CS-25 Amendment 20— Change Information

EASA publishes amendments to certification specifications as consolidated documents. These documents are used for establishing the certification basis for applications made after the date of entry into force of the amendment.

Consequently, except for a note '[Amdt No: 25/20]' under the amended paragraph, the consolidated text of CS-25 does not allow readers to see the detailed changes introduced by the new amendment. To allow readers to also see these detailed changes, this document has been created. The same format as for publication of notices of proposed amendments (NPAs) has been used to show the changes:

(a) deleted text is marked with ~~strike through~~;

(b) new or amended text is highlighted in grey;

(c) an ellipsis (…) indicates that the remaining text is unchanged in front of or following the reflected amendment.

BOOK 1 — SUBPART F

CS 25.1309 Equipment, systems and installations

(See AMC 25.1309)

The requirements of this paragraph, except as identified below, are applicable, in addition to specific design requirements of CS-25, to any equipment or system as installed in the aeroplane. Although this paragraph does not apply to the performance and flight characteristic requirements of Subpart B and the structural requirements of Subparts C and D, it does apply to any system on which compliance with any of those requirements is dependent. Certain single failures or jams covered by CS 25.671(c)(1) and CS 25.671(c)(3) are excepted from the requirements of CS 25.1309(b)(1)(ii). Certain single failures covered by CS 25.735(b) are excepted from the requirements of CS 25.1309(b). The failure conditions covered by CS 25.810 and CS 25.812 are excepted from the requirements of CS 25.1309(b). The requirements of CS 25.1309(b) apply to power plant installations as specified in CS 25.901(c).

(a) The aeroplane equipment and systems must be designed and installed so that:

(…)

(e) Certification Maintenance Requirements must be established to prevent the development of the failure conditions described in CS 25.1309(b), and must be included in the Airworthiness Limitations Section of the Instructions for Continued Airworthiness required by CS 25.1529.

BOOK 1 — Appendices

Appendix H

Instructions for Continued Airworthiness

(See AMC to Appendix H)

(…)

H25.4 Airworthiness Limitations Section

(a) The Instructions for Continued Airworthiness must contain a section titled Airworthiness Limitations that is segregated and clearly distinguishable from the rest of the document. This section must set forth –

(1) Each mandatory replacement time, structural inspection interval, and related structural inspection procedure approved under CS 25.571, and

(2) Reserved

(3) Any mandatory replacement time of EWIS components as defined in CS 25.1701 (see AMC Appendix H 25.4(a)(3)),

(4) A limit of validity (LOV) of the engineering data that supports the structural maintenance programme, stated as a total number of accumulated flight cycles or flight hours or both, approved under CS 25.571. Until the full-scale fatigue testing is completed and the LOV is approved, the Airworthiness Limitations Section must specify an interim limitation restricting aircraft operation to not more than half the number of the cycles accumulated on the fatigue test article.

(5) Each Certification Maintenance Requirement established to comply with any of the applicable requirements of CS-25 (see AMC 25-19).

(b) If the Instructions for Continued Airworthiness consist of multiple documents, the section required by this paragraph must be included in the principal manual. This section must contain a legible statement in a prominent location that reads: 'The Airworthiness Limitations Section is approved and variations must also be approved'.'

(…)

BOOK 2 — GENERAL AMC

AMC 25-19

Certification Maintenance Requirements

1 PURPOSE

~~This AMC is similar to FAA Advisory Circular AC 25–19 dated 28 November 1994.~~

This Acceptable Means of Compliance (AMC) provides guidance on the selection, documentation, and control of Certification Maintenance Requirements (CMRs). ~~For those aeroplanes whose initial maintenance programme is developed under~~ ~~the Maintenance Review Board (MRB) process,~~ ~~this document~~ This AMC also provides a rational basis for coordinating the CMR selection process and the Maintenance Review Board (MRB) process ~~and CMR selection processes~~, if the latter is used. ~~in order to minimise the impact of CMRs on aeroplane operators.~~ The applicant should ensure that the maintenance tasks and intervals identified in the system safety analyses to support compliance with CS 25.1309 and other system safety requirements (such as CS 25.671, CS 25.783, CS 25.901, and

CS 25.933) are protected in service.~~ It is recognised that, f~~For those aeroplanes whose initial maintenance programme is developed under a different process than the MRB process, the coordination and document~~ation~~ aspects have to be adapted to the particular case. ~~Like all acceptable means of compliance, this AMC is not, in itself, mandatory, and does not constitute a requirement. It is issued to~~ This AMC describes an acceptable means, but not the only means, for selecting, documenting, and managing CMRs. Terms such as ’shall‘ and ’must‘ are used only in the sense of ensuring applicability of this ~~particular method~~ ~~of compliance when the~~ acceptable ~~method~~ means of compliance ~~described herein is used~~.

2 RELATED CERTIFICATION SPECIFICATIONS

~~CS 25.1309 and CS 25.1529 of the Certification Specifications (CS).~~

a. CS 25.671 Control Systems — General

b. CS 25.783 Fuselage Doors

c. CS 25.901 Powerplant — Installation

d. CS 25.933 Reversing systems

e. CS 25.1309 Equipment, systems and installations

f. CS 25.1529 Instructions for Continued Airworthiness

3 RELATED DOCUMENTS

~~a. AC 25.1309–1A, System Design and Analysis.~~

~~b. Acceptable Means of Compliance AMC 25.1309, System Design and Analysis.~~

~~c. AC 121–22A, Maintenance Review Board (MRB) Procedures.~~

a. ~~d.~~ Airlines for America (A4A), ~~ATA~~, ~~Maintenance Steering Group~~MSG-3, ~~Airline~~Operator/Manufacturer ~~Maintenance Program~~ Scheduled Maintenance Development ~~Document~~, ~~Available from the Air Transport Association of America, 1301 Pennsylvania Avenue – Suite 1100, Washington, DC 20004–1707.~~

b. International Maintenance Review Board/Maintenance Type Board Process Standard (IMPS)

~~e. AC 120–17A, Maintenance Program Management through Reliability Methods.~~

4 ~~BACKGROUND~~ NOT USED

~~CMRs have been in use since the early 1970’s, when the industry began using quantitative approaches to certify systems to the requirements of CS 25.1309 and other requirements requiring safety analyses. CMRs have been established on several aeroplanes certified in Europe and in other countries, and are being planned for use on aeroplanes currently under development.~~

5 CERTIFICATION MAINTENANCE REQUIREMENTS (CMR) DEFINITION

A CMR is a required~~ periodic~~ scheduled maintenance task, established during the design certification of the aeroplane systems as an ~~operating~~ airworthiness limitation of the type certificate (TC) or supplemental type certificate (STC). The CMRs are a subset of the ~~tasks~~ Instructions for Continued Airworthiness (ICA) identified during the ~~type~~ certification process. A CMR~~s~~ usually results from a formal, numerical analysis conducted to show compliance with the requirements applicable to

~~C~~catastrophic and ~~H~~hazardous ~~F~~failure ~~C~~conditions, as defined in paragraph 6e~~b~~ below. ~~There are two types of CMRs, as defined in paragraph 12 of this AMC.~~ A CMR may also result from a qualitative, engineering judgment-based analysis.

a. The CMRs are required tasks, and associated intervals, developed to achieve compliance with CS 25.1309 and other requirements requiring safety analyses (such as CS 25.671, 25.783, 25.901, and 25.933). A CMR is usually intended to detect ~~safety-significant~~ latent failures ~~which~~ that would, in combination with one or more other specific failures or events, result in a Hazardous or Catastrophic Failure Condition. A CMR can also be used to establish a required task to detect an impending wear out of an item whose failure is associated with a hazardous or catastrophic failure condition. A CMR may also be used to detect a latent failure that would, in combination with one specific failure or event, result in a major failure condition, where the SSA identifies the need for a scheduled maintenance task.

b. ~~It is important to note that~~ CMRs are derived from a fundamentally different analysis process than the maintenance tasks and intervals ~~which~~that result from the ~~Maintenance Steering Group (~~MSG-3~~)~~ analysis associated with~~ Maintenance Review Board (~~MRB~~)~~ activities (if the MRB process is used). ~~MSG–3 analysis activity produces maintenance tasks which are performed for safety, operational, or economic reasons, involving both preventative maintenance tasks, which are performed before failure occurs (and are intended to prevent failures), as well as failure-finding tasks. CMRs, on the other hand, are failure finding tasks only, and exist solely to limit the exposure to otherwise hidden failures. Although CMR tasks are failure-finding tasks, use of potential failure-finding tasks, such as functional checks and inspections, may also be appropriate.~~ Although both types of analysis may produce equivalent maintenance tasks and intervals, it is not always appropriate to address a Candidate Certification Maintenance Requirement (CCMR) with a Maintenance Review Board Report (MRBR) task.

c. CMRs ~~are designed to~~ verify that a certain failure has or has not occurred, ~~and do not provide any preventative maintenance function.~~ indicate that corrective maintenance or repair is necessary if the item has failed, or identify the need to inspect for impending failures (e.g. wear out or leakage).~~CMRs 'restart the failure clock to zero' for latent failures by verifying that the item has not failed, or cause repair if it has failed.~~ Because the exposure time to a latent failure is a key element in the calculations used in a safety analysis~~ performed to show compliance with CS 25.1309~~, limiting the exposure time will have a significant effect on the resultant overall failure probability of the system. The intervals for CMR tasks~~ interval~~ should be designated in terms of flight hours, cycles, or calendar time, as appropriate.

d. The type certification process assumes that the aeroplane will be maintained in a condition of airworthiness ~~at least~~ equal to its certified ~~or properly altered~~ condition. The process described in this AMC is not intended to establish ~~normal~~ routine maintenance tasks (e.g. greasing, fluid-level checks, etc.) that should be defined through the MSG-3 analysis process. Also, this process is not intended to establish CMRs for the purpose of providing supplemental margins of safety for concerns arising late in the type design approval process. Such concerns should be resolved by appropriate means, which are unlikely to include CMRs not established via normal safety analyses.

e. CMRs should not be confused with required structural inspection program~~mes, which~~ that are developed by the ~~type certificate~~TC applicant to meet the inspection requirements for damage tolerance, as required by CS 25.571 or CS 25.1529, and Appendix H25.4 (Airworthiness Limitations ~~s~~Section). CMRs are to be developed and ~~administered~~ managed separately from any structural inspection program~~me~~s.

6 OTHER DEFINITIONS

The following terms apply to the system design and analysis requirements of CS 25.1309(b) and (c), and to the guidance material provided in this AMC~~. For~~ (for a complete definition of these terms, refer to the applicable specifications and acceptable means of compliance~~ requirements and guidance material,~~ (~~i~~e.g. ~~AC 25.1309–1A and/or the EASA Acceptable Means of Compliance~~ CS and AMC 25.1309)). ~~AC 25.1309–1A and AMC 25.1309 are periodically revised by the FAA/EASA and are the controlling documents for definition of these terms. The terms listed below are derived from this guidance material and are included to assist in the use of this document.~~

~~a. Failure~~

~~A loss of function, or a malfunction, of a system or a part thereof.~~

~~b. Failure Condition~~

~~The effect on the aeroplane and its occupants, both direct and consequential, caused or contributed to by one or more failures, considering relevant adverse operational or environmental conditions.~~

~~Failure Conditions may be classified according to their severities as follows:~~

~~(1) Minor Failure Conditions: Failure Conditions which would not significantly reduce aeroplane safety, and which involve crew actions that are well within their capabilities. Minor Failure Conditions may include, for example, a slight reduction in safety margins or functional capabilities, a slight increase in crew workload, such as routine flight plan changes, or some inconvenience to occupants.~~

~~(2) Major Failure Conditions: Failure Conditions which would reduce the capability of the aeroplane or the ability of the crew to cope with adverse operating conditions to the extent that there would be, for example, a significant reduction in safety margins or functional capabilities, a significant increase in crew workload or in conditions impairing crew efficiency, or discomfort to occupants, possibly including injuries.~~

~~(3) Hazardous Failure Conditions: Failure Conditions, which would reduce the capability of the aeroplane or the ability of the crew to cope with adverse operating, conditions to the extent that there would be:~~

~~(i) A large reduction in safety margins or functional capabilities;~~

~~*(ii) physical distress or higher workload such that the flight crew cannot be relied upon to* perform their tasks accurately or completely, or~~

~~(iii) serious or fatal injury to a relatively small number of the occupants.~~

~~(4) Catastrophic Failure Conditions: Failure Conditions, which would prevent the continued safe flight and landing of the aeroplane.~~

~~(c) Probability Terms~~

~~When using qualitative or quantitative assessments to determine compliance with CS 25.1309(b), the following descriptions of the probability terms used in the requirement and in the acceptable means of compliance listed above have become commonly accepted aids to engineering judgement:~~

~~(1) Probable Failure Conditions: Probable Failure Conditions are those anticipated to occur one or more times during the entire operational life of each aeroplane. Probable Failure Conditions are those having a probability of the order of 1 x 10^{-5} or greater. Minor Failure Conditions may be probable.~~

~~(2) Improbable Failure Conditions: Improbable Failure Conditions are divided into two categories as follows:~~

~~(i) Remote: Unlikely to occur to each aeroplane during its total life but may occur several times when considering the total operational life of a number of aeroplanes of the same type. Improbable~~

~~(Remote) Failure Conditions are those having a probability of the order of 1 x 10^{-5} or less, but greater than of the order of 1 x 10^{-7}. Major Failure Conditions must be no more frequent than Improbable (Remote).~~

~~(ii) Extremely Remote. Unlikely to occur when considering the total operational life of all aeroplanes of the same type, but nevertheless has to be considered as being possible. Improbable (Extremely Remote) Failure Conditions are those having a probability of the order of 1 x 10^{-7} or less, but greater than of the order of 1 x 10^{-9}. Hazardous Failure Conditions must be no more frequent than Improbable (Extremely Remote).~~

~~(3) Extremely Improbable Failure Conditions: Extremely Improbable Failure Conditions are those so unlikely that they are not anticipated to occur during the entire operational life of all aeroplanes of one type, and have a probability of the order of 1 x 10^{-9} or less. Catastrophic Failure Conditions must be shown to be Extremely Improbable.~~

~~d. Qualitative~~

~~Those analytical processes that assess system and aeroplane safety in a subjective, non-numerical manner, based on experienced engineering judgement.~~

~~e. Quantitative~~

~~Those analytical processes that apply mathematical methods to assess system and aeroplane safety.~~

a. Catastrophic. Refer to AMC 25.1309.

b. Compatible MRBR task. An MRBR task whose intent addresses the CCMR task intent and whose interval is equal to or lower than the interval that would otherwise be required by a CMR.

c. Crew. The cabin crew, or flight crew, as applicable.

d. Failure. Refer to AMC 25.1309.

e. Failure Condition. Refer to AMC 25.1309.

f. Failure Effect Category 5 task (FEC5). Refer to MSG-3, Operator/Manufacturer Scheduled Maintenance Development.

g. Failure Effect Category 8 task (FEC8). Refer to MSG-3, Operator/Manufacturer Scheduled Maintenance Development.

h. Hazardous. Refer to AMC 25.1309.

i. Latent Failure. Refer to AMC 25.1309.

j. Major. Refer to AMC 25.1309.

k. Qualitative. Refer to AMC 25.1309.

l. Quantitative. Refer to AMC 25.1309.

m. Significant Latent Failure. A latent failure that would, in combination with one or more other specific failures or events, result in a hazardous or catastrophic failure condition.

n. Task. Short description (e.g. descriptive title) of what is to be accomplished by a procedure. Example: ‘Operational check of the static inverter’.

o. Wear out. A condition where a component is worn beyond a predetermined limit.

7 SYSTEM SAFETY ASSESSMENTS (SSAs)

~~CS 25.1309(b) provides general requirements for a logical and acceptable inverse relationship between the probability and severity of each Failure Condition, and AMC 25.1309, sub-paragraph 9~~

~~b.(1) specifies that compliance should be shown primarily by analysis. In recent years there has been an increase in the degree of system complexity and integration, and in the number of safety–critical functions performed by systems. This increase in complexity has led to the use of structured means for showing compliance with the requirements of CS 25.1309.~~

a. CS 25.1309(b) specifies required safety levels in qualitative terms, and ~~AMC 25.1309, subparagraph 9 b.(1) specifies that~~ a safety assessment ~~should~~ must be ~~made~~ conducted to show compliance. Various assessment techniques have been developed to ~~assist~~ help applicants and ~~the Agency~~ EASA in determining that a logical and acceptable inverse relationship exists between the probability and the severity of each Failure Condition. These techniques include the use of service experience data of similar, previously approved systems, and thorough qualitative and quantitative analyses.

b. In addition, difficulties have been experienced in assessing the acceptability of some designs, especially those of systems, or parts of systems, that are complex, that have a high degree of integration, that use new technology, or that perform safety-critical functions. These difficulties led to the selective use of rational analyses to estimate *quantitative* probabilities, and the development of related criteria based on historical data of accidents and ~~hazardous~~ incidents caused or contributed to by failures. These criteria, expressed as numerical probability ranges associated with the terms used in CS 25.1309(b), ~~became commonly~~ are accepted for evaluating the quantitative analyses that are ~~often~~ used ~~in such cases~~ to support experienced engineering and operational judgment and to supplement qualitative analyses and tests.

NOTE: See ~~Acceptable Means of Compliance~~ AMC 25.1309~~, System Design and Analysis,~~ for a complete description of the inverse relationship between the probability and severity of Failure Conditions, and the various methods of showing compliance with CS 25.1309.

8 DESIGN CONSIDERATIONS RELATED TO ~~CANDIDATE CMRs~~SIGNIFICANT LATENT FAILURES

~~A decision to create a candidate CMR should follow the guidelines given in AMC 25.1309 (i.e. the use of candidate CMRs in lieu of practical and reliable failure monitoring and warning systems to detect significant latent failures when they occur does not comply with CS 25.1309(c)).~~

a. The applicant should implement practical and reliable failure monitoring and flight crew indication systems to detect failures that would otherwise be significant latent failures. ~~A practical failure monitoring and warning system is one, which is considered to be within the state-of-the-art.~~ A reliable failure monitoring and ~~warning~~ flight crew indication system ~~is one, which would not result in either excessive failures of a genuine warning, or excessive or untimely false warnings, which can sometimes be more hazardous than lack of provision for, or failures of, genuine but infrequent warnings.~~should utilise current state-of-the-art technology to minimise the probability of falsely detecting and indicating non-existent failures. Experience~~d~~ and judgment should be applied when determining whether or not a failure monitoring and ~~warning~~ flight crew indication system would be practical and reliable. Comparison with similar, previously approved systems is sometimes helpful. ~~Appendix 1 outlines some design considerations that should be observed in any decision to create a candidate CMR.~~

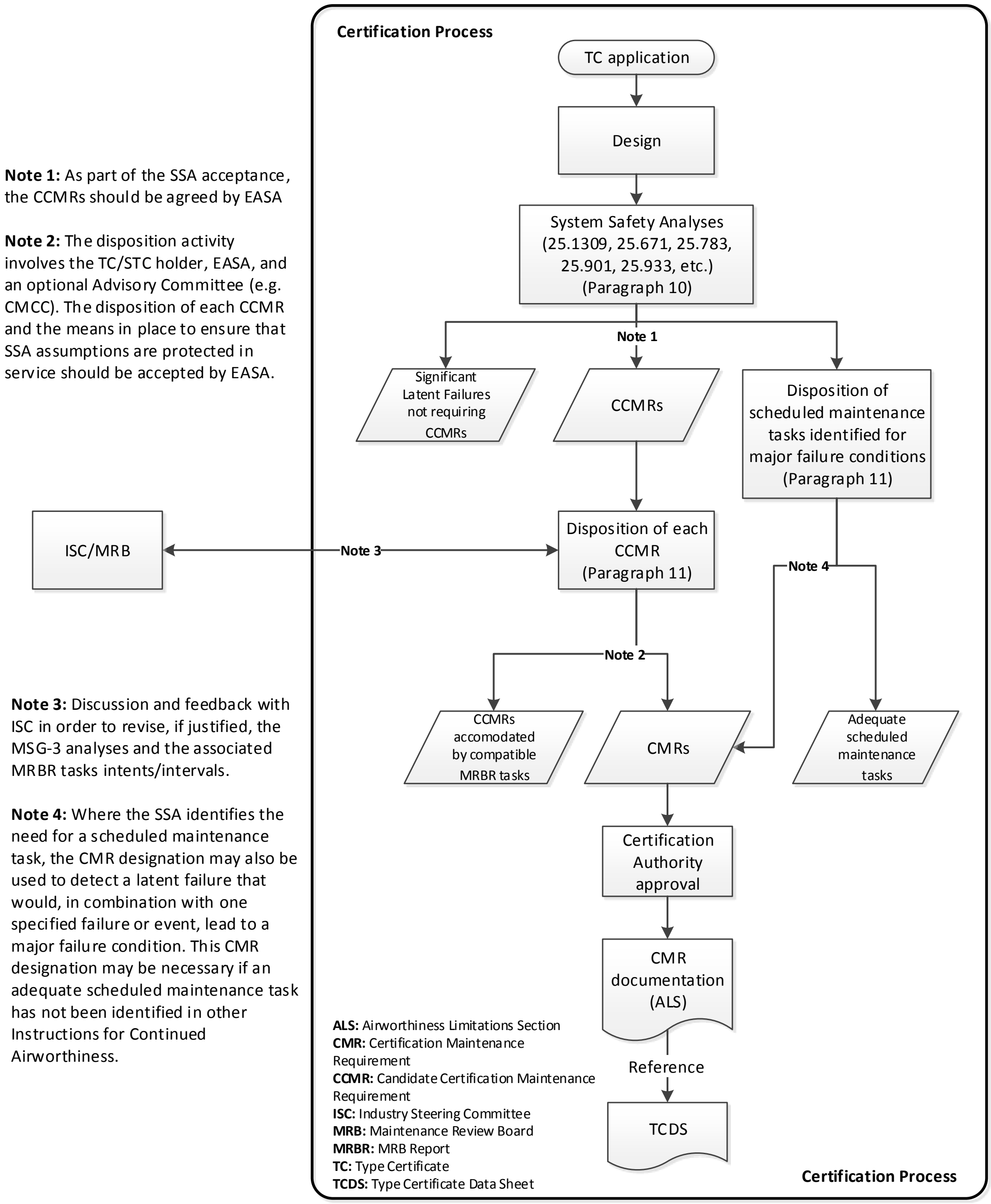
b. Supplemental design considerations are provided in Appendix 1 to this AMC.

9 OVERVIEW ~~IDENTIFICATION~~ OF ~~CANDIDATE CMRs (CCMRs)~~ THE CERTIFICATION MAINTENANCE REQUIREMENTS DEVELOPMENT PROCESS

~~*a.*~~ Figure 1 ~~illustrates the relationship between the certification process and the MRB process inestablishing scheduled maintenance tasks. Those tasks related to the certification process, as wellas those derived through MSG–3 analysis, must be identified and documented as illustrated. The~~

~~details of the process to be followed in defining, documenting, and handling CMRs are given in paragraphs 9b through 12 below.~~ shows the development process of CMRs. The details of the process to be followed in defining, documenting, and handling CMRs are given in paragraphs 10 through 13.

Figure 1 — CMR development process



~~b. Candidate CMRs~~

~~(1) Tasks that are candidates for selection as CMRs usually come from safety analyses (e.g.~~

~~System Safety Assessments (SSA), which may establish the need for tasks to be carried out periodically to comply with CS 25.1309 and other requirements requiring this type of analysis). Tasks may be selected from those intended to detect latent failures, which would, in combination with one or more specific failures or events, lead to a Hazardous or Catastrophic Failure Condition.~~

~~(2) Other tasks, not derived from formal safety analyses but based on properly justified engineering judgement, may also be candidates for CMRs. The justification must include the logic leading to identification as a candidate CMR, and the data and experience base supporting the logic.~~

10 ~~CERTIFICATION MAINTENANCE COORDINATION COMMITTEE (CMCC)~~ IDENTIFICATION OF CANDIDATE CMRs (CCMRs)

~~a. In order to grant operators of the aeroplane an opportunity to participate in the selection of CMRs and to assess the candidate CMRs and the proposed MRB tasks and intervals in an integrated process, the type certificate (TC) applicant should convene a Certification Maintenance Coordination Committee (CMCC) (see Figure 1). This committee should be made up of manufacturers, operator representatives designated by the Industry Steering Committee (ISC) Chairperson, Agency Certification Specialist(s) and the MRB Chairperson.~~

~~b. As early as possible in the design phase of the aeroplane programme, and at intervals as necessary, the CMCC should meet to review candidate CMRs, their purpose, criticality, and other relevant factors. During the CMCC's discussions, participants' experience may suggest alternatives to a given CMR, which would satisfy the intent of the CMR, while allowing reduced operational impact. In addition, where multiple tasks result from a quantitative analysis, it may be possible to extend a given interval at the expense of one or more other intervals, in order to optimise the required maintenance activity. However, if a decision is made to create a CMR, then the CMR task interval shall be based solely on the results of the safety analysis.~~

~~c. The CMCC would function as an advisory committee for the TC applicant. The results of the CMCC (proposed CMRs to be included on the type design definition and proposed revisions to MRB tasks and/or intervals) would be forwarded by the TC applicant to the ISC for their consideration. Revisions to proposed MRB tasks and/or intervals accepted by the ISC will be reflected in the MRB report proposal. Revisions to proposed MRB tasks and/or intervals rejected by the ISC will result in CMR tasks. Subsequent to the ISC's consideration, the TC applicant will submit the CMR document, as defined in paragraph 12 of this AMC, to the Agency for final review and approval~~.

a. The SSA should address all significant latent failures.

b. Credit may be taken for correct flight crew performance of the periodic checks required to demonstrate compliance with CS 25.1309(b). Unless these flight crew actions are accepted as normal airmanship, they should be included in the approved Aeroplane Flight Manual procedures. Similarly, credit may be taken from self-initiated checks (e.g. power-up built-in tests). In both cases, these significant latent failures do not need a CCMR.

c. Tasks that are candidates for selection as CMRs come from safety analyses (e.g. SSAs), which establish whether there is a need for tasks to be carried out periodically to comply with CS 25.1309, and other requirements (such as CS 25.671, CS 25.783, CS 25.901, and CS 25.933) requiring this type of analysis. The SSA should identify as CCMRs the maintenance tasks intended to detect significant latent failures. Tasks may also be selected from those intended to inspect for impending failures due to wear out.

d. As the safety analysis may be qualitative or quantitative, some task intervals may be derived in a qualitative manner (e.g. engineering judgment and service experience). As per AMC 25.1309, numerical analysis supplements, but does not replace, qualitative engineering and operational judgment. Therefore, other tasks that are not derived from numerical analysis of significant latent failures, but are based on properly justified engineering judgment, can also be candidates for CMRs. The justification should include the logic leading to identification of CCMRs, and the data and experience base supporting the logic.

e. In some situations, a Catastrophic or Hazardous Failure Condition might meet the quantitative probability objective, yet it might contain one or more components that, as per the quantitative analysis, do not require a periodic maintenance task to meet that objective (i.e. could be failed latent for the life of the aeroplane). In such cases, the SSA should include a qualitative assessment to determine whether a periodic maintenance task is needed.

Unless otherwise substantiated, a CCMR should be identified to:

— reduce exposure to a single failure or event that would cause the failure condition,

— ensure the availability of backup or emergency systems, and

— ensure the availability of equipment/systems required to be installed as per CS-25.

f. For failure conditions involving multiple significant latent failures, the SSA should identify a CCMR for each significant latent failure unless otherwise justified (e.g. one CCMR may cover multiple significant latent failures, or the significant latent failure could exist for the life of the aeroplane without compromising compliance with the safety objectives and paragraph 10.e considerations).

g. For each identified CCMR, the applicant should indicate:

— the failure mode to be detected,

— the failure condition of concern,

— the intended maintenance task, and

— the task interval (the allowable value coming from the SSA or other relevant analysis).

11 SELECTION OF CMRs

~~a. The candidate~~ Each CCMR~~s~~ should be reviewed ~~by the CMCC~~ and a determination made as to whether or not it should be a CMR. ~~status is necessary and, if so, whether to categorise the CMR as One Star or Two Star, as defined in paragraph 12 of this AMC.~~ ~~To reach this decision, the following should be considered by the CMCC:~~

~~(1) CMR status does not need to be applied if the CCMR is satisfied by:~~

~~(i) Maintenance actions considered to be routine maintenance activity (and which are also identified as MRB tasks) based on engineering judgement and experience on similar aeroplane types, or (ii) Tasks included in the approved Aeroplane Flight Manual.~~

~~(2) CMRs remaining after application of paragraph 11a(1) should be categorised as either One Star or Two Star CMRs. The following should be considered in assigning One Star or Two Star status:~~

~~(i) The degree of conservatism taken in the classification of the Failure Condition consequences.~~

~~(ii) (ii) The degree of conservatism taken in the individual failure rates and event occurrence rates used.~~

~~(iii) The margin between safety analysis calculated maximum interval and the interval selected through the MRB process.~~

~~(iv) The sensitivity of the Failure Condition probability to interval escalation.~~

~~(v) The proximity of the calculated maximum interval to the aeroplane life.~~

~~b. For operators with approved escalation practices or an approved reliability programme, dat a collection and analytical techniques are used to make adjustments to an operator's maintenance programme. It has been demonstrated that the management of a maintenance programme does not give rise to undue escalations. Therefore, escalation of Two Star CMR task intervals within an operator's maintenance programme ensures that Two Star CMRs will be properly managed by the operator with adequate controls.~~

Criteria and guidance are provided below for CMR selection or non-selection. The applicant may seek additional input from an advisory committee, as described in Appendix 2, before proposing CMRs to EASA for final review and approval.

a. The applicant should provide sufficient information to enable an understanding of the Failure Conditions and the failure or event combinations that result in the CCMRs. CCMRs are evaluated in the context of the Failure Conditions in which they are involved, e.g. whether the significant latent failure is part of a dual failure, a triple failure, or more.

b. The CMR designation should be applied in the case of catastrophic dual failures where one failure is latent. The CMR designation should also be applied to tasks that address wear out of a component involved in a Catastrophic Failure Condition that results from two failures.

c. In all other cases, the CMR designation may not be necessary if there is a compatible MRBR task to accommodate the CCMR, provided that the applicant has the means in place to ensure that the CCMRs are protected in service. Appendix 3 provides examples of acceptable means of protection. Any means should be presented to EASA for acceptance.

These means of protection should address future evolutions of the compatible MRBR task proposed by the applicant or by the operator. In this respect, these means should ensure that in service:

— the compatible MRBR task would not be changed to the extent that the CCMR task intent is adversely affected, and

— the compatible MRBR task would not be escalated beyond the interval that would otherwise be required by a CMR.

The TC applicant should adequately describe the selected means of protection in the associated technical publication in order for the operator to be aware of the process to be followed if there are modifications to any compatible MRBR tasks that are included in the operator's aeroplane maintenance program (AMP).

d. The rationale for the disposition of each CCMR should be presented to EASA for acceptance.

e. Since the MSG-3 logic may not consider a Failure Condition containing three or more failures, it is possible that a CCMR might not have any identified MRBR tasks. In this case, a CMR will be required.

f. Where the SSA identifies the need for a scheduled maintenance task, the CMR designation may also be used to detect a latent failure that would, in combination with one specified failure or event, lead to a Major Failure Condition. This CMR designation may be necessary if no adequate scheduled maintenance task has been identified in any other Instructions for Continued Airworthiness.

g. If the SSA does not specify an interval shorter than the life of the aeroplane, an interval may be established by considering the factors that influence the outcome of the Failure Condition, such as the nature of the fault, the system(s) affected, field experience, or task characteristics.

12 DOCUMENTATION AND HANDLING OF CMRs

~~CMRs should be listed in a separate CMR document, which is referenced in the Type Certificate Data Sheet. The latest version of the CMR document should be controlled by a EASA-approved log of pages. In this way, changes to CMRs following certification will not require an amendment to the Type Certificate Data Sheet. The CMR document should clearly identify the two types of CMR tasks, which are handled as follows:~~

~~a. One Star CMRs (*) – The tasks and intervals specified are mandatory and cannot be changed, escalated, or deleted without the approval of the Agency.~~

~~b. Two Star CMRs (**) – Task intervals may be adjusted in accordance with an operator 's approved escalation practices or an approved reliability programme, but the task may not be changed or deleted without prior Agency approval.~~

~~c. All minimum initial scheduled maintenance tasks, and CMRs, should reside in an MRB report to ensure that the operator's maintenance planning personnel are aware of all requirements. The CMR document should be included as Appendix 1 or A (the first appendix) to the MRB report. The MRB report should include a note indicating that the CMR document is the controlling document for all CMR tasks. When a CMR task corresponds to an MRB task, whatever the respective intervals, this fact should be highlighted, for example, by flagging the task in the CMR appendix of the MRB report.~~

a. CMRs are considered functionally equal to airworthiness limitations, therefore they should be included in the Airworthiness Limitations Section of the Instructions for Continued Airworthiness.

b. The CMR data location should be referenced in the type certificate data sheet (TCDS). The latest version of the applicant's CMR documentation should be controlled by a log of pages approved by EASA. In this way, changes to CMRs following certification will not require an amendment to the TCDS.

~~d.~~c. Since CMRs are based on statistical averages and reliability rates, an 'exceptional short-term extension' for ~~a single~~ CMR intervals may be made on one aeroplane for a specific period of time without ~~jeopardising~~ affecting safety. Any exceptional short-term extensions to CMR intervals ~~(both one star and two star)~~ must be defined and fully explained in the applicant's CMR documentation. The ~~local~~ competent authority must ~~be notified as soon as practicable if~~ <u>concur</u> with any exceptional short-term extension allowed by the applicant's CMR documentation ~~has~~ before it takes~~n~~ place, using procedures established with the competent authority in the operators' manuals. The exceptional short-term extension process is applicable to CMR intervals. It should not be confused with the operator's 'short-term escalation' program for normal maintenance tasks described in the operators' manuals.

(1) The term 'exceptional short-term extension' is defined as an increase in a CMR interval ~~which~~ that may be needed to cover an uncontrollable or unexpected situation. Any allowable increase must be defined either as a percentage of the normal interval, or a stated number of flight hours, flight cycles, or calendar days. If no exceptional short-term extension is to be allowed for a given CMR, this restriction should be stated in the applicant's CMR documentation.

(2) Repeated use of exceptional short-term extensions, either on the same aeroplane or on similar aeroplanes in an operator's fleet, should not be used as a substitute for good management practices. Exceptional s~~S~~hort-term extensions must not be used for ~~fleet~~ the systematic escalation of CMR intervals.

(3) The applicant's CMR documentation should state that the ~~Agency~~ competent authority must approve, prior to its use, any desired exceptional short-term extension not explicitly listed in the CMR document.

13 POST-CERTIFICATION CHANGES TO CMRs (New, revised or deleted)

~~Any post-certification changes to CMRs should be reviewed by the CMCC, and must be approved by the Agency, which approved the type design.~~

a. ~~Since the purpose of a CMR is to limit the exposure time to a given significant latent failure as part of an engineering analysis of overall system reliability, instances of a CMR task repeatedly finding that no failure has occurred may not be sufficient justification for deleting the task or increasing the time between repetitive performances of the CMR task. In general, One Star CMRs are not good candidates for escalation under an operator's reliability programme. A One Star CMR task change or interval escalation could only be made if world fleet service experience indicates that certain assumptions regarding component failure rates made early during the engineering analysis were overly conservative, and a re-calculation of system reliability with revised failure rates of certain components reveals that the task or interval may be changed.~~ The introduction of a new CMR or any change to an existing CMR should be reviewed by the same entities that were involved in the process of CCMR/CMR determination (refer to paragraphs 10 and 11 of this AMC) at the time of initial certification. To allow operators to manage their own maintenance programs, it is important that they be afforded the same opportunity for participation that they were afforded during the initial certification of the aeroplane.

b. ~~The introduction of a new~~ Any post-certification changes to CMRs ~~or any change to an existing CMR should~~ must be ~~reviewed~~ approved by ~~the Agency~~ EASA,~~same process used during initial certification. It is important that operators be afforded the same opportunity to participate they received during the original certification of the aeroplane, in order to allow the operators to manage their own maintenance programmes.~~ which approved the type design.

c. ~~In the event that later data provide sufficient basis for a relaxation of a CMR (less restrictive actions to be required), the change may be documented by a EASA-approved change to the~~

~~CMR document.~~ Since the purpose of a CMR is to limit the time of exposure to a given significant latent failure, or a given wear out, as part of an engineering analysis of the overall system safety, instances of a CMR task repeatedly finding that no failure has occurred may not be sufficient justification for deleting the task or increasing the time between repetitive performances of the CMR task. In general, a CMR task change or interval escalation should only be made if experience with the aeroplane fleet in service worldwide indicates that certain assumptions regarding component failure rates made early during the engineering analysis were too conservative, and a re-calculation of the system's reliability with revised failure rates of certain components reveals that the task or interval may be changed.

d. If ~~the requirements~~ later data provides a sufficient basis for the relaxation of a~~n existing~~ a CMR ~~must be increased~~ (less ~~more~~ restrictive actions to be ~~performed~~ required), ~~it will be mandated by an airworthiness directive (AD).~~the change may be documented by a revision to the applicant's CMR documentation and approved by EASA.

e. ~~After initial aeroplane certification, the only basis for adding a new CMR is in association with certification of design changes.~~ To address an unsafe condition, EASA may determine that the requirements of an existing CMR must be modified (more restrictive actions to be required) or a new CMR must be created. These modified requirements will be mandated by an Airworthiness Directive (AD) and the applicant's CMR documentation will be revised to include the change.

f. ~~A~~ N~~n~~ew CMRs that are unrelated to in-service occurrences may be created ~~as part of a design change should be a part of the approved data for that change, and added to the CMR document.~~ and they should be documented and approved by EASA. New CMRs can arise in situations such as:

(1) the certification of design changes, or

(2) updates of the applicant's certification compliance documentation. These may result from regulatory changes, actions required by an AD on similar systems or aeroplanes, awareness of additional Hazardous or Catastrophic Failure Conditions, revised failure rates, consideration of extended service goals, etc.

Figure 1 SCHEDULED MAINTENANCE TASK DEVELOPMENT has been deleted.

APPENDIX 1

SUPPLEMENTAL GUIDANCE FOR THE USE OF CMRs

~~The underlying goal of any system design should be an absolute minimum number of CMRs, with none as the goal. However the final determination of system design, and ultimately the number of CMRs, after safety and reliability are assured, should be based on the total cost of ownership of the system (or the aeroplane), with due regard to weight, reliability, initial and recurring costs.~~

1. The TC/STC applicant should choose a system design that minimises the number of significant latent failures, with the ultimate goal that no such failures should exist, if this is practical. A practical and reliable failure monitoring and flight crew indication system should be considered as the first means to detect a significant latent failure. If the cost of adding a practical and reliable failure monitoring and~~/or~~ ~~warning to a~~ flight crew indication system is ~~*large*~~ high, and the added maintenance ~~burden~~ cost of a CMR is ~~*small*~~ low, the addition of a CMR may be the solution of choice for both the type certificate applicant and the operator, provided all applicable regulations are met. Substituting a CMR with an MRBR task does not necessarily reduce maintenance costs.

2. The ~~A~~ decision to create a CMR ~~should~~ may include a ~~rigorous~~ trade-off of the cost, weight, or complexity of providing a~~n alerting~~ a mechanism or device that will expose the latent failure, versus the requirement for the operator to conduct a maintenance or inspection task at fixed intervals.

3. The following points should be considered in any decision to create a CMR~~.~~ in lieu of a design change:

   a. What is the magnitude of the changes to the system and/or aeroplane needed to add a reliable failure monitoring ~~or warning device~~ and flight crew indication system that would expose the ~~hidden~~ latent failure? What is the cost in added system complexity?

   b. Is it possible to introduce a self-test on power-up?

   c. Is the failure monitoring and ~~warning~~ flight crew indication system reliable? False warnings must be considered, as well as a lack of warnings.

   d. Does the failure monitoring and ~~warning~~ flight crew indication system itself need a CMR due to its latent failure potential?

(…)

APPENDIX 2

ROLE OF THE CERTIFICATION MAINTENANCE COORDINATION COMMITTEE (CMCC)

1. The CMCC functions as an advisory committee for the applicant and proposes the disposition of each presented CCMR. EASA is the authority that ultimately approves CMRs as airworthiness limitations of the type certificate as per Part-21.

2. In order to grant aeroplane operators the opportunity to participate in the selection of CMRs, and to assess the CCMRs and the proposed MRBR tasks and intervals in an integrated process, the applicant should convene a CMCC as early as possible in the design phase of the aeroplane program, and at intervals as necessary. This CMCC should comprise TC/STC holder representatives (typically maintenance, design, and safety engineering personnel), operator representatives designated by the Industry Steering Committee (ISC) chairperson, EASA certification specialist(s), and the MRB chairperson(s). EASA certification specialist participation in the CMCC is necessary to provide regulatory guidance on the disposition of CCMRs.

3. The CMCC should review CCMRs and their purposes, the Failure Conditions and their classifications, the intended tasks and their intervals, and other relevant factors. In addition, where multiple tasks result from a quantitative analysis, it may be possible to extend a given interval at the expense of one or more other intervals, in order to optimise the required maintenance activity. However, once a decision is made to create a CMR, then the CMR interval should be based solely on the results of the SSA or other relevant analysis. If the SSA does not specify an interval shorter than the life of the aeroplane, then the CMR interval may be proposed by the CMCC considering factors that influence the outcome of the failure condition, such as the failure mode(s) to be detected, the system(s) affected, field experience, or task characteristics.

4. The CMCC should address all CCMRs. Alternatively, the applicant may coordinate with EASA to define a subset of CCMRs to be presented to the CMCC.

5. The CMCC discusses compatible tasks (if any) that the MRB generates. The CMCC may select an MRBR task in lieu of a CMR in accordance with paragraph 11 of this AMC.

6. The CMCC may request the ISC to review selected CMCC results (e.g. proposed revised MRBR tasks and/or intervals). Upon ISC review, the proposed revised MRBR tasks and/or intervals accepted by the ISC are reflected in the MRBR proposal, and the proposed revised MRBR tasks and/or intervals rejected by the ISC result in CMRs. Following consideration by the ISC, the applicant submits the CMRs to EASA for final review and approval.

APPENDIX 3

MEANS OF PROTECTION PROPOSED BY THE DESIGN APPROVAL HOLDER (DAH) AGAINST FUTURE EVOLUTIONS OF THE COMPATIBLE MRBR TASKS AND DERIVED TASKS OF THE OPERATOR'S AEROPLANE MAINTENANCE PROGRAM — EXAMPLES

1. With reference to paragraph 11.c of this AMC, this Appendix provides examples to facilitate the implementation of the means to ensure that the CCMRs are protected in service.
2. These examples describe acceptable means, but not the only means. Any means should be presented to EASA for acceptance.

EXAMPLE 1 — Traceability of CCMRs and MRBR tasks in the Airworthiness Limitations Section

a. The CMR designation may not be necessary if there is a compatible MRBR task to accommodate the CCMR, provided that the design approval holder (DAH) shows direct traceability between the MRBR task and the accommodated CCMR in the airworthiness limitations section (ALS).

b. The compatible MRBR task and its interval are not airworthiness limitations. The status of the compatible MRBR task with regard to the MRB process remains unchanged.

c. Traceability between the CCMR and the compatible MRBR task should be provided in the ALS of the instructions for continued airworthiness to ensure that the CCMR is respected during in-service operation of the aeroplane and any future evolution of the maintenance program.

Table 1 illustrates one possible means for traceability.

CCMR task reference	CCMR interval	Compatible MRBR task reference
CCMR task #NN	*60 months*	*MRBR task #XX*
CCMR task #MM	*10 000 flight hours*	*MRBR task #YY*
…	*…*	*…*

Appendix 3 — Table 1

d. If the DAH changes the compatible MRBR task to the extent that the intent of the corresponding CCMR task is adversely affected, this corresponding CCMR task is no longer accommodated. Therefore, the DAH could either propose another compatible MRBR reference, if one exists, or create a new CMR in line with the intent of the previously referenced CCMR limitation. These changes to the ALS require EASA approval.

e. If the DAH escalates the interval of the compatible MRBR task beyond the corresponding CCMR limitation, this corresponding CCMR is no longer accommodated and the DAH needs to create a CMR in order to satisfy the corresponding CCMR limitation. Alternatively, the DAH could assess the feasibility of escalating the interval of the corresponding CCMR by re-evaluating the system safety assumptions that lead to the CCMR at the time of initial certification. These changes to the ALS require EASA approval.

f. Furthermore, the DAH shall describe in the ALS what the operator needs to observe when changing the operator's aeroplane maintenance program (AMP). For tasks included in an AMP, which are based on compatible MRBR tasks, the following applies:

i. Should the operator propose to change the intent of a task, the operator should ask for the DAH's confirmation that this change does not adversely affect the intent of the corresponding CCMR task. If the corresponding CCMR task is no longer accommodated, the operator needs to propose to include a mandatory task in the AMP in order to satisfy the intent of the referenced CCMR limitation. These changes to the AMP require the approval of the competent authority responsible for the oversight of the operator.

ii. If the operator proposes to escalate the interval of a task, the corresponding CCMR limitation must not be exceeded.

EXAMPLE 2 — Uniquely identifying the compatible MRBR tasks

a. The CMR designation may not be necessary if there is a compatible MRBR task to accommodate the CCMR, provided that the DAH uniquely identified each compatible MRBR task in the existing MRBR task listing. Table 2 illustrates one possible means for marking.

MRBR task reference	MRBR task description	Failure effect category (FEC)	Interval	Tracking
MRBR task #XX	*Functional check of […]*	*FEC 8*	*60 months*	
MRBR task #YY	*Detailed inspection of […]*	-	*72 months*	*EWIS*
MRBR task #ZZ	*Operational check of […]*	*FEC 8*	*10 000 flight hours*	*CCMR*
…	…	…	…	…

Appendix 3 — Table 2

b. The purpose of the marking and the policies to be observed for appropriate change control of the marked MRBR tasks should be stated in the MRB report.

c. The status of the compatible MRBR task with regard to the MRB process remains unchanged.

d. If the DAH changes the marked MRBR task to the extent that the intent of the corresponding CCMR task is adversely affected, the DAH needs to create a CMR to satisfy the intent of the initial CCMR task. This change to the ALS requires EASA approval.

e. For future escalations of MRBR tasks, the DAH should have procedures in place to ensure that these escalations do not increase the interval of the marked MRBR task beyond the corresponding CCMR interval.

f. However, should the DAH escalate the marked MRBR task beyond the CCMR interval, the DAH needs to create a CMR in order to satisfy the corresponding CCMR. This change to the ALS requires EASA approval. Alternatively, the DAH could assess the feasibility of escalation of the interval of the corresponding CCMR by re-evaluating the system safety assumptions that lead to the CCMR at the time of initial certification. This change to the CCMR interval requires EASA involvement in accordance with the process described in paragraph 11 of this AMC.

g. Furthermore, the DAH shall describe in the MRBR what the operator needs to observe when changing the operator's aeroplane maintenance program (AMP). For tasks included in the AMP, which are based on marked MRBR tasks, the following applies:

i. If the operator proposes to change the intent of a task, the operator should ask for the DAH's confirmation that this change does not adversely affect the intent of the corresponding CCMR task. If the corresponding CCMR task is no longer accommodated, the operator needs to propose the inclusion of a mandatory task in the AMP in order to satisfy the intent of the referenced CCMR limitation. These changes to the AMP require the approval of the competent authority responsible for the oversight of the operator.

ii. If the operator proposes to escalate the interval of a task, the operator should ask for the DAH's confirmation that this escalation does not increase the interval beyond the corresponding CCMR interval. These changes to the AMP require the approval of the competent authority responsible for the oversight of the operator.