

Proposed Special Condition

Applicable to Self-Ignition Piston Engines (Diesel Engines)

Comment Response Document

Commentor:	UK CAA
Page No:	1
<p>Paragraph No: Statement of Issue, last sentence. “In flight restart of the engine may be difficult to achieve if a proper in-flight restart procedure has not been provided”</p> <p>Comment: A re-start procedure is defined for this type of engine and is normally included in the operating instructions. The problem is believed to be maintaining ignition and ability to restart under low temperature conditions. This is based on a review of the referenced ADs</p> <p>Justification:</p> <p>Proposed Text (if applicable):In-flight re-start of the engine may be difficult to achieve under certain environmental conditions.</p>	
Author’s Response:	Accepted.

Commentor:	UK CAA
Page No:	2
<p>Paragraph No: Proposed Special Condition</p> <p>Comment: There is no discussion prior to this paragraph regarding the relevance of cetane number to the operation of the Diesel engine, and in particular the ability to maintain ignition and re-start the engine in flight. The reader is therefore unable to link the text of this paragraph to the problem identified previously.</p> <p>Justification:</p> <p>Proposed Text (if applicable):</p>	
Author’s Response:	Accepted.

Commentor:	UK CAA
Page No:	2
<p>Paragraph No: Proposed Special Condition</p> <p>Comment: It is proposed that the cetane number of the fuel used to substantiate continued ignition capability is to be recorded on the TCDS. The cetane number of Jet fuels, which are commonly used in this type of engine, is not included in any specification and is not routinely checked. It is not clear what purpose stating a minimum cetane number serves, since this is not explained in the discussion section of the paper .(see comment above). If it is proposed as a limitation, then it is not clear how it would be satisfied in service.</p> <p>Justification: Specification for Jet fuel contains no reference to cetane number.</p> <p>Proposed Text (if applicable): Remove reference to cetane number in the special condition.</p>	
Author's Response:	Not accepted. The Cetane Number will be mentioned in a TCDS note to record what was tested. It is not intended to be an operating limitation.

Commentor:	UK CAA
Page No:	2
<p>Paragraph No: Discussion “In difference to spark ignition engines which have an inherent in-flight relight capability diesel engines do not have. “</p> <p>Comment: Relight instructions are included in the operating manuals for diesel engines, so there is re-light capability. (A restart envelope has to be declared as part of the aircraft certification, ref CS 23.903, CS- VLA 903, so the engine must have a capability of in-flight restart.) It is believed to be the effectiveness of these instructions which is in question, in certain parts of the flight envelope.</p> <p>Justification: operating manuals of previously approved EASA engines make reference to in flight restart procedures.</p> <p>Proposed Text (if applicable): Amend sentence to more closely reflect the problem</p>	
Author's Response:	Accepted.

Commentor:	UK CAA
Page No:	2
<p>Paragraph No: proposed special condition. All self ignition piston engines shall comply with CS-E 910 “Relighting in Flight”</p> <p>Comment: The text of CS-E 910 (developed for turbine engines) does not highlight the importance of some of the factors which have been shown to be important for diesel engine restart, for example ambient air temperature. Since the SC is being developed specifically for this problem, it is proposed that the text is modified to make it clear that temperature considerations are taken into account.</p> <p>Justification:</p> <p>Proposed Text (if applicable): Remove sentence. Replace with text:</p> <p>The engine constructor must recommend an envelope of conditions for relighting in flight and must substantiate it by appropriate tests or other evidence. The recommendation must state all of the conditions applicable e.g. altitude, air speed, windmilling rotational speed, whether starter assistance is required, the recommended drill. <i>Possible effects of low ambient temperature on re-light capability must be included in the development of the recommendation.</i></p>	
Author’s Response:	Accepted.

Commentor:	Thielert Aircraft Engines GmbH
Page No:	
<p>Paragraph No: Proposed Special Condition</p> <p>Comment: All current fuel certificates of Jet-A or Jet A-1 fuel which are available to the customer do not provide any information about cetane number. In conclusion, the pilot cannot verify the cetane number at the filling station. Therefore there is no benefit in providing this information in the engine TCDS.</p> <p>Justification:</p> <p>Proposed Text (if applicable):</p>	
Author’s Response:	Not accepted. See response above.

Commentor:	Thielert Aircraft Engines GmbH
Page No:	
Paragraph No: Proposed Special Condition	
Comment: In our opinion a minimum cetane number requirement of XX (perhaps 30) should be defined. All restart in flight tests should be performed with this fuel. Furthermore EASA and FAA should request the ASTM to implement a cetane requirement to their ASTM D1655 specification.	
Justification:	
Proposed Text (if applicable):	
Author's Response:	Partly accepted. Establishing of a worst case certification fuel is ongoing at ASTM. Due to the small amount of jet fuels used in diesel engines, there is currently no consensus in ASTM to implement a cetane requirement in D1655.

Commentor:	FAA
Page No:	
Paragraph No: Proposed Special Condition	
Comment: I am a little confused by some of the wording in the proposed Special Condition. I believe that it means the following: a) All compression ignition piston engines must be able to demonstrate the ability to sustain combustion without interruption during engine power transients over the entire range of the intended operating conditions while driving the maximum parasitic loads (in other words, with the worst case aircraft installed horsepower extractions being applied). b) The ability to sustain combustion must be demonstrated by test (comment: I'm not so sure of "other evidences". What do you have in mind?). c) The lowest cetane number fuel used to demonstrate sustained combustion under the conditions described in a) will be recorded in the Engine Type Certificate Data Sheet. d) All compression ignition piston engines must comply with CS-E 910, Relighting in Flight.	
Justification:	
Proposed Text (if applicable):	
Author's Response:	Accepted. Tried to improve the wording.