

Certification Memorandum

Engine Time Limited Dispatch (TLD) and Master Minimum Equipment List (MMEL)

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Regulatory requirement(s): CS-MMEL, CS-E 1030

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Log of issues

Issue	Issue date	Change description
01	24.04.2017	First issue.

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1. Introduction

1.1. Purpose and scope

The purpose of this Certification Memorandum is to provide specific guidance for the handling of Engine faults in the Master Minimum Equipment List (MMEL) and clarify the use of Time Limited Dispatch (TLD) analysis in the development process of the MMEL.

This Certification Memorandum describes the capabilities and limitations of the TLD analysis when intended to be used to support the justification of MMEL and proposes a certification workflow to manage related activities.

This Certification Memorandum applies to all aeroplanes and helicopters for which a TLD approval may be granted.

1.2. References

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

Reference	Title	Code	Issue	Date
[1]	Certification Specifications For Engines	CS-E	Amdt 3	23-12-2010
[2]	SAE ARP5107 Guidelines for Time-Limited-Dispatch (TLD) Analysis for Electronic Engine Control Systems	---	REV B	01-08-2006
[3]	CS-MMEL	CS-MMEL	Initial Issue	31-01-2014

1.3. Abbreviations

AMC	Acceptable Means of Compliance
CMR	Certification Maintenance Requirement
CS	Certification Specification
EEC	Electronic Engine Controller
EECS	Electronic Engine Control System
ETOPS	Extended Range Operation with Two-Engine Aeroplanes
FHA	Functional Hazard Assessment
ICA	Instructions for Continued Airworthiness
IFSD	In-Flight Shut Down(s)
JAA	Joint Airworthiness Authorities (of Europe)
JAR	Joint Airworthiness Requirement



LOTC	Loss of Thrust Control
LT	Long Time Fault/Fault State/Repair Interval
LOPC	Loss of Power Control
MEL	Minimum Equipment List
MMEL	Master Minimum Equipment List
MPD	Maintenance Planning Document
MRB	Maintenance Review Board
OSD	Operational Suitability Data
SSA	System Safety Assessment
ST	Short Time Fault/Fault State/Repair Interval
TC	Type Certificate
TCDS	Type Certificate Data Sheet
TLD	Time Limited Dispatch

2. Background

2.1. Identification of the need

Dispatch of aircraft with detected Engine Control System faults requires a safety assessment by the Engine manufacturer during Engine certification resulting in a Time Limited Dispatch (TLD) approval and a safety assessment by the Aircraft manufacturer as part of the Type certification resulting in approved Operational Suitability Data (OSD) to be used by the operators. The relationship between Engine certification and Aircraft certification activities needs to be clarified.

2.2. Evolutions of the engine certification specifications

The JAR-E 510 (e)(2) required the Engine Failure Analysis to include: *“Justification for the inclusion in the Master Minimum Equipment List [MMEL] of any Engine-associated item permitted to be carried in an unserviceable state for specific periods”*.

The above JAR-E paragraph was introduced in JAR-E Change 7 dated 24/01/86 and was deleted with the incorporation of NPA E-38 at change 12 dated 05/2003. A new section CS-E 1030 was then introduced in CS-E Initial Issue. At that time the content of the paragraph was:

“If time limited dispatch is requested, any dispatchable configuration of the Engine, including its control system, must comply with the applicable specifications of CS-E. The length of time allowed prior to rectification of a Fault resulting in degraded operation must be justified as part of the system safety assessment of CS-E 50 (d) or the safety analysis of CS-E 510 and documented as part of the MMEL of the aircraft in which the Engine is installed.”

The CS-E 1030 was re-written and expanded, including AMC, at CS-E Amendment 1 dated 12/2007. The first sub-paragraph CS-E 1030 (a) states: *“If approval is sought for dispatch with Faults present in an Electronic Engine Control System (EECS), a time limited dispatch (TLD) analysis of the EECS must be carried out to*



determine the dispatch and maintenance intervals.” TLD has therefore been recognised as part of the Engine TC and approved at Engine level while the MMEL has been recognised as an aircraft activity and references to it have been removed from CS-E.

As a consequence of the above regulations history, there is a need identified to clarify the certification workflow to ensure engine and aircraft certification requirements are both complied with.

2.3. TLD “MEL maintenance approach” vs. “Inspection/Repair maintenance approach”

The general philosophy of the MMEL is that every failure/fault or inoperative equipment, once discovered and reported, requires a MMEL item to allow the aircraft dispatch until the condition is rectified. Through an “Inspection/Repair Maintenance Approach” (as per Ref. [1] AMC E 1030 (2) Definitions) an engine system fault or functional failure that is not displayed to the flight crew can be detected (found) through a periodic check of the Engine Control System. The applicable rectification time limit is set by TLD analysis and recorded in the Airworthiness Limitations for the Engine Type Certification or equivalent.

3. EASA Certification Policy

3.1. Dispatch with EECS faults for which TLD approval is required

If dispatch is sought with faults (or faults combination) present in an Electronic Engine Control System (EECS), a time limited dispatch (TLD) approval is required as per Ref. [1] CS-E 1030 for faults such as EECS degraded protection or loss of redundancy against Loss of Thrust Control (LOTC)/Loss of Power Control (LOPC). TLD approval is granted once the engine manufacturer has demonstrated compliance to applicable engine certification requirements including the verification that LOTC/LOPC rates and Hazardous Engine Effects rates remains acceptable with proposed rectification time limits.

Once TLD approval is granted, the inclusion of such items in the MMEL as part of the OSD requires an approval under the aircraft type certificate.

If taking credit on the TLD analysis to demonstrate compliance to the applicable OSD certification basis (e.g. CS-MMEL), the aircraft manufacturer should ensure the MMEL content remains consistent with the TLD restrictions, time limitations, and other related installation requirements set by the engine manufacturer.

3.2. Dispatch with Engine system faults for which TLD approval is not required

Engine system faults that do not have an impact on the LOTC rate or on the compliance with the applicable engine certification requirements may however be included as part of the TLD report.

If rectification time limits are included in the TLD report for such faults, it should be clearly indicated that they are not derived from the LOTC analysis.

3.3. Evaluation of aircraft level consequences for MMEL evaluation

When Engine related MMEL items are involved in aircraft level failure conditions classified as Hazardous or Catastrophic, the compliance with applicable requirements for qualitative and quantitative analysis (e.g. Ref. [3] CS MMEL.145) should be demonstrated.

Contributions from Engine Control System to the aircraft FHA/SSA may be affected while under MMEL conditions and may need to be re-evaluated. In such cases coordination between the aircraft and the engine manufacturer is necessary to complete the demonstration of compliance for the MMEL.

It is recommended that the aircraft manufacturer MMEL safety analysis is made prior to the definition of the generic cockpit messages related to TLD categories (Short Term and Long Term) to avoid re-design issues.



3.4. Dispatch with EECS faults with performance effects

Particular attention should be paid to range sensitive operations, including LROPS and ETOPS, when Engine system faults, including some included in TLD analysis, could have an effect on fuel consumption, hence range. Normally, degraded performance is not analysed by the engine manufacturer for LOTC but should be assessed by the aircraft manufacturer. Flight duration and thrust variation in case of an IFSD should be considered in performance / range assessment. If necessary, operational limitations should be specified in the MMEL for combination of MMEL items.

3.5. MMEL rectification intervals allocation

When TLD approval is granted at the engine level, the repair limitations for Short Term or Long Term faults may be used by the aircraft manufacturer to support the allocation of the appropriate MMEL rectification interval. If the repair intervals are taken from the TLD analysis, MMEL Rectification interval A (non-extendable) should be used.

The MMEL rectification interval cannot be less restrictive than that allocated to the corresponding item in the approved TLD.

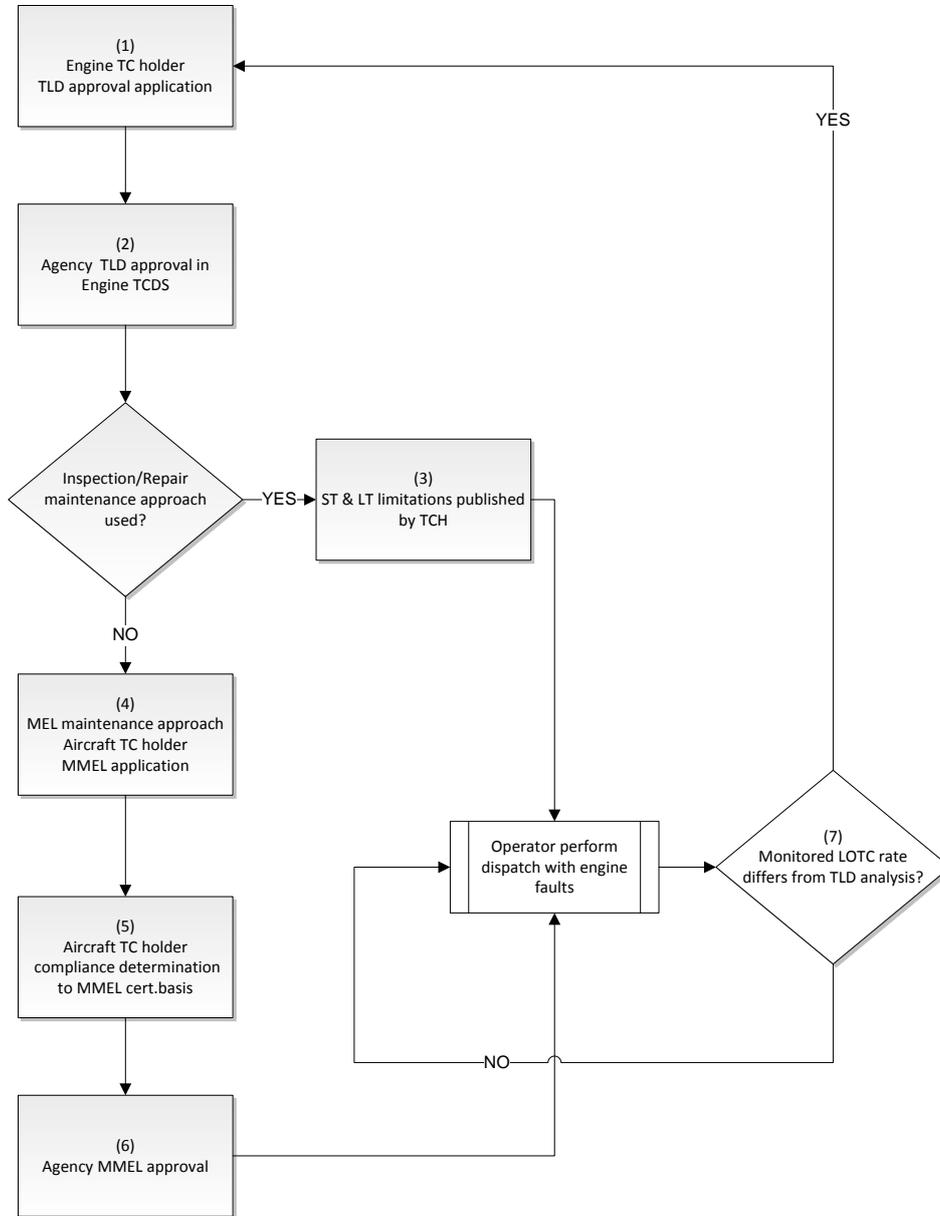
The MMEL rectification interval may need to be set to a shorter period based on a qualitative evaluation of the flight deck effects, consequences on crew procedures, workload, etc. Considerations about the adequate aircraft alerting level are also applicable.

3.6. Certification workflow for TLD and MMEL

In the case when a MMEL approval is requested including faults present in the EECS, the following workflow is proposed to enable proper coordination of certification activities:



Certification Process Flowchart for TLD and MMEL



1. Application for TLD approval according to CS-E 1030 should be made by the Engine Type Certificate holder to the type certification authority of the state of design. Justifications are provided by the applicant including a TLD analysis.
2. Once approved or validated by EASA, the TLD approval is recorded in the Engine TCDS (See CS-E 40(d)).
3. The approved TLD operating limitations (times allowed for rectification of ST and LT Faults) should be documented in the manuals specified in CS-E 20 (d) and CS-E 25 (a), whichever is appropriate, and provided to operators as required by Part 21, 21.A.61. The Aircraft TCH may take-over the responsibility to provide the data to the operators (e.g. through the MMEL and/or maintenance inspections program) based on arrangements with the engine TCH. When the TLD operating limitations are published in the Engine Installation Manual/Engine Operating Manual, the aircraft Type Certificate Holder is then responsible to issue them in the appropriate aircraft documentation available to the operators. The periodic inspection and repair requirement may also be identified as Certification Maintenance Requirements (CMRs) by the Certification Authorities and be listed in the CMR section of the MRB report and MPD (Ref. [2] Appendix D page 92).
4. If “MEL maintenance approach” was retained, the aircraft Type Certificate Holder should apply for MMEL inclusion of corresponding items.
5. The aircraft Type Certificate Holder provides justifications for MMEL, taking into account the results of the engine TLD analysis but also the aircraft level aspects to comply with applicable MMEL certification basis (e.g. CS-MMEL).
6. The MMEL is approved as part of the OSD within the aircraft TC and issued to the operators by the TCH.
7. The actual LOTC rate is monitored by the Engine Type Certificate Holder in accordance with Ref. [1] AMC E 1030. A yearly review of this rate should be organized. This topic should be part of the Continuing Airworthiness activities. If the need for changes to the TLD is identified, an application for a major change should be sent to EASA or the responsible authority in the state of design. Following the initial approval, changes made to the TLD operating limitations (change to the times allowed for rectification of Faults, addition or removal of Faults) and approved by the engine type certifying authority, should be taken into account by the aircraft Type Certificate Holder for potential impact on MMEL once notified of the change by the engine Type Certificate Holder. Operators will be informed by appropriate means of changes to TLD, MMEL, or maintenance inspection tasks, as applicable.

3.7. Who this Certification Memorandum affects

Aircraft and Engine Type Certificate Holders when Time Limited Dispatch (TLD) and/or MMEL are applied to cover dispatch with Engine faults.

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.
2. For any question concerning the technical content of this EASA Proposed Certification Memorandum, please contact:

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