EASA European Union Aviation Safety Agency	**Special Condition** **Engines – Engine Mounts – Non-declaration of Approved Life**	Doc. No.: **SC E-15** Issue : 2 Date : 23 Sep 2019 Proposed ☒ Final ☐ Deadline for comments: 18 Oct 2019

SUBJECT	:	**Engines – Engine Mounts – Non-declaration of Approved Life**
REQUIREMENTS incl. Amdt.	:	**CS-E 25, CS-E 510 and CS-E 515, all Amendments**
ASSOCIATED IM/AMC[1]	:	Yes☐ / No ☒
ADVISORY MATERIAL	:	

INTRODUCTORY NOTE:

The following Special Condition has been classified as an important Special Condition and as such shall be subject to public Consultation in accordance with EASA Management Board decision 12/2007 dated 11 September 2007, Article 3 (2.) of which states:

"2. *Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency.*"

IDENTIFICATION OF ISSUE:

A single engine mount failure would normally be expected to result in a Major Engine Effect, as provided by AMC E 510 (e):

Typically, the following may be considered as Major Engine effects:

- *Vibration levels that result in crew discomfort.*
- *Loss of integrity of the load path of the Engine supporting system without actual Engine separation.*

If a Hazardous Engine Effect can result from a single mount failure, the provisions of CS-E 510 (a)(3) and (c) shall apply. For Primary Failures of certain single elements, CS-E 510 (c) refers to the integrity specifications of CS-E 515 as means to support the objective of an Extremely Remote probability.

APPLICANT PROPOSAL:

If a single engine mount is declared as an Engine Critical Part, the applicant expressed their intention not to declare any life limitation in the Airworthiness Limitation Section. This is proposed on the basis of analytically demonstrating significant stress margin, and a life greater than 100 000 start-stop cycles.

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[1] In the case of a SC, the associated Interpretative Material and/or Acceptable Means of Compliance may be published for awareness only and they are not subject to public consultation.

EASA POSITION:

CS-E 515 (a) requires an Approved Life to be substantiated and, by reference to CS-E 25 (b), published in the Airworthiness Limitation Section (ALS). It has however been accepted, for parts featuring significant stress margin, that their Approved Life need not be published in the ALS if it can be demonstrated to be greater than 100 000 cycles. Engine mounts are static, relatively simple parts and not in direct contact with gas path or secondary air system, which result in more accurate failure rate prediction. This previously accepted condition could therefore apply to the proposed engine mount type design[2].

The non-declaration of a life limitation for an Engine Critical Part constitutes a novel and unusual design feature relative to the design practices on which the applicable airworthiness code (CS-E) is based. Per Part 21 paragraph 21.A.16B, EASA is proposing a Special Condition detailing the technical specifications for the certification of the engine with these engine mounts[3].

On 14 November 2017 EASA published Special Condition Turboshaft Engines – Engine Mounts – Non-declaration of Approved Life Issue 1[3]

This Special Condition was titled “Turboshaft Engines”, however EASA considers it is also equally applicable to all Turbine and Piston Engines.

In addition, EASA has found it necessary to require that the Engine applicant coordinates and collaborates with the aircraft manufacturer.

For the reasons stated above EASA considers it necessary to amend the Special Condition as described below:

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[2] In June 2007 EASA published for public consultation a Special Condition “Fan Blade Containment” related to composite fan blade containment, applicable to another engine type. That Special Condition included similar provisions to that of the present Special Condition for not specifying life limitations in the ALS where the life could be demonstrated to be greater than 100 000 cycles. However the different context (e.g. operating conditions, loading, consequences of failure) of engine mounts as compared with fan blade, justify the need for a specific public consultation.

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[3] https://www.easa.europa.eu/document-library/product-certification-consultations/special-condition-turboshaft-engines-%E2%80%93-engine

Special Condition to CS-E, all Amendments

Engines – Engine Mounts – Non-declaration of Approved Life

a) Using a procedure approved by EASA, the applicant shall establish an operating limitation that specifies the Approved Life of any engine mount identified as a Critical Part, such that it can be withdrawn from service before Hazardous Engine Effects can occur. The life evaluation shall include the combined effects of high cycle and low cycle fatigue. If the operating limitation is greater than 100 000 cycles, that limitation need not be specified in the Airworthiness Limitation Section of the Engine Manual.

b) It must be demonstrated, using the provisions of CS-E 515 (an engineering plan, a manufacturing plan and a service management plan), that the static and cyclic margins of the engine mounts identified as Critical Parts will be maintained during the entire life of the part.

c) Single engine mounts identified as Critical Parts must be listed as Engine Critical Parts in the Airworthiness Limitation Section of the Instructions for Continued Airworthiness and must be identified in accordance with CS-E 510 (a)(2) and Part 21.A.805.

d) The effects of a failure of any Engine mount that is classified as a Critical Part shall be established and provided to the aircraft manufacturer for consideration at aircraft level, and recorded as necessary in the instructions for installing and operating the engine.