A repair that requires a permanent additional inspection to the approved maintenance programme, necessary to ensure the continued airworthiness of the product. Temporary repairs for which specific inspections are required prior to installation of a permanent repair do not necessarily need to be classified as 'major'. Also, inspections and changes to inspection frequencies not required as part of the approval to ensure continued airworthiness do not cause the classification of the associated repair as 'major'.

(2) A repair to life-limited or critical parts.

(3) A repair that introduces a change to the aircraft flight manual (AFM).

## AMC1 21L.A.205(a) Application for the approval of a repair design to a type-certificated product

**FORM AND MANNER**

The applicant should file an application using the web-based 'EASA Applicant Portal'[20] or the application forms for the approval of major changes/major repair designs (FO.CERT.0xxxx)[21] or for the approval of minor changes/minor repair designs (FO.CERT.00032)[22], which may be downloaded from the EASA website.

FO.CERT_.00032-00 3 - Application for A

Part 21 Light Application for majc

The forms should be completed in accordance with the instructions embedded at the bottom of the application forms, and sent to EASA by fax, email or regular mail following the information provided on the EASA website[23].

## AMC1 21L.A.205(b) Application for the approval of a repair design to a type-certificated product

**RECORD-KEEPING**

(a) Relevant substantiation data associated with a new major repair design and record-keeping should include:

(1) the identification of the damage and the reporting source;

(2) the major repair design approval sheet identifying the applicable specifications and references of justifications;

(3) the repair drawing and/or instructions and scheme identifier;

(4) the correspondence with the type-certificate (TC) holder or the supplemental type-certificate (STC) holder if its advice on the design has been sought;

(5) the structural justification (static strength, fatigue, damage tolerance, flutter, etc.) or references to this data;

(6) if applicable, the effect on the certified noise and emissions levels and the characteristics that may affect the environmental compatibility of the product;

(7) the effect on the aircraft, engines and/or systems (performance, flight handling, etc., as appropriate);

[20] https://ap.easa.europa.eu (accessed: DD.MM.2023)

[21] https://www.easa.europa.eu/document-library/application-forms/focert00031 (accessed: DD.MM.2023)

[22] https://www.easa.europa.eu/document-library/application-forms/focert00032 (accessed: DD.MM.2023)

[23] https://www.easa.europa.eu/document-library/application-forms/certificates-and-approvals (accessed: DD.MM.2023)

(8) the effect on the maintenance programme;

(9) the effect on airworthiness limitations, the flight manual and the operating manual;

(10) any weight and moment changes; and

(11) special test requirements.

(b) Special consideration should be given to repairs that impose subsequent limitations on the part, product or appliance (e.g. engine turbine segments that may only be repaired a finite number of times, the number of repaired turbine blades per set, oversizing of fastener holes, etc.).

(c) Special consideration should also be given to life-limited parts and critical parts, notably with the involvement of the TC or STC holder, when deemed necessary under point 21L.A.208.

(d) Repairs to engines would normally only be accepted with the involvement of the TC holder.

## AMC1 21L.A.206 Demonstration of compliance

The description of the repair should include an explanation of the purpose of the repair, the pre-repair and post-repair configuration(s) of the product, schematics/pictures, and any other detailed features and boundaries of the repair (this may be supplemented by drawings or outlines of the design, if this helps to understand the repair), as well as the identification of the affected areas of the product that are functionally affected by the repair, and the identification of any changes to the approved manuals.

The applicant should identify any reinvestigations that are necessary to demonstrate compliance. This is a list of affected items of the applicable certification basis for which a new demonstration is necessary, together with the means (e.g. calculation, test or analysis) by which it is proposed to demonstrate compliance.

For a major repair, AMC1 21L.A.24(b)(4) should be used as applicable to the change for the development of the compliance-demonstration plan.

Compliance documentation for the demonstration of compliance in point 21L.A.206(a) comprises one or more test or inspection programmes/plans, reports, drawings, design data, specifications, calculations, analyses, etc., and provides a record of the means by which compliance with the applicable type-certification basis and environmental-protection requirements is demonstrated.

Each compliance document should typically contain:

— the reference of the certification specifications, special conditions or environmental-protection requirements addressed by the document;

— substantiation data demonstrating compliance (except test or inspection programmes/plans);

— a statement by the applicant declaring that the document provides the proof of compliance for which it has been created; and

— the appropriate authorised signature.

Each compliance document should be unequivocally identified by its reference and issue date. The various issues of a document should be controlled and comply with point 21L.A.7.

The level of detail of the compliance documentation that is referred to in point 21L.A.206(a) should be the same regardless of whether the repair is approved by EASA or under a design organisation approval (DOA) privilege, to allow the repair to be assessed in the frame of the DOA surveillance.

The compliance-demonstration process always takes into account the specific configuration(s) in the type certificate (TC) to which the major repair under approval is applied. This (these) configuration(s)

may be defined by product models/variants or by repairs to the type design. The demonstration of compliance covers this (these) applicable specific configuration(s). Consequently, the approval of the major repair excludes any other configurations, in particular those that already exist but are not considered in the compliance-demonstration process, as well as those that may be certified in the future.

For major repairs approved by a design organisation approval (DOA) holder on the basis of its privilege as per point 21.A.263(c)(5) of Annex I (Part 21), the process described under AMC No 2 to 21.A.263(c)(5), (8) and (9) applies.

## AMC1 21L.A.206(c) Demonstration of compliance

**INSPECTIONS AND TESTS**

Proposed type design: this term defines the type design (or the portion of the type design) as it is determined at the time when the testing and inspections are performed.

Verification document (also known as 'statement of conformity'): before each testing and inspection, the verification document must confirm that the test specimen conforms with the proposed design, the test and measuring equipment is adequate for the test, and the sensors and measuring system are appropriately calibrated.

Conformity of the test specimen: the documented verification is intended to ensure that the manufactured test specimen, even in the presence of non-conformities, adequately represents the proposed type design. Possible types of non-conformity may be the following:

— Non-conformity between the design of the test specimen and the proposed type design at the time of the test. These are typically identified in the early stage of the testing and inspections planning, and should be addressed as early as possible (e.g. in the test plan). There may be several reasons for such a non-conformity: to account for interfaces with the test equipment, to conservatively cover several or future design configurations, etc.

— Non-conformity between the manufactured test specimen and the design of the test specimen. Such a non-conformity may be the result of the manufacturing of the test specimen.

While it is convenient to define any possible non-conformity as early as possible, the applicant does not need to make the distinction between the two types of non-conformity above as long as they are explicitly addressed, justified in the verification document or by cross reference to the test plan or other documents. However, testing for the demonstration of compliance with the applicable environmental-protection requirements may be conducted in the final design of the product having incorporated the repair design.

Type certification is typically an iterative process in which the design is under continuous evolution. If the type design evolves after the time of the testing and inspections, then the final type design should be checked against the proposed type design (as it was at the time of the testing and inspections), and the differences (if any) should be analysed to ensure that the testing and inspection results are representative of the final configuration. However, such changes made to the type design may lead to the invalidation of the testing and inspection results, and the need to repeat the testing and inspections. It is recommended that the design organisation should have a thorough configuration management process to track the evolving type design.

Conformity of the test and measuring equipment: the configuration of the test and measuring equipment should be defined in the test plan and include the following:

— definition/design of the test equipment (relevant tools, mechanical parts, electronic components used to execute the test); and

— definition of the measuring equipment:

  — type/model of sensors, together with their technical characteristics;

  — position and orientation of exciters and sensors; and

  — electronic measuring equipment (in some cases, this may also include the acquisition and post-processing of data).

The configuration of the test and measuring equipment should be defined and controlled through certification test plans and supporting documentation, according to the design assurance system, if applicable. The test plan should also include the following elements:

— the test cases, methods, and procedures for test execution;

— the pass–fail criteria; and

— pre-, during- and post-test inspections.

The verification document should confirm that the test and measuring equipment conforms to its purpose, and that the sensors and measuring system are appropriately calibrated. Any non-conformity should be assessed, and it should be justified that it will not compromise the test purpose and results. This may be done either in the verification document or by cross reference to other documents (test minutes of meetings, test notes, etc.).

Use of the term 'adequate': the test specimen, as well as the test and measuring equipment, is considered 'adequate' as long as the test execution on the manufactured test specimen (including any non-conformity) and the use of the installed test set-up do not compromise the test purpose and results (for example, by providing better performance than the proposed type design, or masking any potential failure mode or behaviour).

Changes that affect the validity of the verification document: if changes need to be introduced to the test specimen or to the test and measurement equipment after the verification is documented (and before the test is undertaken), then the verification document must be updated. The updated verification document must be made available to EASA before the test if EASA has informed the applicant that it will witness or carry out the tests or inspections.

Development versus certification tests: sometimes, tests of specimens that conform to a preliminary design, but are not intended for certification (known as development tests), are performed as part of a risk control strategy and to develop knowledge of a subject. Problems and failures found during development are part of the process of increasing the understanding of the design, including its failure modes and the potential for optimisation. Such development tests do not need to meet the requirements of point 21L.A.206(c).

Any planned test event should be classified in advance as either a development test or a certification test. Tests that support the compliance demonstration should be classified as certification tests.

It is acceptable for a development test to finally form part of the compliance demonstration, and it may be declared afterwards to be a certification test as long as it meets the requirements of point 21L.A.206(c). For this reason, it is important to keep the configuration of such tests under control.

If the test specimen used for a certification test has already undergone a series of previous tests that may affect or ultimately invalidate its acceptance as required by point 21L.A.206(c), this aspect should be considered when documenting the verification, and specific analyses or inspections may be required.

Because of the above aspects, EASA advises applicants to inform EASA if they intend to conduct a campaign of development tests that may eventually be used as certification tests to establish whether EASA would wish to witness the tests.

## AMC1 21L.A.206(e)(1) Demonstration of compliance

**REVIEW OF DATA AND INFORMATION RELATED TO THE DEMONSTRATION OF COMPLIANCE**

Availability of compliance data (see point 21L.A.206(e)): data and information required to be provided by the applicant should be made available to EASA in a reliable and efficient way as agreed with EASA.

## AMC1 21L.A.206(e)(2) Demonstration of compliance

**TESTS AND INSPECTIONS**

The applicant should inform EASA sufficiently in advance about the execution of tests and inspections that:

— are used for compliance-demonstration purposes; and

— have been identified as being of particular interest to EASA during the review and approval of the compliance-demonstration plan

in order to permit EASA the opportunity to witness or carry out these inspections or tests.

The applicant may propose to EASA to witness or carry out flight or other tests of particular aspects of the product during its development and before the type design is fully defined.

However, in case of flight tests, the applicant should perform the tests before EASA witnesses or performs them to ensure that no features of the product preclude the safe conduct of the evaluation requested. EASA may require any such tests to be repeated once the type design is fully defined to ensure that subsequent changes have not adversely affected the conclusions from any earlier evaluation.

A verification document as per point 21L.A.206(c) is required for the above tests.

## AMC1 21L.A.206(e)(3) Demonstration of compliance

**PHYSICAL INSPECTION OF THE FIRST ARTICLE**

The applicant should be prepared for any additional investigations as notified by EASA according to point 21L.B.203(c).

Refer to AMC1 21L.A.25(e)(3) for an explanation of the activities performed under the first-article inspection.

## GM1 21L.A.206(f) Demonstration of compliance

**DECLARATION OF COMPLIANCE**

All compliance-demonstration activities in accordance with the compliance-demonstration plan, including all the testing and inspections in accordance with point 21L.A.206(c) and all flight testing in accordance with point 21L.A.206(d), should be completed before the issuance of the final declaration of compliance.

'No feature or characteristic' that may make the product with the repair design unsafe in point 21L.A.206(f)(2) means the following: while every effort is made to address in the applicable certification basis all the risks to product safety that may be caused by the product, experience shows that safety-related events may occur with products in service, even though compliance with the certification basis is fully demonstrated. One of the reasons may be that some existing risks are not properly addressed in the certification basis. Therefore, the applicant should declare that it has not identified any such feature or characteristic.

'No feature or characteristic' that may make the product with the repair design environmentally incompatible (point 21L.A.206(f)(2):

It is assumed that environmental compatibility is demonstrated when the product with the repair design complies with the applicable environmental-protection requirements. Therefore, the applicant, when declaring that the product with the repair design complies with the applicable environmental-protection requirements under point 21L.A.206(f)(1), should also declare that it has not identified any such feature or characteristic.

## AMC1 21L.A.207 Requirements for the approval of a minor repair design

(a) Applicability of point 21L.A.207

Point 21L.A.207 should be complied with by applicants for the approval of a minor repair to a type certificate (TC), and by design organisation approval (DOA) holders that approve minor changes under their privileges.

Point 21L.A.207(c), however, only applies to projects for which an application is submitted to EASA. For DOA holders that approve minor repairs under their privileges, the justification of compliance and the declaration of compliance required by point 21L.A.207(b) should be produced but do not need to be submitted to EASA. They should be, however, kept on record and submitted to EASA upon request during its DOA continued surveillance process.

(b) The approval process

The approval process comprises the following steps:

*Note:* Steps 1, 2 and 4 should be followed only by applicants for minor repairs approved by EASA. DOA holders that approve minor repairs under their privileges should refer to AMC No 1 to 21.A.263(c)(2) or AMC No 2 to 21.A.263(c)(2), as applicable to their approval process.

(1) Application

When the minor repair is approved by EASA, an application should be submitted to EASA as described in point 21L.A.205 and in AMC1 21L.A.205(a).

(2) Certification basis

(3) Justification of compliance

(4) Declaration of compliance

(c) Certification basis

The certification basis for a minor repair consists of a subset of the elements of the product's certification basis 'incorporated by reference in the type certificate'.

The certification basis 'incorporated by reference in the type certificate' is the certification basis for the product as recorded in the type certificate data sheet (TCDS) for the product type/model in the applicable configuration(s).

The certification basis contains the applicable airworthiness and environmental-protection requirements specified by reference to their amendment level, as complemented by special conditions, equivalent safety findings, deviations, a proposed 'elect to comply', etc., as applicable.

By way of derogation from the above, CSs that became applicable after those incorporated by reference in the TC may be used for the approval of a minor repair (see the guidance below on certification specifications that became applicable after those 'incorporated by reference in the type certificate').

If other changes are required for the embodiment of the minor repair, the certification basis corresponding to the product modified by these other changes should also be considered when determining the certification basis for the minor repair.

(d) Justification of compliance required by point 21L.A.207(c)

The applicant should justify compliance with the certification basis established for the minor repair for all areas that are either physically changed or functionally affected by the minor repair.

(1) Means of compliance: the applicant should define and record the means (calculation, test or analysis, etc.) by which compliance is demonstrated. Appendix A to AMC1 21L.A.24(b) may be used to describe how compliance is demonstrated.

(2) Compliance documents: the compliance demonstration should be recorded in compliance documents. For minor repairs, one comprehensive compliance document may be sufficient, provided that it contains evidence of all aspects of the compliance demonstration.

See also the additional guidance in point (e).

(3) Aircraft manuals: where applicable, supplements to manuals (e.g. aircraft flight manual (AFM), aircraft maintenance manual (AMM), etc.) may be issued.

See also additional guidance below in point (f) on embodiment/installation instructions.

(e) Definition of the repair design to the type certificate

The repair design to the type certificate should be defined in accordance with the aspects in GM 21L.A.61.

(f) Embodiment/installation instructions

The instructions for the embodiment/installation of the repair (e.g. service bulletin, modification bulletin, production work order, etc.) should be defined. This may include the installation procedure, the required materials, etc.

(g) Certification specifications that are applicable to the product on the date of the application for the change

(1) Minor repairs are those changes to the design that do not affect the airworthiness and the environmental compatibility of the product or the certified noise and emissions

levels. This means that the certification basis for the minor repair may consist of the items of the certification basis incorporated by reference in the TCDS of the product type/model, and normally it should not be necessary for a minor repair to use certification specifications that became applicable after those that are incorporated by reference in the type certificate.

(2) On the other hand, the applicant may elect to use the certification specifications that are applicable to the product on the date of the application for the change for the compliance demonstration. This does not affect the classification of the repair.

(h) Feature or characteristic affecting the airworthiness or environmental compatibility of the product with the repair design

The term 'no feature or characteristic' applies to a minor repair design to a product, in which case the effect of the repair on the product's safety or environmental compatibility is quite low. Minor repair designs should not be approved if either the design organisation approval (DOA) holder approving minor repairs under its privileges or EASA is aware of a feature or characteristic that may make the product with the repair design unsafe or environmentally incompatible for the uses for which approval is requested.

## GM1 21L.A.207(c) Requirements for the approval of a minor repair design

The level of detail of the justification that is referred to in point 21L.A.207(c) should be the same regardless of whether the repair is approved by EASA or under a design organisation approval (DOA) privilege, to allow the repair to be assessed in the frame of the DOA surveillance.

## AMC1 21L.A.208 Requirements for the approval of a major repair design

(a) For major repairs approved by EASA, the applicant should use all the AMC and GM to point 21L.A.25.

(b) For major repairs approved by the design organisation approval (DOA) holder on the basis of its privilege as per point 21.A.263(c)(5) of Annex I (Part 21), the process described under AMC No 2 to 21.A.263(c)(5), (8) and (9) applies.

## AMC1 21L.A.208(c) Requirements for the approval of a major repair design

For the demonstration by the applicant that there are no unresolved issues, see AMC1 21L.A.27(d).

## GM1 21L.A.208 Requirements for the approval of a major repair design

**REPAIR DESIGN APPROVAL BY EASA**

EASA's approval is required in cases of major repair designs proposed by design organisation approval (DOA) holders that do not hold the necessary privilege as per point 21.A.263(c)(5) of Annex I (Part 21) to Regulation (EU) No 748/2012 to approve certain major repair designs, as well as in cases of minor repair designs proposed by persons or organisations that have submitted a declaration of design capability (declared design organisation) in accordance with Subpart J of Annex Ib (Part 21 Light) to Regulation (EU) No 748/2012 .

## GM1 21L.A.209(b) Approval of a repair design under a privilege

**REPAIR DESIGN APPROVAL BY A DESIGN ORGANISATION APPROVAL (DOA) HOLDER**

(a) Approval by a DOA holder

The approval of repairs through the use of procedures agreed with EASA implies that the DOA holder issues the approval without EASA's involvement. EASA will monitor the application of this procedure within the surveillance plan for the relevant organisation. When the organisation exercises this privilege, the repair release documentation should clearly show that the approval is issued on the basis of its privilege.

(b) Previously approved data for other applications

When it is intended to use previously approved data for other applications, it is expected that an appropriately approved design organisation has checked the applicability and effectiveness of this data. After damage identification, if a repair solution exists in the available approved data, and if the application of this solution to the identified damage remains justified by the previously approved repair design (structural justifications still valid, possible airworthiness limitations unchanged), the solution may be considered approved and may be used again.

(c) Temporary repairs

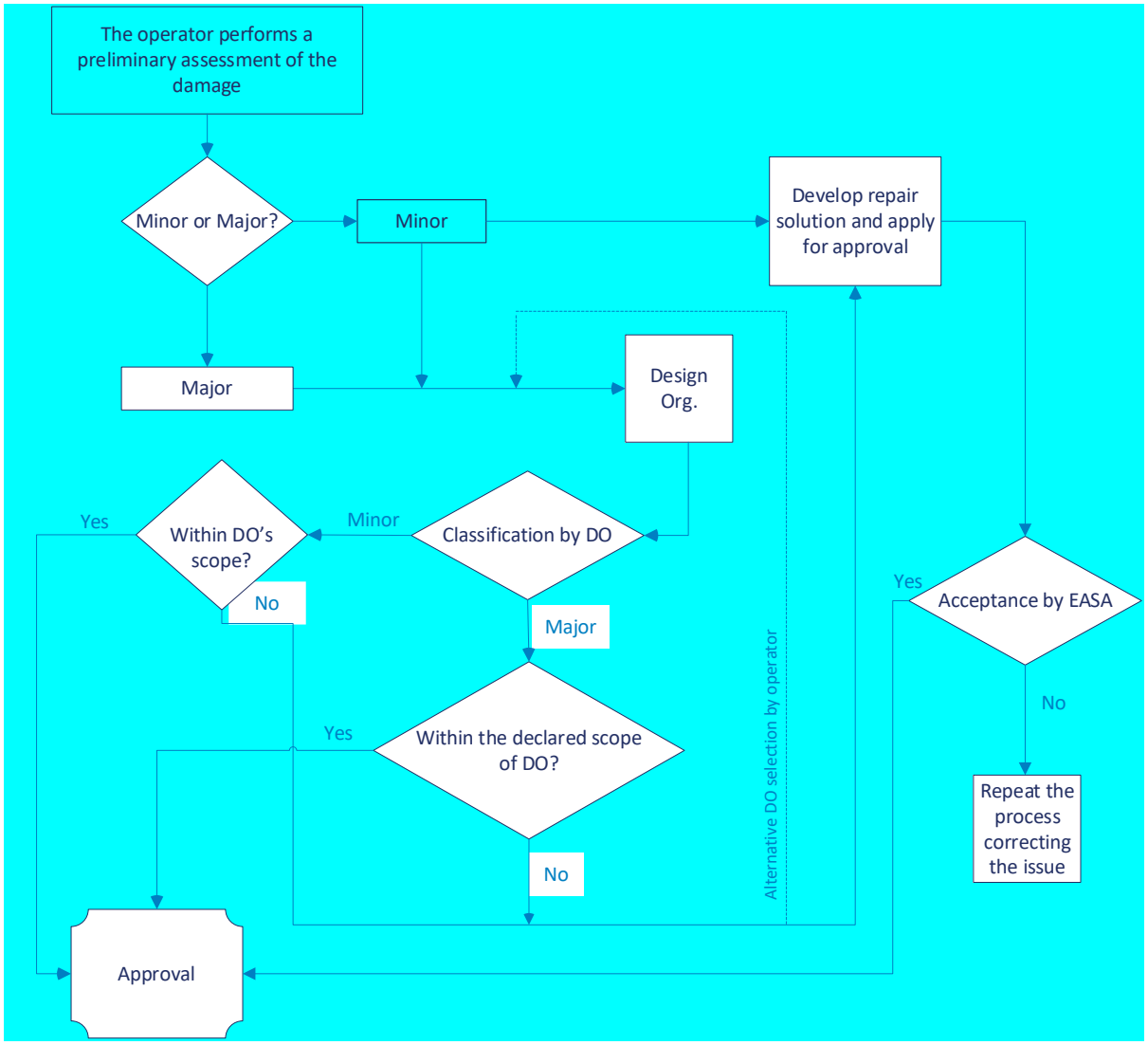
These are life-limited repairs to be removed and replaced by permanent repairs after a limited service period. These repairs should be classified under point 21L.A.203, and the service period should be defined when the temporary repair is approved.

(d) Fatigue and damage tolerance

An approved design issued before the fatigue- and damage-tolerance evaluation has been completed should specify the limited service period.

## GM1 21L.A.211 Unrepaired damage

This process is not intended to supersede the normal maintenance practices defined by the type-certificate holder (e.g. blending out corrosion and re-protection, stop drilling cracks, etc.), but addresses specific cases not covered in the manufacturer's documentation.


The operator performs a preliminary assessment of the damage
Minor or Major?
Minor
Major
Develop repair solution and apply for approval
Design Org.
Classification by DO
Minor
Within DO's scope?
Yes
No
Major
Within the declared scope of DO?
Yes
No
Alternative DO selection by operator
Acceptance by EASA
Yes
No
Repeat the process correcting the issue
Approval

# SUBPART N — DESIGN OF REPAIRS TO AIRCRAFT FOR WHICH DESIGN COMPLIANCE HAS BEEN DECLARED

## GM1 21L.A.221 Scope

Manuals and other instructions for continued airworthiness (such as the manufacturer's structural repair manual, maintenance manuals and engine manuals provided by the declarant for a declaration of design compliance) for operators contain useful information for the development and approval of repairs.

When that data is explicitly identified as being declared applicable for use, it may be used by operators without further actions to cope with anticipated in-service problems arising from normal usage provided that it is used strictly for the purpose for which it has been developed.

Declared design data is data which is declared as being applicable for use by the declarant of a declaration of design compliance.

Approved data is data which is approved by an appropriately approved design organisation.

## GM1 21L.A.222 Standard repairs

**CERTIFICATION SPECIFICATIONS**

CS-STAN[24] contains the certification specifications referred to in point 21L.A.222(a)(1). Guidance on the implementation of Standard Changes and Standard Repairs may be found in AMC M.A.801 of the AMC to Part-M.

## GM1 21L.A.223(a) Classification of repairs designs to an aircraft for which design compliance has been declared

(a) Clarification of the terms 'Major/Minor'

In line with the definitions given in point 21L.A.203, a new repair is classified as 'major' if the result on the aircraft, engine or propeller design has an appreciable effect on structural performance, weight, balance, systems, operational characteristics, declared noise or emissions levels or other characteristics affecting the airworthiness or the environmental compatibility of the product or part. In particular, a repair is classified as 'major' if it requires extensive static, fatigue and damage tolerance strength justification and/or testing in its own right, or if it requires methods, techniques or practices that are unusual (i.e. unusual material selection, heat treatment, material processes, jigging diagrams, etc.).

Repairs that require a reassessment and re-evaluation of the original substantiation data to ensure that the aircraft continues to comply with all the relevant requirements should be considered 'major' repairs.

[24] https://www.easa.europa.eu/en/certification-specifications/cs-stan-standard-changes-and-standard-repairs

Repairs whose effects are considered minor and require minimal or no assessment of the original substantiation data to ensure that the aircraft continues to comply with all the relevant requirements should be considered 'minor'.

It is understood that not all the substantiation data will be available to those persons/organisations classifying repairs. A qualitative judgement of the effects of the repair will, therefore, be acceptable for the initial classification. A subsequent review of the design of the repair may lead to it being reclassified, owing to early judgements being no longer valid.

(b) Airworthiness and environmental-protection concerns for 'Major/Minor' classification

The following should be considered for the magnitude of their effect when classifying repairs. Should the effect be considered significant, then the repair should be classified as 'major'. The repair may be classified as 'minor' where the effect is known to be without appreciable consequence.

(1) Structural performance

The structural performance of the product includes static strength, fatigue, damage tolerance, flutter and stiffness characteristics. Repairs to any element of the structure should be assessed for their effect upon the structural performance.

(2) Weight and balance

The weight of the repair may have a greater effect upon smaller aircraft as opposed to larger aircraft. The effects to be considered are related to overall aircraft centre of gravity and aircraft load distribution. Control surfaces are particularly sensitive to the changes due to the effect upon the stiffness, mass distribution and surface profile which may have an effect upon flutter characteristics and controllability.

(3) Systems

Repairs to any elements of a system should be assessed for the effect intended on the operation of the complete system and for the effect on system redundancy. The consequence of a structural repair on an adjacent or remote system should also be considered as above (for example, airframe repair in the area of a static port).

(4) Operational characteristics

Changes may include:

— stall characteristics,

— handling,

— performance and drag,

— vibration.

(5) Other characteristics:

— changes to load path and load sharing,

— fire protection/resistance,

— characteristics affecting the environmental compatibility of the product are characteristics affecting the compliance of the product with the applicable environmental-protection requirements

*Note:* Considerations for classifying repairs as 'Major/Minor' should not be limited to those listed above.

(c) Examples of 'major' repairs

(1) A repair that requires a permanent additional inspection to the maintenance programme, necessary to ensure the continued airworthiness of the product. Temporary repairs for which specific inspections are required prior to installation of a permanent repair do not necessarily need to be classified as 'major'. Also, inspections and changes to inspection frequencies not required to ensure continued airworthiness do not cause the classification of the associated repair as 'major'.

(2) A repair to life-limited or critical parts.

(3) A repair that introduces a change to the aircraft flight manual (AFM).

## AMC1 21L.A.225(a) Declaration of design compliance for minor repair designs

**REQUIREMENTS FOR THE DECLARATION OF A MINOR REPAIR**

(a) Applicability of point 21L.A.225

Point 21L.A.225 should be complied with by declarants for the declaration of compliance of a minor repair, including design organisation approval (DOA) holders that declare compliance of minor changes under their privileges as per point (c)(3) of point 21.A.263 of Annex I (Part 21).

In accordance with point 21L.A.225(c) for declarations of compliance for minor repairs, the substantiating data and the declaration of compliance required by point 21L.A.225(a) should be produced but do not need to be submitted to EASA. They should be, however, kept on record and made available to EASA upon request during any oversight visit.

(b) The declaration process

The declaration process comprises the following steps:

(1) classification of the repair;

(2) applicable detailed technical specifications;

(3) determination of compliance;

(4) declaration of design compliance.

(c) Detailed technical specifications

The detailed technical specifications for a minor repair consist of the detailed technical specifications that were incorporated by reference in the declaration of design compliance that was submitted for the particular aircraft under Subpart C unless EASA has determined that these are no longer appropriate and the latest detailed technical specifications should be complied with or the declarant elects to comply with these detailed technical specifications.

(d) Determination of compliance required by point 21L.A.103(a)

The declarant should determine compliance with the applicable detailed technical specifications established for the minor change for all areas that are either physically changed or functionally affected by the minor change.

(1) Means of compliance: the declarant should define and record the means (calculation, test or analysis, etc.) by which compliance is determined. Appendix A to AMC1 21L.A.44(a) may be used for this purpose.

(2) Compliance documents: the compliance determination should be recorded in compliance documents. For minor changes, one comprehensive compliance document may be sufficient, provided that it contains evidence of all aspects for compliance. AMC1 21L.A.227(b) may also be used, where applicable.

(3) Aircraft manuals: where applicable, supplements to manuals (e.g. aircraft flight manual (AFM), aircraft maintenance manual (AMM), etc.) may be issued.

See also additional guidance below in point (e) on embodiment/installation instructions.

(e) Embodiment/installation instructions

The instructions for the embodiment/installation of the repair (e.g. service bulletin, modification bulletin, production work order, etc.) should be defined. This may include the installation procedure, the required materials, etc.

## AMC1 21L.A.225(b) Declaration of design compliance for minor repair designs

**FORM AND MANNER**

The declarant should complete and file a declaration of compliance for the minor repair using the applicable form below (which can also be downloaded from the EASA website) for the declaration of minor changes/minor repair designs.


Declaration of Compliance for Min

If there are any changes to the data (e.g. propeller or engine designation) that was provided in the EASA Part 21 Light database of declared noise levels as a result of the minor repair design, then this data should be added by the declarant.

The justification of the classification of the change should also be recorded.

## AMC1 21L.A.225(c) Declaration of design compliance for minor repair designs

**REGISTER OF DECLARATIONS FOR MINOR REPAIRS**

The register that is used by the declarant to record the declarations of design compliance for minor repairs should also comply with point 21L.A.7 and be easily accessible in case EASA requests the details of a specific minor change during oversight.

## AMC1 21L.A.226(b) Declaration of design compliance of major repair designs

**FORM AND MANNER**

The declarant should use the form below for the declaration of design compliance for the major repair:


The declarant should submit the declaration of design compliance through the web-based 'EASA Applicant Portal'[25] using the request for registration of a declaration of design compliance form (FO.CERT.xxxxx), which may be downloaded from the EASA website.

The form should be completed along with the declaration of design compliance and sent to EASA by email or regular mail following the information provided on the EASA website[26].

If the data sheet for airworthiness needs to be adapted, then an amended version should also be provided.

If there are any changes to the data that was provided in the EASA Part 21 Light database of declared noise levels as a result of the major change, then this data should be added by the declarant as a new record within the EASA Part 21 Light database identifying that it is applicable after the major repair.

## GM1 21L.A.226(c) Declaration of design compliance of major repair designs

**INFORMATION TO BE PROVIDED TO EASA**

The documents and information that are required to be provided to EASA in point 21L.A.226(c) may be provided to EASA by the declarant in advance of the submission of the declaration of design compliance for the 'major' change. This would be advantageous for the declarant to facilitate EASA's investigations and to determine the need for the first-article inspection under point 21L.B.221(b).

## AMC1 21L.A.226(e) Declaration of design compliance of major repair designs

**SPECIFIC CONFIGURATION(S)**

The compliance-demonstration process always takes into account the specific configuration(s) in the declaration of design compliance to which the major repair relates. This (these) configuration(s) may be defined by product models/variants or by design changes to the declaration. The demonstration of compliance applies to this (these) applicable specific configuration(s). Consequently, the declaration of the major change excludes any other configurations, in particular those that already exist but are

[25] https://ap.easa.europa.eu (accessed: DD.MM.2023)
[26] https://www.easa.europa.eu/document-library/application-forms/certificates-and-approvals (accessed: DD.MM.2023)

not considered in the compliance-demonstration process, as well as those that may be declared in the future.

## GM1 21L.A.227 Compliance activities for declaring compliance of a major repair design

**VOLUNTARY INVOLVEMENT OF EASA PRIOR TO THE SUBMISSION OF DECLARATION**

The declarant may choose to involve EASA prior to submitting the declaration of design compliance for a major repair design. This would allow EASA to:

(a) check the scope of the product is still within the scope of Subpart C;

(b) provide guidance on the completeness of the compliance-demonstration plan and the selection of means of compliance;

(c) advise on the selection of the applicable detailed technical specifications and applicable noise requirements;

(d) provide guidance about noise tests (if applicable) and witness them;

(e) avoid any issues or delays during the first-article inspection (after submission of the declaration of design compliance and if considered necessary under point 21L.B.221(b)).

The initiation of the project may occur before starting the compliance activities or during those activities. The assignment of a dedicated project number would facilitate any subsequent communication with EASA. This will facilitate the provision of compliance documentation required by point 21L.A.226(d) which may be provided by the declarant to EASA at key stages in the compliance demonstration prior to the submission of the declaration of design compliance for the major repair design.

## AMC1 21L.A.227(a) Compliance activities for declaring compliance of a major repair design

**COMPLIANCE-DEMONSTRATION PLAN FOR A MAJOR REPAIR**

The compliance-demonstration plan for a major repair is a document that allows the declarant to manage and control the design of the major repair, as well as the process of compliance demonstration, and that enables EASA to investigate the root cause(s) in the event of a safety issue being discovered.

The description of the repair should include an explanation of the purpose of the repair, the pre-repair and post-repair configuration(s) of the aircraft, schematics/pictures, and any other detailed features and boundaries of the physical change (this may be supplemented by drawings or outlines of the design, if this helps to understand the design change), as well as the identification of the areas of the aircraft that are affected by the repair, and the identification of any changes to the approved manuals.

The items of the declaration of aircraft design compliance made in accordance with Subpart C that are affected by the repair and for which a new demonstration of compliance is necessary should be

identified together with the means (e.g. calculation, test or analysis) by which it is proposed to demonstrate compliance.

The compliance demonstration should include the analysis for the classification of the change in accordance with GM1 21L.A.223.

In particular, the following information should typically be expected:

— identification of the relevant personnel that make decisions affecting airworthiness and environmental compatibility, and that will interface with EASA during any physical inspection and assessment of the repaired aircraft if required under point 21L.B.221(b);

— subcontracting arrangements for design, environmental compatibility and/or production (if applicable).

Point 21L.A.226(d)(1) 'Description of the major repair'

An overview of the nature and type of repair that is required should be provided that describes the changes to the previously declared design.

Point 21L.A.226(d)(2) 'Operating characteristics, design features and limitations'

The declarant should consider whether there are any affects to the operating characteristics and limitations as a result of the repair, including:

— operating speed limitations;

— service ceiling, maximum airfield elevation;

— cabin pressure;

— limit load factors;

— number of passengers, minimum crew, payload, range;

— weight and centre-of-gravity (CG) envelope and fuel loading;

— performance;

— environmental envelope;

— runway surface conditions;

— other items, if considered to be more appropriate, which address the specific aeronautical product.

The declarant should provide detailed information about the means of compliance with the applicable requirements identified under point 21L.A.226(a). This should include the following:

— a compliance checklist addressing each requirement, the proposed means of compliance (see Appendix A to AMC1 21L.A.227(a) below for the relevant codes), and the related compliance document(s);

— identification of industry standards, methodology documents, handbooks and any other acceptable means of compliance, specified in the airworthiness or noise data sheet, which have been followed in the demonstration of compliance;

— when the compliance demonstration involves testing, a description of the ground- and flight-test article(s), test method(s), test location(s), test schedule, test house(s), test conditions (e.g. limit load, ultimate load), as well as of the intent/objective(s) of the testing; and

— when the compliance demonstration involves analyses/calculations, a description/identification of the tools (e.g. name and version/release of the software programs) and methods used, the associated assumptions, limitations and/or conditions, as well as of the intended use and purpose.

For every aspect mentioned above, the declarant should clearly identify whether the demonstration of compliance involves different means than those contained in the published AMC to the relevant CSs and any method (analysis or test) which is novel or unusual for the declarant.

For every aspect related to compliance with the applicable environmental-protection requirements mentioned above, the declarant should clearly identify whether the demonstration of compliance involves means that are described in ICAO Doc 9501 'Environmental Technical Manual'.

## Appendix A to AMC1 21L.A.227(a) Compliance activities for declaring compliance of a major repair design

**MEANS-OF-COMPLIANCE CODES**

| Type of compliance | Means of compliance | Associated compliance documents |
|---|---|---|
| Engineering evaluation | MC0:<br>(a) compliance statement<br>(b) reference to design data<br>(c) election of methods, factors, etc.<br>(d) definitions | (a) Design data<br>(b) Recorded statements |
| | MC1: design review | (c) Descriptions<br>(d) Drawings |
| | MC2: calculation/analysis | (e) Substantiation reports |
| | MC3: safety assessment | (f) Safety analyses |
| Tests | MC4: laboratory tests | (g) Test programmes<br>(h) Test reports<br>(i) Test interpretations |
| | MC5: ground tests on related product(s) | |
| | MC6: flight tests | |
| | MC8: simulation | |
| Inspection | MC7: design inspection/audit | (j) Inspection or audit reports |
| Equipment qualification | MC9: equipment qualification | *Note:* Equipment qualification is a process that may include all previous means of compliance at equipment level. |

## AMC1 21L.A.227(b) Compliance activities for declaring compliance of a major repair design

**COMPLIANCE DOCUMENTATION**

(a) Compliance documentation comprises one or more test or inspection programmes/plans, reports, drawings, design data, specifications, calculations, analyses, etc., and provides a record of the means by which compliance with the applicable detailed technical specifications and environmental-protection requirements has been demonstrated.

(b) Each compliance document should typically contain:

— the reference of the detailed technical specifications or environmental-protection requirements addressed by the document;

— substantiation data demonstrating compliance (except test or inspection programmes/plans);

— a statement by the declarant declaring that the document provides the proof of compliance for which it has been created; and

— the declarant's signature.

(c) Each compliance document should be unequivocally identified by its reference and issue date. The various issues of a document should be controlled and comply with point 21L.A.7.

## AMC1 21L.A.227(c);(d);(e) Compliance activities for declaring compliance of a major repair design

**INSPECTIONS AND TESTS**

In accordance with point 21L.A.227(d), the declarant must address the conformity of the test specimen, as well as of the test and measuring equipment.

Conformity of the test specimen

The recorded justification of the conformity of the test articles is intended to ensure that the manufactured test specimen adequately represents the declared applicable design data. Possible types of non-conformity may be the following:

— Non-conformity between the design of the test specimen and the originally intended design data at the time of the test. These are typically identified in the early stage of the test planning, and should be addressed as early as possible (e.g. in the test plan). There may be several reasons for such a non-conformity: to account for interfaces with the test equipment, to conservatively cover several or future design configurations, etc.

— Non-conformity between the manufactured test specimen and the design of the test specimen. Such a non-conformity may be the result of the manufacturing of the test specimen.

While it is convenient to define any possible non-conformity as early as possible, the declarant does not need to make the distinction between the two types of non-conformity above as long as they are explicitly addressed and justified by cross reference to the test plan or other documents. However, testing for the demonstration compliance with the applicable environmental-protection requirements may be conducted in the final design of the product having incorporated the repair design.

Compliance demonstration is typically an iterative process in which the design is under continuous evolution. If the aircraft design evolves after the time of the inspection or test, then the final major change design should be checked against the originally intended design (as it was at the time of the inspection or test), and the differences (if any) should be analysed to ensure that the inspection or test results are representative of the final configuration. However, such changes made to the design may lead to the invalidation of the inspection or test results and the need to repeat the inspection or test. It is recommended that the declarant should have a thorough configuration management process to track the evolving design of the major repair.

Conformity of the test and measuring equipment: the configuration of the test and measuring equipment should be defined in the test plan and include the following:

— definition/design of the test equipment (relevant tools, mechanical parts, electronic components used to execute the test); and

— definition of the measuring equipment:

  — type/model of sensors, together with their technical characteristics;

  — position and orientation of exciters and sensors; and

  — electronic measuring equipment (in some cases, this may also include the acquisition and post-processing of data).

The configuration of the test and measuring equipment should be defined and controlled through test plans and supporting documentation. The test plan should also include the following elements:

— the test cases, methods, and procedures for test execution;

— the pass–fail criteria; and

— pre-, during- and post-test inspections.

The declarant should confirm that the test and measuring equipment conform to its definition in the test plan, and that the sensors and measuring system are appropriately calibrated. Any non-conformity should be assessed, and it should be justified that it will not compromise the test purpose and results. This may be done either in the recorded justification of the conformity of the test articles and equipment or by cross reference to other documents (test minutes of meetings, test notes, etc.).

Use of the term 'adequate': the test and measuring equipment is considered 'adequate' as long as the test execution on the manufactured test specimen (including any non-conformity) and the use of the installed test set-up do not compromise the test purpose and results (for example, by providing better performance than the proposed type design, or by masking any potential failure mode or behaviour).

Changes that affect the validity of the recorded justification of the conformity of the test articles and equipment: if changes need to be introduced to the test specimen or to the test and measurement equipment after the justification has been recorded (and before the test is undertaken), then it must be updated.

Development versus compliance demonstration tests: sometimes, tests of specimens that conform to a preliminary design, but are not intended for demonstration of compliance (known as development tests), are performed as part of a risk control strategy and to develop knowledge of a subject. Problems and failures found during development are part of the process of increasing the understanding of the design, including its failure modes and the potential for optimisation. Such development tests do not need to meet the requirements of point 21L.A.227(d) and (e).

Any planned test event should be classified in advance as either a development test or a compliance demonstration test.

It is acceptable for a development test to finally form part of the compliance demonstration, and it may be declared afterwards to be a compliance demonstration test as long as it meets the requirements of point 21L.A.227(d) and (e). For this reason, it is important to keep the configuration of such tests under control.

If the test specimen used for a compliance-demonstration test has already undergone a series of previous tests that may affect or ultimately invalidate its validity due to potential non-conformity to point 21L.A.227(d) as required by point 21L.A.226(d)(6), this aspect should be considered when justifying the conformity, and specific analyses or inspections may be required to support such a statement.

Because of the above aspects, declarants may wish to inform EASA if they intend to conduct a campaign of development tests that may eventually be used as demonstration-of-compliance tests to establish whether EASA would wish to witness the tests.

## AMC1 21L.A.227(f) Compliance activities for declaring compliance of a major repair design

**PHYSICAL INSPECTION OF THE FIRST ARTICLE**

The declarant should be prepared for any additional investigations as notified by EASA according to point 21L.B.222(b).

Refer to AMC 21L.A.47(a) for an explanation of the activities performed under the first-article inspection.

## GM1 21L.A.227(f) Compliance activities for declaring compliance of a major repair design

**TESTS AND INSPECTIONS PERFORMED BY THE AGENCY**

The declarant should inform EASA sufficiently in advance about the execution of significant inspections and tests that are used for compliance-demonstration purposes in order to permit EASA the opportunity to perform or witness these inspections or tests in advance of any physical inspection and assessment of the repaired aircraft if required by point 21L.B.221(b).

This would be advantageous for the declarant to avoid any issues or delays if a physical inspection and assessment of the repaired product is required.

Additionally, the declarant may propose to EASA to perform or witness flight or other tests of particular aspects of the product during its development and before the design of the major repair is fully defined. However, before EASA performs or witnesses any flight test, the declarant should perform these tests and should ensure that no features of the product preclude the safe conduct of the evaluation requested.

A recorded justification of the conformity of the test articles and equipment as per point 21L.A.226(d)(6) is required for the above tests.

## GM1 21L.A.229 Unrepaired damage

This process is not intended to supersede the normal maintenance practices defined by the declarant (e.g. blending out corrosion and re-protection, stop drilling cracks, etc.), but addresses specific cases not covered in the manufacturer's documentation.

# SECTION B

## *PROCEDURES FOR COMPETENT AUTHORITIES*

## SUBPART D — CHANGES TO TYPE CERTIFICATES

### AMC1 21L.B.83(c) Investigation of a major change to a type certificate

**PHYSICAL INSPECTION AND CRITICAL DESIGN REVIEW**

Depending upon the nature of the design change, prior to the approval of the flight conditions to support the issuance of a permit to fly, a physical inspection and a critical design review should be conducted with the applicant and the competent authority for conformity (production) under point 21L.B.242(a). The experience and outcome of this activity should be used by EASA to determine the need for a physical inspection and assessment of the first article of that changed product (first-article inspection) that may be conducted under point 21L.B.83(d) prior to the issuance of the supplemental type certificate for the change.

### AMC1 21L.B.83(d) Investigation of a major change to a type certificate

**PHYSICAL INSPECTION AND ASSESSMENT OF THE FIRST ARTICLE OF THE CHANGED PRODUCT (FIRST-ARTICLE INSPECTION)**

If EASA determines that there is a need to conduct a first-article inspection of the changed product under point 21L.B.83(c), then AMC2 21L.B.46(c) provides the description of this activity for EASA.

## SUBPART E — SUPPLEMENTAL TYPE CERTIFICATES

### AMC1 21L.B.102(c) Investigation

**PHYSICAL INSPECTION AND CRITICAL DESIGN REVIEW**

Depending upon the nature of the design change, prior to the approval of the flight conditions to support the issuance of a permit to fly, a physical inspection and a critical design review should be conducted with the applicant and the competent authority for conformity (production) under point 21L.B.242(a). The experience and outcome of this activity should be used by EASA to determine the need for a physical inspection and assessment of the first article of that changed product (first-article inspection) that may be conducted under point 21L.B.102(d) prior to the issuance of the supplemental type certificate for the change.

### AMC1 21L.B.102(d) Investigation

**PHYSICAL INSPECTION AND ASSESSMENT OF THE FIRST ARTICLE OF THE CHANGED PRODUCT (FIRST-ARTICLE INSPECTION)**

If EASA determines that there is a need to conduct a first-article inspection of the changed product under point 21L.B.102(c), then AMC2 21L.B.46(c) provides the description of this activity for EASA.

## SUBPART F — CHANGES TO AIRCRAFT FOR WHICH DESIGN COMPLIANCE HAS BEEN DECLARED

### AMC1 21L.B.121 Initial oversight investigation of a declaration of design compliance of a major change to the design of an aircraft for which design compliance has been declared

**PHYSICAL INSPECTION AND ASSESSMENT OF THE FIRST ARTICLE OF THE CHANGED PRODUCT (FIRST-ARTICLE INSPECTION)**

If EASA determines that there is a need to conduct a first-article inspection of the changed product under point 21L.B.121(b), then AMC 21L.B.62(b) provides the description of this activity for EASA.

## SUBPART M — DESIGN OF REPAIRS TO TYPE-CERTIFIED PRODUCTS

### AMC1 21L.B.203(d) Investigation of an application for the approval of a major repair design

**PHYSICAL INSPECTION AND ASSESSMENT OF THE FIRST ARTICLE OF THE CHANGED PRODUCT (FIRST-ARTICLE INSPECTION)**

If EASA determines that there is a need to conduct a first-article inspection of the changed product under point 21L.B.203(c), then AMC2 21L.B.46(c) provides the description of this activity for EASA.

## SUBPART N — DESIGN OF REPAIRS TO AIRCRAFT FOR WHICH DESIGN COMPLIANCE HAS BEEN DECLARED

### AMC1 21L.B.221 Initial oversight investigation of a declaration of design compliance of a major repair design to an aircraft for which design compliance has been declared

**PHYSICAL INSPECTION AND ASSESSMENT OF THE FIRST ARTICLE OF THE REPAIRED PRODUCT (FIRST-ARTICLE INSPECTION)**

If EASA determines that there is a need to conduct a first-article inspection of the repaired product under point 21L.B.221(b), then AMC 21L.B.62(b) provides the description of this activity for EASA.

# 4. References

## 4.1. Related EU regulations

— Commission Regulation (EU) No 748/2012 of 3 August 2012 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations (OJ L 224, 21.8.2012, p. 1)

# 5. Quality of the NPA

To continuously improve the quality of its documents, EASA welcomes your feedback on the quality of this NPA with regard to the following aspects:

## 5.1. The regulatory proposal is of technically good/high quality

*Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.*
Fully agree / Agree / Neutral / Disagree / Strongly disagree

## 5.2. The text is clear, readable and understandable

*Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.*
Fully agree / Agree / Neutral / Disagree / Strongly disagree

## 5.3. The regulatory proposal is well substantiated

*Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.*
Fully agree / Agree / Neutral / Disagree / Strongly disagree

## 5.4. The regulatory proposal is fit for purpose (capable of achieving the objectives set)

*Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.*
Fully agree / Agree / Neutral / Disagree / Strongly disagree

## 5.5. The impact assessment (IA), as well as its qualitative and quantitative data, is of high quality

*Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.*
Fully agree / Agree / Neutral / Disagree / Strongly disagree

## 5.6. The regulatory proposal applies the 'better regulation' principles[1]

*Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification*.
Fully agree / Agree / Neutral / Disagree / Strongly disagree

## 5.7. Any other comments on the quality of this NPA (please specify)

*Note:* Your comments on Chapter 5 will be considered for internal quality assurance and management purposes only and will not be published in the related CRD.

[1] For information and guidance, see:
- https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how_en
- https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox_en
- https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox/better-regulation-toolbox_en