

SUBJECT : **Time Limited Dispatch (TLD) for Piston Engines**

REQUIREMENTS incl. Amdt. : **CS-E, all amendments**

ASSOCIATED IM/AMC¹ : Yes ☒ / No ☐

ADVISORY MATERIAL : **AMC E 1030, FAA AC 33.28-2**

INTRODUCTORY NOTE:

The following Special Condition has been classified as important 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.) 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:

Application was made for certification of a piston engine equipped with an electronic engine control system (EECS) containing features that allow dispatch respective flight operation for a certain duration when the EECS is in a degraded condition.

CS-E does not address degraded EECS conditions for piston engines.

As the applicable certification specifications do not contain adequate or appropriate safety standards for piston engines with electronic engine control systems that are permitted to be operated with these systems in a degraded condition for a certain duration which are considered to be novel or unusual design features relative to the design practices on which the applicable certification specifications are based, EASA has developed a special condition.

The objective of this Special Condition and Interpretative Material is to ensure that piston engines with EECS in a degraded condition are considered to the degree that any approval in accordance with this Special Condition/Interpretative Material is appropriately conservative.

CS-E currently addresses only turbine engine faults caused by EECS's loss of redundancy in CS-E 1030 »Time Limited Dispatch« (TLD). The related AMC E 1030 states:

»TLD methodology is one way of managing dispatch with EECS Faults. Faults in systems or equipment other than EECS or EECS Faults other than loss of redundancy are typically addressed through the Master Minimum Equipment List (MMEL).« Further guidance is given in EASA [CM-MMEL-001](#).

¹ In case of 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.

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Historically, FAA has issued guidance for piston engine operation in degraded conditions in [AC 33.28-2](#). The following definitions apply:

Time-Limited Operations (TLO): »TLO refers to the duration of flight operations permitted with the EEC system in a degraded condition.«

Degraded System or Configuration: »A degraded system or configuration is an EEC system that has faults or failures present that have no effect on engine operation but may cause a loss of redundancy in the system.«

Fault or Failure: »A fault or failure is an occurrence that affects the operation of an engine component, part, or element so that it cannot function as intended (this includes both loss of function and malfunction). Software errors may cause failures, but are not considered faults.«

In that respect, EASA proposes:

- to introduce a special condition for piston engines similar to CS-E 1030 for turbine engines
- to accept AMC E 1030 also for piston engines, or alternatively FAA AC 33.28-2

Considering all the above, the following Special Condition is proposed:



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Special Condition

Time Limited Dispatch (TLD) for Piston Engines

- (a) If approval is sought for dispatch with Faults present in an Electronic Engine Control System (EECS), an EECS analysis must be carried out to determine the dispatch and maintenance intervals.
- (b) For each dispatchable configuration it must be shown by test or analysis that:
- (1) The Engine remains capable of meeting the following:
 - (i) Proper engine operation without shut-downs or unintended power fluctuations throughout its operating envelope and operability aspects covered by CS-E 240(b)(1) (for self-ignition engines), CS-E 360, CS-E 370 and CS-E 390;
 - (ii) Relighting in flight covered by CS-E 240(b)(2)
 - (2) The ability to control the Engine within limits is maintained;
 - (3) Protection is maintained against Hazardous Engine Effects, if provided solely by the EECS and shown to be necessary by the safety analyses required under CS-E 210 and CS-E 50;
 - (4) A means is maintained to provide necessary signals to identify EECS Faults;
 - (5) A further single Failure in the EECS will not produce a Hazardous Engine Effect;
 - (6) The Engine continues to meet its certification specifications for external threats;
 - (7) The proposed dispatch interval is justified.
- (c) The time-weighted-average of the Full-up Configuration and all allowable dispatch configurations with Faults, must meet the Loss of Power Control (LOPC) rate for the intended application(s).
- (d) The periods of time allowed prior to rectification of Faults must be documented in the appropriate manual(s).
- (e) Provision must be made for any no-dispatch configuration to be indicated to the flight crew
- (f) The provisions required under paragraph (b)(4) and (e) should facilitate the installation to be compliant with the applicable aircraft certification specifications for flight crew interface.«



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Associated Means of Compliance

The associated Means of Compliance is published for awareness only and is not subject to public consultation.

1. AMC E 1030 should generally be considered valid for Piston Engines.
2. The term »Hazardous Engine Effects« covers the following:
 - Non-containment of high-energy debris,
 - Uncontrolled fire,
 - Failure of the Engine mount system leading to inadvertent Engine separation,
 - Release of the propeller by the Engine
 - Significant thrust in the opposite direction to that commanded by the pilot (e.g. unintended movement of the propeller blades below the established minimum in-flight low-pitch position)
 - Complete inability to shut the Engine down.
3. In relation with the annunciation of faults, and to facilitate the compliance with the applicable aircraft certification specifications for flight crew interface, it is expected that the annunciation in the cockpit of faults which are acceptable for continued operation will be segregated from the annunciation of no-dispatch faults.
4. [FAA AC 33.28-2](#) is an accepted means of compliance as an alternative to AMC E 1030.
Note: FAA AC 33.28-2 Chapter 5 describes an acceptable method »for demonstrating compliance that allows for operation with certain faults (that is, in a degraded state) and that addresses the mechanical components of the control system.« and thus allows operation of degraded systems configuration limited to 20 hours based on an Electronic Control System Safety Analysis (EECSA) including qualitative and quantitative analysis and grouping of EECS faults in the following three operating limitation categories: No Take-Off (NTO), Time-Limited Operation (TLO) of 20 hours, and Unlimited Operation (ULO).
5. TLD/TLO approval will be recorded on the engine TCDS

