CIVIL AVIATION DIRECTIVE – 8104

DESIGN OF MODIFICATIONS

CAAM PART 21 SUBPART D

CIVIL AVIATION AUTHORITY OF MALAYSIA

ISSUE 01
REVISION 00 – 1ST MAY 2021

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Introduction

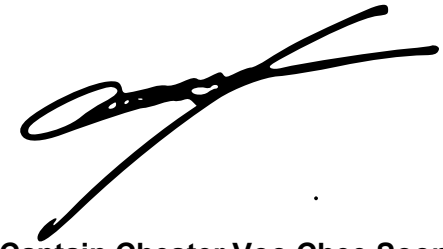
In exercise of the powers conferred by regulations 24O of the Civil Aviation Act 1969 [Act 3], the Chief Executive Officer Makes this Civil Aviation Directive (CAD) 8104 - Design of Modifications (CAAM Part 21 Subpart D) pursuant to Regulation 21, 23 and 24, 189 and 193 of the Malaysia Civil Aviation Regulation (MCAR) 2016.

This CAD provides procedure for the approval for the design of modifications (including changes to a type certificate) of aircraft, engine and propeller and establishes the rights and obligations of the applicants for, and holders of, those approvals.

This CAD 8104 – Design of Modifications (CAAM Part 21 Subpart D) is published by the Chief Executive Officer under section 24O of the Civil Aviation Act 1969 [*Act 3*] and come into operation on 1st May 2021.

Non-compliance with this CAD

Any person who contravenes any provision in this CAD commits an offence and shall on conviction be liable to the punishment under section 24O of the Civil Aviation Act 1969 [*Act 3*] and/or under Malaysia Civil Aviation Regulation 2016.



(Captain Chester Voo Chee Soon)
Chief Executive Officer
Civil Aviation Authority of Malaysia

Civil Aviation Directive components and Editorial practices

This Civil Aviation Directive is made up of the following components and are defined as follows:

Standards: Usually preceded by words such as *"shall"* or *"must"*, are any specification for physical characteristics, configuration, performance, personnel or procedure, where uniform application is necessary for the safety or regularity of air navigation and to which Operators must conform. In the event of impossibility of compliance, notification to the CAAM is compulsory.

Recommended Practices: Usually preceded by the words such as "*should"* or "*may*", are any specification for physical characteristics, configuration, performance, personnel or procedure, where the uniform application is desirable in the interest of safety, regularity or efficiency of air navigation, and to which Operators will endeavour to conform.

Definitions: Terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

Tables and Figures: These add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

Notes: Included in the text, where appropriate, Notes give factual information or references bearing on the Standards or Recommended Practices in question but not constituting part of the Standards or Recommended Practices;

Attachments: Material supplementary to the Standards and Recommended Practices or included as a guide to their application.

It is to be noted that some Standards in this Civil Aviation Directive incorporates, by reference, other specifications having the status of Recommended Practices. In such cases, the text of the Recommended Practice becomes part of the Standard.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in CAD 5. Where CAD 5 permits the use of non-SI alternative units, these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Throughout this Civil Aviation Directive, the use of the male gender should be understood to include male and female persons.

Record of revisions

Revisions to this CAD shall be made by authorised personnel only. After inserting the revision, enter the required data in the revision sheet below. The *'Initials'* has to be signed off by the personnel responsible for the change.

Rev No.	Revision Date	Revision Details	Initials

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1 General

1.1 Citation

1.1.1 These Directives are the Civil Aviation Directives 8104 – Design of Modifications (CAAM Part 21 Subpart D) [CAD 8104], issue 01/Revision 00, and comes into operation on 1st May 2021.

1.1.2 This CAD 8104 – Design of Modifications (CAAM Part 21 Subpart D), Issue 01/Revision 00 will remain current until withdrawn or superseded.

1.2 Applicability

1.2.1 This CAD shall be applicable to—

a) a holder of type certificate issued under regulation 23 of the MCAR;

b) a holder of certificate of approval issued under regulation 21 of the MCAR;

c) an applicant for an approval for the design of modification under regulation 24 of the MCAR; or

d) a holder of approval for the design of modification under regulation 24 of the MCAR.

1.3 Revocation

1.3.1 This CAD, in conjunction with CAD 8105 – Supplemental Type Certificate read together with CAD 8109 – Installation of Modification revokes Airworthiness Notice 78 issue 2 dated 15 May 2005.

1.4 Definition

1.4.1 In this CAD, unless the context otherwise requires:

Aeronautical Product means any aircraft, aircraft engine, aircraft propeller or a part to be installed thereon;

Large Aeroplane means aeroplanes with maximum certified take-off mass of more than 5 700 kg;

Large Rotorcraft means a rotorcraft with maximum weights of more than 3 175 kg;

MCAR means Civil Aviation Regulations 2016;

Modification means a change to the type design of an aeronautical product which is not a repair;

Type Certificate means a Type Certificate issued by the Director General under regulation 23 of the MCAR;

Type Design means set of data and information necessary to define an aircraft, engine or propeller type for the purpose of airworthiness determination.

2 [Reserved]

3 Classification of Modifications [21.91]

3.1 Modifications are classified as minor and major.

3.2 A ‘minor modification’ has no appreciable effect on the mass, balance, structural strength, reliability, operational characteristics, operational suitability data, or other characteristics affecting the airworthiness of the product or its environmental characteristics. Without prejudice to paragraph 9 of CAD 8102, all other modifications are ‘major modifications’ under this CAD.

3.3 Major and minor modifications shall be approved in accordance with paragraphs 6 or 7 of this CAD, as appropriate, and shall be adequately identified.

4 Eligibility [21.92]

4.1 Only the type certificate holder may apply for approval of a major modification (including change to a type certificate) under this CAD; all other applicants for a major modification shall apply under CAD 8105.

4.2 The applicant for the approval of design of minor modification shall demonstrate to CAAM that it has –

a) comprehensive knowledge, experience and capabilities in the applicable technologies, such that in-depth analyses can be performed where required; and

b) sufficient information on the type design of the aircraft involved, and if necessary, the State of Design of the aircraft shall be consulted.

5 Application [21.93]

5.1 An application for approval of a modification shall be made in a form and manner established by CAAM.

5.2 An application shall include, or be supplemented after the initial application, a certification programme for the demonstration of compliance in accordance with paragraph 10 of CAD 8102, consisting of:

a) a description of the change identifying:

1) the configuration(s) of the product in the type certificate upon which the modification is to be made;

2) all areas of the product in the type certificate, including the approved manuals, that are modified or affected by the modification; and

3) when the modification affects the operational suitability data, any necessary changes to the operational suitability data;

b) an identification of any reinvestigations necessary to demonstrate compliance of the modification and areas affected by the modification with the type certification basis, operational suitability data certification basis and environmental protection requirements; and

c) for a major modification:

1) a proposal for the initial type certification basis, operational suitability data certification basis and environmental protection requirements, prepared in accordance with the requirements and options specified in paragraph 8 of this CAD;

2) a proposal for a breakdown of the certification programme into meaningful groups of compliance demonstration activities and data, including a proposal for the means of compliance and related compliance documents;

3) a proposal for the assessment of the meaningful groups of compliance demonstration activities and data, addressing the likelihood of an unidentified non-compliance with the type-certification basis, operational suitability data certification basis or environmental protection requirements and the potential impact of that non-compliance on product safety or environmental protection. The proposed assessment shall take into account at least the following elements:

i) novel or unusual features of the certification project, including operational, organisational and knowledge management aspects;
ii) complexity of the design and/or demonstration of compliance;
iii) criticality of the design or technology and the related safety and environmental risks, including those identified on similar designs; and
iv) performance and experience of the design organisation of the applicant in the domain concerned.

Based on this assessment, the application shall include a proposal for CAAM's involvement in the verification of the compliance demonstration activities and data; and

4) a project schedule including major milestones.

5.3 An application for a modification of a large aeroplane or a large rotorcraft shall be valid for five years and an application for any other modifications shall be valid for three years. In the case where the modification has not been approved, or it is evident that it will not be approved, within the time limit provided for in this point, the applicant may:

a) submit a new application for a modification and comply with the type certification basis, operational suitability data certification basis and environmental protection requirements, as established by CAAM in accordance with paragraph 8 of this CAD for the date of the new application; or

b) apply for an extension of the time period provided for in the first sentence of paragraph 5.3 of this CAD for the original application and propose a new date for the issuance of the approval. In that case, the applicant shall comply with the type certification basis, operational suitability data certification basis and environmental protection requirements, as established by CAAM in accordance with paragraph 8 of this CAD, for a date to be selected by the applicant. However, that date shall not precede the new date proposed by the applicant for the issuance of the approval by more than five years for an application for a large aeroplane or a large rotorcraft, and by more than three years for any other application.

6 Requirements for Approval of Design of Minor Modification [21.95]

6.1 Minor modifications shall be classified and approved either:

a) by CAAM; or

b) an approved design organisation within the scope of its privileges provided for in paragraph 15.3 (a) and 15.3 (b) of CAD 8401, as recorded in the terms of approval.

6.2 A minor modification shall only be approved:

a) when it has been demonstrated that the change and areas affected by the change comply with the type certification basis and the environmental protection requirements incorporated by reference in the type certificate;

b) in the case of a change affecting the operational suitability data, when it has been demonstrated that the necessary changes to the operational suitability data comply with the operational suitability data certification basis incorporated by reference in the type certificate;

c) when compliance with the type certification basis that applies in accordance with paragraph 6.2(a) of this CAD has been declared and the justifications of compliance have been recorded in the compliance documents; and

d) when no feature or characteristic has been identified that may make the product unsafe for the uses for which certification is requested.

6.3 By derogation from paragraph 6.2(a) of this CAD, airworthiness codes which became applicable after those incorporated by reference in the type certificate can be used for approval of a minor change, provided they do not affect the demonstration of compliance.

6.4 The applicant shall submit to CAAM the substantiation data for the modification and a statement that compliance has been demonstrated in accordance with paragraph 6.2 of this CAD.

6.5 An approval of a minor modification shall be limited to the specific configuration(s) in the type certificate to which the modification relates.

7 Requirements for Approval of Design of Major Modification [21.97]

7.1 Major modifications shall be classified either by:

a) CAAM; or

b) an approved design organisation within the scope of its privileges provided for in paragraph 15.3 (a) of CAD 8401, as recorded in the terms of approval.

7.2 Major modifications shall be approved by CAAM.

7.3 A major modification shall only be approved:

a) when it has been demonstrated that the modification and areas affected by the modification comply with the type certification basis and environmental protection requirements, as established by CAAM in accordance with paragraph 8 of this CAD;

b) in the case of a modification affecting the operational suitability data, when it has been demonstrated that the necessary changes to the operational suitability data meet the operational suitability data certification basis, as established by CAAM in accordance with paragraph 8 of this CAD; and

c) when compliance with paragraph 7.3(a) and 7.3(b) of this CAD has been demonstrated in accordance with paragraph 10 of CAD 8102, as applicable to the change.

7.4 By derogation from paragraph 7.3(b) and 7.3(c) of this CAD, at the applicant's request included in the declaration referred to in paragraph 10.4 of CAD 8102, a major modification may be approved before compliance with the operational suitability data certification basis has been demonstrated, provided that the applicant demonstrates such compliance before the date at which those data are actually used.

7.5 An approval of a major modification shall be limited to the specific configuration(s) in the type certificate to which the change relates.

8 Type Certification Basis, Operational Suitability Data Certification Basis and Environmental Protection Requirements for a Major Modification [21.101]

8.1 A major modification and areas affected by the modification shall comply with either the airworthiness codes applicable to the changed product on the date of the application for the change or airworthiness codes which became applicable after that date in accordance with paragraph 8.6 of this CAD. The validity of the application shall be determined in accordance with paragraph 5.3 of this CAD. In addition, the

changed product shall comply with the environmental protection requirements designated by CAAM.

8.2 By derogation from paragraph 8.1 of this CAD, an earlier amendment to an airworthiness code referred to in paragraph 8.1 of this CAD and to any other airworthiness code which is directly related may be used in any of the following situations, unless the earlier amendment became applicable before the date at which the corresponding airworthiness codes incorporated by reference in the type certificate became applicable:

a) a modification that CAAM finds not to be significant. In determining whether a specific change is significant, CAAM shall consider the modification in the context of all previous relevant design changes and all related revisions to the applicable airworthiness codes incorporated by reference in the type certificate for the product. Modifications meeting one of the following criteria shall automatically be considered significant:

1) the general configuration or the principles of construction are not retained;

2) the assumptions used for certification of the product to be changed do not remain valid;

b) each area, system, part or appliance that CAAM finds not affected by the modification;

c) each area, system, part or appliance that is affected by the modification for which CAAM finds that compliance with the airworthiness codes referred to in paragraph 8.1 of this CAD does not contribute materially to the level of safety of the modified product or is impractical.

8.3 By derogation from paragraph 8.1 of this CAD, in the case of a modification to an aircraft other than a rotorcraft of 2 722 kg (6 000 lb) or less maximum weight, or to a non-turbine rotorcraft of 1 361 kg (3 000 lb) or less maximum weight, the modification and areas affected by the modification shall comply with the type certification basis incorporated by reference in the type certificate. However, if CAAM finds that the change is significant in an area, CAAM may require that the modification and areas affected by the modification comply with an amendment to an airworthiness code of the type certification basis incorporated by reference in the type certificate and with any other airworthiness code which is directly related, unless CAAM also finds that compliance with that amendment does not contribute materially to the level of safety of the modified product or is impractical.

8.4 If CAAM finds that the airworthiness codes applicable on the date of the application for the modification do not provide adequate standards with respect to the proposed modification, the modification and areas affected by the modification shall also comply with any special conditions, and amendments to those special conditions, prescribed by CAAM, to provide a level of safety equivalent to that established by the airworthiness codes applicable on the date of the application for the modification.

8.5 By derogation from paragraphs 8.1, 8.2 and 8.3 of this CAD, the modification and areas affected by the modification may comply with an alternative to an airworthiness code designated by CAAM if proposed by the applicant, provided that CAAM finds that the alternative provides a level of safety which is equivalent to that of the airworthiness codes designated by CAAM under paragraphs 8.1, 8.2 and 8.3, of this CAD.

8.6 If an applicant chooses to comply with an airworthiness code set out in an amendment that becomes applicable after submitting the application for a modification, the modification and areas affected by the modification shall also comply with any other airworthiness code which is directly related.

8.7 When the application for a modification for an aircraft includes, or is supplemented after the initial application to include, changes to the operational suitability data, the operational suitability data certification basis shall be established in accordance with paragraphs 8.1 to 8.6 of this CAD.

9 Record-keeping [21.105]

9.1 For each modification, all relevant design information, drawings and test reports, including inspection records for the modified product tested, shall be held by the applicant at the disposal of CAAM and shall be retained in order to provide the information necessary to ensure the continued airworthiness, continued validity of the operational suitability data and compliance with applicable environmental protection requirements of the modified product.

9.2 The record-keeping shall consist of at least the following and shall be made available to CAAM:

(a) the drawings and specifications, and a listing of those drawings and specifications necessary to define the configuration and design features of the modification as it was shown to comply with the requirements applicable to the aeronautical product;

(b) reports on analysis and tests undertaken to substantiate compliance with the applicable requirements;

(c) information, materials and processes used in the construction of the modification of the aircraft, engine or propeller;

(d) an approved aircraft flight manual supplement or its equivalent (type-related document), including revisions to the master minimum equipment list and configuration deviation list, if applicable;

(e) approved revisions or recommendations to the maintenance programme or equivalent document, and aircraft maintenance manual with details of revisions to the manufacturer's recommended and CAAM accepted scheduled maintenance plan and procedures guidelines; and

(f) any other data necessary to allow, by comparison, the determination of airworthiness and noise characteristics (where applicable) of modified aeronautical products of the same type.

9.3 The modification records are permanent and shall not be destroyed without written permission from CAAM.

10 Instructions for Continued Airworthiness [21.107]

10.1 The holder of a minor modification approval shall furnish at least one set of the associated variations, if any, to the instructions for continued airworthiness of the product on which the minor modification is to be installed, prepared in accordance with the applicable type certification basis, to each known owner of one or more aircraft, engine, or propeller incorporating the minor modification, upon its delivery, or upon issuance of the first certificate of airworthiness for the affected aircraft, whichever occurs later, and thereafter make those variations in instructions available, on request, to any other person required to comply with any of the terms of those instructions.

Note. – The obligations pertaining to instructions for continued airworthiness for the holder of a major modification approval is contained in CAD 8102 (for type certificate holder) and CAD 8105 (for other than type certificate holder).

10.2 In addition, changes to those variations of the instructions for continued airworthiness shall be made available to all known operators of a product incorporating the minor change and shall be made available, on request, to any person required to comply with any of those instructions.

11 Availability of Operational Suitability Data [21.108]

11.1 In the case of a modification affecting the operational suitability data, the holder of the minor modification approval shall make available:

a) At least one set of changes to the operational suitability data prepared in accordance with the applicable operational suitability certification basis, to all known operators of the changed aircraft, before the operational suitability data must be used by a training organisation or an operator; and

b) Any further change to the affected operational suitability data, to all known operators of the modified aircraft; and

c) On request, the relevant parts of the changes in paragraphs 11.1 a) and 11.1 b) of this CAD, to:

1) CAAM; and

2) Any person required to comply with one or more elements of this set of operational suitability data.

12 Obligations and Marking [21.109]

12.1 The holder of the design of modification approval remains responsible for the continued integrity of the design change to approved type design and it or its representative must continue to be CAAM's contact point for resolving issues that may require corrective action. To fulfil this responsibility, the holder shall have the continued capability, or access to a capability, of providing appropriate technical solutions for service difficulties when service experience warrants it, or when CAAM requires mandatory corrective action.

12.2 The holder of a design of minor modification approval to a type design shall:

a) undertake the obligations laid down in paragraphs 9, 10 and 11 of this CAD;

b) undertake the obligation laid down in paragraph 16.0(a)(3) of CAD 8102;

c) undertake the obligation laid down in paragraph 2 of CAD 8101; and

d) specify the marking, in accordance with paragraph 4.1 of CAD 8206.