

Certification Memorandum

Critical Parts – Lifing Shortfall

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Regulatory requirement(s): 21.A.3A, 21.A.3B, GM 21.A.3, CS-E 510, CS-E 515

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Log of issues

Issue	Issue date	Change description
01	30.05.2017	First issue.

Table of Content

Log of issues..... 2

Table of Content 2

1. Introduction..... 3

 1.1. Purpose and scope 3

 1.2. References 3

 1.3. Abbreviations..... 3

2. Background..... 3

3. EASA Certification Policy 4

 3.1. EASA Policy 4

 3.2. Whom this Certification Memorandum affects 4

4. Remarks 4



1. Introduction

1.1. Purpose and scope

The purpose of this Certification Memorandum is to provide additional guidance regarding the management of shortfalls in the expected life of engine Critical Parts within the provisions of Part 21.A.3B and its GM.

For the purposes of this CM, a shortfall in the expected life of an engine Critical Part is defined as the inability of a Critical Part within the Engine Type Design to achieve the Agency Approved Life as established within CS-E 515. This may be due to a physical deficiency with the design, or utilisation outside of the assumptions made in the engineering plan of CS-E 515 resulting in an accelerated rate of fatigue accumulation.

1.2. References

It is intended that the following reference materials be used in conjunction with this Certification Memorandum:

Reference	Title	Code	Issue	Date
Part 21.A.3A	Failures, malfunctions and defects	---	---	---
Part 21.A.3B	Airworthiness directives	---	---	---
GM 21.A.3B	Airworthiness directives	---	---	---
CS-E 510	Safety Analysis	CS-E	---	---
CS-E 515	Engine Critical Parts	CS-E	---	---

1.3. Abbreviations

CM	Certification Memorandum
CS	Certification Specification
GM	Guidance Material

2. Background

CS-E 510 recognises that the probability of Primary Failures of certain single elements cannot be sensibly estimated in numerical terms and that if the failure of such elements is likely to result in Hazardous Engine Effects, reliance must be placed on meeting the prescribed integrity specifications of CS-E 515 in order to support the safety objective of an Extremely Remote Probability of Failure.

The Engineering Plan of CS-E 515 establishes criteria by which each Engine Critical Part is given an Approved Life and can be withdrawn from service before a Hazardous Engine Effect can occur. Any shortfall in the expected life on an engine Critical Part may therefore result in a Hazardous Engine Effect, which is assumed to constitute an unsafe condition unless it can be shown that the consequences at aircraft level do not constitute an unsafe condition for a particular aircraft installation.

The GM to Part 21.A.3B provides the basic principles which should be used to guide the course of actions to be followed so as to maintain an adequate level of airworthiness risk after a defect has been detected and reported which, if uncorrected, would involve a potential significant increase of the level of risk for an aircraft type. The GM also devises guidelines to be used in judging whether a proposed campaign of corrective actions is sufficient in airworthiness terms, when managing an unsafe condition.. These guidelines are applicable for a rectification campaign to manage the risk from an issue associated with a hazardous failure condition without grounding the aircraft. These guidelines provide a theoretical maximum reaction time and are not



intended to allow avoidance of quicker reaction times where these can be achieved (see GM 21.A.3B (a) (4) 4.4).

3. EASA Certification Policy

3.1. EASA Policy

During the service life of a Critical Part included in an engine type design, the engine type certificate holder may through service experience or any other means discover that a Critical Part is unable to meet the Agency Approved Life as established in accordance with CS-E 515.

Such occurrences should be reported to the Agency in accordance with Part 21.A.3A (b) and a control programme established to correct the deficiency in accordance with Part 21.A.3A (c). The control programme should consist of corrective actions which restore the level of safety intended by CS-E 515, enabling parts to be withdrawn from service before exceeding a reduced life that is approved by the Agency. The Agency would in such circumstances initially publish this reduced life in an Airworthiness Directive.

It is recognised by the Agency that in some cases, Critical Parts in service may already have exceeded, or be close to exceeding the reduced life. Within the guidelines established in the GM to Part 21.A.3B the Agency may approve via an Airworthiness Directive a limited continued operation of such parts beyond the reduced life using a life draw-down plan in order to limit disruption of service. It should be noted however that the control programme in such circumstances will be expected to ensure that parts that exceed the reduced life are removed from service as soon as is reasonably practical, without undue delay (see GM 21.A.3B (a) (4) 4.4).

CS-E 515 already includes probabilistic assessments to demonstrate the integrity requirements prescribed by CS-E 510. The Agency therefore considers, for the case of a shortfall in the expected life of a Critical Part included in the engine type design, that it is not appropriate to combine a probabilistic life integrity assessment with additional simplistic component failure orientated probabilistic risk assessments performed in accordance with GM to Part 21.A.3B as this may lead to excessive reaction times and a departure from the principles upon which the Approved Life of CS-E 515 is established. The drawdown schedules should therefore be limited to minimum durations above the lives calculated in accordance with CS-E 515 and should be agreed with the Agency. The drawdown schedule should be founded upon the principles of CS-E 515 and should prioritise the removal of parts with the highest exceedance and risk.

3.2. Whom this Certification Memorandum affects

This Certification Memorandum is applicable to engine type certificate holders.

4. Remarks

1. Suggestions for amendment(s) to this EASA Certification Memorandum should be referred to the Certification Policy and Safety Information Department, Certification Directorate, EASA. E-mail CM@easa.europa.eu.
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