

Response to comments on NPA-E-23

1 - Justification of the NPA

In April 1984 the JAA introduced, via JAR-E change 7 by reference to Blue paper C791, changes to the oil / fuel filter requirements (former references were C3-2, 2.1.4 and 2.2.1) in an attempt to clarify when filters were required and what indications were to be provided to the flight or maintenance crew.

Subsequent experience suggested that both JAR-E and FAR part 33 would benefit from some re-wording. Consideration of such a change coincided with the informal start of the JAR-E / FAR 33 harmonisation process so that it was decided that a total re-write should be formulated to accomplish both these objectives.

Also there was a requirement from JAA Headquarters to modify current JAR-E 570 (a)(4) (ii) and (5)(ii) for avoiding the continuous need to grant exemptions for rotorcraft engines (flight crew indication is not required in the JAR-27 / -29 requirements, therefore there was an inconsistency between engine and helicopter requirements).

The first draft of this NPA was informally circulated, the comments received, reviewed and a new draft prepared as part of an informal JAR / FAR harmonisation process.

After the FAA / JAA meeting in San Diego (June 1996), it was decided to concentrate the harmonisation effort on the main differences between FAR 33 and JAR-E. This "fuel and oil systems" subject was therefore no longer considered as an official harmonisation item and therefore JAA decided to publish this NPA unilaterally.

The opportunity was taken to simplify the requirements by more clearly separating the safety objectives (in the rules) and the interpretative material or description of a "good practice" (in the ACJ).

It is considered that JAR-E as modified by this NPA-E-23 is not significantly more different from FAR 33 than the current rules. Therefore, this NPA is not considered as changing the list of significant differences between JAR-E and FAR 33.

For application of paragraph JAR 21.101 (b)(3) as introduced by change 2 of JAR-21, it is considered that this NPA does not influence the safety level.

2 - Economic impact analysis

This NPA is based on the experience of recent engine certifications and concentrates the rules onto the safety objectives. It does not introduce a new significant difference between JAR-E and FAR 33. Therefore, it is believed that this NPA will have no economic impact.

3 - Comments received during the circulation of the NPA

Comments were received from the following organisations :

- Authorities of Austria, Denmark, France, Hungary, United Kingdom and USA
- SAS (Sweden), SBAC (UK), Turboméca (France)

4 - Response to comments

Four commenters provided a «no comment» statement on the proposal and one commenter accepted it. One commenter supported the NPA with minor comments.

General comments

One commenter considered that there were several phrases and words used within the proposal that were grammatically poor but which were nevertheless technically correct. This commenter suggested that these were corrected prior to publication. This was agreed and text improved accordingly.

One commenter noted that NPA-E-33 proposed an additional paragraph JAR-E 560 (h) [*Provision shall be made near each fuel pressure connection provided for instrumentation so as to limit the loss of fluid in the event of a pipe failure.*] which was not present in NPA-E-23 and asked for justification. It has been noted that this is current JAR-E 60 (d) text which should have been retained. In fact, this NPA-E-23 will likely be published before NPA-E-33 and therefore the text will not be lost.

One commenter noted that NPA-E-33 proposed an additional paragraph JAR-E 570 (a)(9) [*Provision shall be made near each oil pressure connection provided for instrumentation so as to limit the loss of fluid in the event of a pipe failure*] which was not present in NPA-E-23 and asked for justification. It has been noted that this is current JAR-E 60 (d) text which should have been retained. In fact, this NPA-E-23 will likely be published before NPA-E-33 and therefore the text will not be lost.

One commenter noted that paragraph JAR-E 570 was modified by NPA-E-33 and that this fact should be noted in NPA-E-23 at the appropriate places. Another commenter suggested removing all references to NPA-E-33. The references have been deleted because NPA-E-33 has been delayed.

One commenter noted that some years ago the JAA PPSG suggested a requirement for ‘... a means to prevent loss of engine oil, if the oil filler cap came off in flight, or if it was not re-fitted following replenishment’. This recommendation followed a number of engine failures, due to this very reason. If Harmonisation with the FAA is not the greatest priority this commenter suggested this be included also. See another comment below.

One commenter misunderstood the references to FAA in the tables. These references simply stated an obvious fact : only FAA could decide if the new requirements are equivalent to FAR 33.

Comments on paragraph JAR-E 560

One commenter considered that FAR 33 and the proposed JAR-E rules were equivalent, with the exception of JAR-E 560 (a)(1) which makes direct reference to fuel and additive specs and limitations (FAR 33.71 does not) and JAR-E 560 (b)(1) which does not refer to 80°F fuel saturated with water as in 33.67 (b)(4)(ii). This has been noted.

Comments on paragraph JAR-E 560 (a)(1)

One commenter suggested that for clarity the text should be amended to read: “... *temperature and pressure that ensure proper Engine functioning...*”. Additionally, this commenter noted that this requirement appears to also be largely covered by the existing paragraphs E-40 (d) and E-660 and that correct fuel ‘flow’ can be inferred by correct engine performance. The first part of the comment has been agreed. The second part has been noted.

Comments on paragraph JAR-E 560 (a)(2)

One commenter noted that the subject of “critical parts”, addressed in JAR-E 515, is being discussed for harmonisation with FAR 33. This relates to parts whose failure would result in a Hazardous Engine Effect. The use of the word “critical” in paragraph JAR-E 560 (a)(2) might induce a confusion because it is unlikely to be related to hazardous effects. This commenter suggested changing this word or sentence to provide a clearer description of the safety objective. Wording has been changed to “adversely affect”.

One commenter considered that the proposed (a)(2) fails to require that engine or rig tests as necessary be conducted using appropriate fuel(s) to substantiate any critical parameter in the fuel specifications to be approved. This is required in the current JAR-E and, since fuels within a given specification can vary considerably within a spec’, this commenter considered that the deletion cannot be justified. In fact, as new and diverse sources of fuel are introduced, this aspect of approval will become increasingly important. Also, any parameter likely to be critical should be declared rather than simply identified. The commenter therefore suggested that the text be amended to read: “(2) *Any parameter of the fuel specification which is likely to be critical for the Engine functioning or durability must be declared so that, where necessary, Engine or rig testing using appropriate fuel may be agreed.*” This has been accepted with some improvement to be more precise.

Proposal for a new paragraph JAR-E 560 (a)(3)

One commenter noted that the existing JAR-E 560(a) requirement for “engine driven pumps” has been deleted and moved to the ACJ material. However it is still the case that an adequate margin of capacity over the maximum engine demand is required (the proposed E 560 (a)(1) refers only to the fuel specification and not the system). This commenter therefore proposed that a new (a)(3) be included: “(3) *The pump(s) supplying fuel to the burners must have an adequate margin of capacity over the maximum engine demand.*” This commenter considered that this correctly removes the requirement for the pumps to be engine driven while retaining the objective of the requirement. However, such a change will require a change to Proposal B1 of this NPA to read:

“JAR E 560
Fuel System

Need for aircraft anti-ice means or fuel with
anti-ice additives.

Need for the pump(s) supplying fuel to the engine to have
adequate capacity over the maximum engine demand.”

The commenter noted that the proposed paragraph (2) of ACJ 560 should then be deleted for consistency with the above change.

This has not been accepted in these exact terms. The commenter did not define what would be an adequate margin (or what would be an inadequate margin). In addition, it would be normal practice to design the engine so that it would receive all the fuel it needs for functioning in the flight envelope. However, it has been noted that some aircraft requirements might impose a margin (see JAR 23.955 for reciprocating engines, for example). Consequently, an alternate wording has been proposed for the rule, making reference to potential additional requirements which could be found in aircraft requirements.

Comments on paragraph JAR-E 560 (b)(1)

One commenter proposed to replace the words "to accommodate any likely quantity of contaminants" with the words "to accommodate the levels of contamination specified". This commenter argued that the proposed revision to JAR-E 560 was inconsistent in that sub-paragraph (b)(1) requires the filter to accommodate "any likely quantity of contaminants", whereas sub-paragraph (b)(2)(ii) uses the wording "the levels of contamination specified". The commenter proposed to use the sub-paragraph (b)(2)(ii) wording in both places. Bearing in mind that significant fuel contamination events are the result of unintended mishaps or lapses of fuel quality control systems, he submitted that it was not reasonable to expect the engine or equipment manufacturer to be able to predict the maximum likely quantity of contaminants that will be present in the fuel throughout the operational life of the product. A more practicable approach is to specify the level of contamination that was assumed during Type Investigation as part of the list of assumptions required by JAR-E 30, and in the engine installation instructions required by JAR-E 20. The installer and operator of the engine will then be able to take such actions as are necessary to ensure that the assumed levels of contamination are not exceeded in service. This has not been accepted because this would change the intent of the paragraph as highlighted in paragraph (3) of ACJ E 560 which refers also to contaminants resulting from failure within the engine fuel system.

One commenter noted that this paragraph is one very long sentence, which makes it difficult to understand. In addition, it includes the expression “a degree of”, which is not precise requirements language, who can say when “a degree of (protection)” has been complied with? This commenter suggested that the sentence be re-worded as follows:

“(b)(1) *Filters, strainers or other equivalent means must be provided to protect the fuel system from malfunction due to contaminants. These devices must have the capacity to accommodate any likely quantity of contaminants, including water, in relation to recommended servicing intervals and, if provided, the blockage or by-pass indication system (see also JAR-E 670).*” This has been accepted.

Proposal for a new paragraph JAR-E 560 (b)(2)

One commenter noted that Table B of the NPA claims that the proposed (b)(1) addresses the current E-560 (f) and considered this incorrect. The current E-560 (f) covers the particular case of dangerous Engine conditions (in fact the reference to Extremely Remote implies Hazardous conditions), associated with fuel burner blockage. The proposed (b)(1) requires only that malfunction of the fuel system is precluded. It is essential that the potentially hazardous condition of a blocked fuel burner be properly covered by the requirement. It is therefore proposed that text similar to the existing E-560 (f) be retained as (b)(2), but revised as follows:

“(2) Each fuel burner in the engine must be protected by a suitable filter, unless the burner design is such that the probability of Hazardous Engine Effects arising from blockage is Extremely Remote.» In addition, (b)(2) in the NPA should be renumbered (b)(3) to take account of this change. The principle of the comment has been accepted. However, it has been considered that the modified JAR-E 560 (b)(1) was adequate for the rule. The proposal has been used in ACJ E 560.

Comments on proposed paragraph JAR-E 560 (b)(2)

One commenter noted that this introduces the impending blockage indication ‘to the maintenance crew’, with provisions. Previously, this indication has been required for ‘the flight crew’. For JAR-25, fuel filter blockage indication will be a new requirement, when NPA 25E,F-315 is introduced, but has been an existing FAR 25 rule for a long time. The commenter’s understanding of this requirement is that the information is required for flight crew awareness. Engines equipped with ‘maintenance’ indications alone may encounter Certification difficulties when JAR-25/FAR 25 Certification is sought. This has been noted. However, engines can be installed in other aircraft than large transport aircraft. Therefore, it is assumed that the engine manufacturer would have all information for making the choice between (b)(2)(i) and (ii).

Comments on paragraph JAR-E 560 (c)(1)

One commenter noted that it is not agreed that it is not possible to prevent previously collected contaminants from re-entering the by-pass flow, as claimed in Table B. It is therefore suggested that the text should be amended as : “...*of the filter or strainer will be prevented.*” This has been agreed in principle but current JAR-E words have been retained.

Comments on paragraph JAR-E 560 (e)

One commenter noted that this paragraph contains the term “positive action”, which is then defined in ACJ E 560 (4). It is suggested that rather than have an additional ‘one-off’ definition within JAR-E, which may conflict with the definition of ‘positive action’ in another code, paragraph E 560 (e) be re-worded as follows:

“...continued satisfactory functioning of the Engine in such circumstances must be ensured, without the need for any action by the flight crew other than the observation of any minimum fuel or oil temperature limitation.» Additionally, for clarification the commenter suggested to amend the second sentence as follows:

“If compliance ~~is~~ relies upon fuel anti-icing additives, or other means ~~to be~~ incorporated in the aircraft fuel system, ...” This has been agreed with editorial improvements. It has been considered that observation of limitations is part of normal pilot duties and should not be repeated here.

Comments on paragraph JAR-E 560 (f)

One commenter noted that the proposal imposes a design feature. The requirement should simply state the objective, which, in this case, is for a means to stop the engine rapidly. It is suggested that the majority of the existing E-560 (g) be retained but modified as: *“(f) Means for stopping the engine rapidly must be provided.”* This commenter suggested considering whether ACJ material could be added to state that this means is normally in the HP line. The change has been accepted but improved for avoiding confusion with the means for stopping engine rotation (see JAR-E 710).

Comments on paragraph JAR-E 570 (a)(2)(i)

One commenter noted that this revision of the rule provides an excellent opportunity of ensuring that design precautions are taken to prevent the possibility of incorrect fitment of magnetic chip detectors (MCDs) (or at least minimise the effect of their incorrect fitment). There have been several multi-engine shutdown events for oil loss caused by incorrectly fitted MCDs and at present we are reliant upon maintenance procedures to prevent further occurrences. A design solution is essential.

This commenter therefore proposed that JAR E 570(a)(2) be amended as follows to address human centred design considerations :

“(2) There must be design precautions

(i) to preclude the possibility of incorrect fitment of the closing device of the oil filling point, or any other access point, or to preclude fluid loss in the event of incorrect fitment
(ii) to prevent entrance into the oil tank or into any oil tank outlet of any object that might obstruct the flow of oil through the system.”

This has been partially agreed. It has been recognised that “to preclude possibility of incorrect fitment” is an absolute goal which cannot be achieved.

Proposals for new paragraphs JAR-E 570 (a)(2)(iii) and (iv)

One commenter considered that ACJ E 570 (4) contained rulemaking by ACJ and that the following paragraphs should be added to JAR E 570 (a)(2) and appropriate deletions made to the ACJ:

“(iii) Tank filler caps must be designed to provide an oil tight seal and be such that they will not loosen in flight.

(iv) Tank filler caps must be marked with the word ‘oil’.”

This has been accepted to be consistent with FAR 33.71 (c)(4) and (5).

Comments on paragraph JAR-E 570 (b)(1)

One commenter noted that FAR 33.71 (b), (b)(1) and (b)(3) and JAR-E 570 (b)(1) have different requirements that could be considered equivalent depending on how “not inherently capable of accepting contaminants” is determined. This commenter suggested adding some guidance material on this issue. This has not been accepted. Each system

would be judged on its own merit. The rule allows for flexibility and engineering judgement.

Comments on paragraph JAR-E 570 (b)(2)

One commenter noted that the requirements of JAR-E 560 (for the fuel system) and JAR-E 570 (for the oil system) both in part deal with the requirements for filters, strainers and filter or strainer by-pass means. In many respects they are similar, and yet they contain important inconsistencies that should be eliminated. The most important inconsistency arises because JAR-E 560 mandates the use of filters, strainers, or equivalent means, for the fuel system. [Filters, strainers or other equivalent means must be provided.....]. On the other hand, JAR-E 570 does not mandate the use of filters or strainers for the oil system, except in cases where the oil system is not capable of accepting contaminants. In this respect the requirements for fuel system filtration are more severe than the requirements for oil system filtration. However, when it comes to indication, any oil system filter must have a means of indicating an impending blockage to the flight crew, whereas an impending fuel system blockage is allowed, under such circumstances, to be indicated to the maintenance crew. In this respect the requirements for fuel system filtration are less severe than the requirements for oil system filtration. Clearly, this is inconsistent. If the need for oil system filtration is sufficiently less important than the need for fuel system filtration, not to mandate its presence, then one must not make the signalling requirements for impending oil filter blockage more severe than those for fuel filter blockage.

This commenter considered that the words and layout of this paragraph should be amended to be similar to those for JAR E 560 (b)(2) as follows:

“(2) The most critical main oil filter must have a means to permit indication of impending blockage of the filter either:

(i) to the flight crew or

(ii) if the filter incorporates a bypass, to the maintenance crew. In this case it must be shown that the Engine will continue to operate normally with the levels of contamination specified for a period equal to the inspection interval of the impending blockage indicator.”

This has not been agreed. It is noted that the fuel contamination could affect all engines on the aircraft at same time (common mode failure). Contamination of the oil system is more likely to affect only one engine. In addition, the time scale for achieving full detrimental effect of the contamination is different for fuel and oil (much shorter for fuel). Therefore, this justifies more severe requirements for the fuel system. However, this comment led to a review of the requirements which have been clarified.

Comments on paragraph JAR-E 570 (c)(1)

One commenter noted that as for his previous comment to JAR E 560 (c)(1), the text should be amended to read:

“...of the filter or strainer will be prevented.”

This has been agreed in principle but current JAR-E words have been retained.

Comments on paragraph JAR-E 570 (c)(2)

One commenter noted that as with JAR-E 570(b)(2), other inconsistencies arise because different text is used in JAR-E 560 to mean the same thing as text in JAR-E 570. JAR-E 560 (c) uses "...at an acceptable rate through the rest of the system", whereas JAR-E 570 (c) uses "...flow through the system at a rate which is within the normal operating range of the system.» This commenter considered that, in principle, if the same meaning were intended, it would be clearer if the same text were used. It is considered that fuel and oil systems are different, and that different requirement would be relevant.

Comments on paragraph JAR-E 570 (d))

One commenter noted that there is no specific tank expansion requirement (contrary to FAR 33.71 (c)(1)). This has been made on purpose in order to not impose the design and to rely on the safety objective set in JAR-E 570 (a)(1).

Comments on paragraph JAR-E 570 (e)(1)

One commenter noted that that ACJ E 130 as in NPA-E-37 defines "hazardous quantity" which is similar to the wording which is used in paragraph JAR-E 570 (e)(1) of this NPA-E-23 ("hazardous quantities"). NPA-E-23 does not define this wording. Therefore, there might be some misunderstanding. This commenter suggested clarifying the definition of hazardous quantities in ACJ E 570. This has been agreed (new paragraph (5) of ACJ E 570).

Comments on paragraph JAR-E 570 (f)(2)

One commenter considered that (f)(2) was not clear in that the words 'have provision for' might suggest that an oil quantity indicator is optional and that this was not the intent. This commenter proposed the following: « *The design of the oil tank must be such that a means of indicating oil quantity is provided.* ». This has not been accepted to remain consistent with FAR 33.71 (c)(11).

Comments on paragraph JAR-E 570 (f)(3)

One commenter declared that the justification for deleting the current JAR E 570 (b)(6)(i) was not accepted (and was inconsistent if (6)(ii) and (6)(iii) are retained as (f)(3)(i) and (f)(3)(ii)). This requirement is important whenever the propeller system is dependent on the engine and should be retained as JAR E 570 (f)(3)(iii). This has been agreed in principle but wording has been improved.

Comments on paragraph JAR-E 570 (g)

One commenter noted that there is direct reference to oil specs and limitations, contrary to FAR 33.71. This has been noted.

One commenter suggested that, in the proposed E 570 (g), there ought to be a requirement, similar to the equivalent fuel requirement of E 560 (a)(2), to identify and declare any parameter of the oil specification that may be critical. Engine and/or component testing should be conducted to take any such critical parameters into account. Service experience has demonstrated the sensitivity of some engine types to variations in oil composition, e.g. bearing loading, oil coking. The following is therefore proposed:

“(g) (1) Each brand and type of oil to be approved, and the associated limitations, must be declared and substantiated.

(2) Any parameter of the oil specification which is likely to be critical for Engine functioning or durability must be declared so that, where necessary, Engine or rig testing using appropriate oil may be agreed.”

This has been accepted with some improvement to be more precise.

Comment on ACJ E 30

One commenter proposed to change the reference in Table 1 of ACJ E 30, "JAR-E 560" item to read: "*Fuel Specifications approved for use. Need for aircraft anti-ice means or fuel with anti-ice additives. Assumptions made with respect to the maximum levels of contamination in the fuel supplied to the engine*". This was agreed with a minor editorial improvement.

Comments on ACJ E 560

One commenter concurred without comment.

Comments on paragraph (1) of ACJ E 560

One commenter suggested that the word ‘grade’ should be replaced with the word ‘specification’ (2 places). The word “type” has been preferred.

One commenter considered that the second sub-paragraph appears to create a new requirement. If it is to be a requirement, it should appear in Section 1. If there is to be a new requirement, it could be preferable to separate it from ‘fuel’ requirements in a similar manner to JAR-25. There is discomfort with the alignment of ‘fuel’ and ‘water methanol’ requirements. A BAC 1-11 crashed as a result of confusing these two fluids – fuel put in the water methanol tank. Also, in JAR-25, the generic term used for ‘water methanol’ is ‘augmentation fluid’. Are any other fluids to be considered? There are requirements that may not be appropriate in all cases. For example the water separation requirement would not be applicable to a pure water thrust augmentation system.

As a minimum the commenter considered that the text should be amended to read: "*Some engines may use other fluids, such as augmentation fluid: where appropriate, the word “fuel” in JAR E 560... ”*. This has been partially agreed.

One commenter noted that in relation to the comment on JAR-E 560 (a)(2) and use of the word “critical”, the third sub-paragraph should be clarified. This commenter considered that the wording “sensitive to a parameter” and “a critical parameter” does not provide adequate guidance for interpreting and applying this rule. Text has been improved.

Comments on paragraph (6) of ACJ E 560

One commenter considered that the advisory material is already a suggested means of compliance, therefore the words “it is suggested” are superfluous. The text should be amended to read:

“(6) For compliance with JAR E 130 (a), ~~it is suggested that~~ each filter or strainer should...”

This commenter also recommended that reference to this ACJ be given in E-130. This has not been agreed. However, wording has been approved.

Comments on paragraph (7) of ACJ E 560

One commenter considered that this entire paragraph is a rule and should be moved to JAR E 560 (b), changing the word ‘should’ to ‘must’. This has not been accepted because too much prescribing the design and not taking account of installation aspects which would be out of control for the engine manufacturer.

Comments on paragraph (9) of ACJ E 560

One commenter considered that the final example given is a design that precaution should be taken against and that the text should be changed to read: “*Examples of design precautions are: locking devices, sealing, ensuring access to the installation.*” This commenter misunderstood the issue : the intention is to prevent accessibility.

Comments on paragraph (4) of ACJ E 570

One commenter suggested that in light of other comments on JAR E 570 (a)(2), ACJ E 570 (4) should be amended to read: “*(4) In complying with JAR E 570 (a)(2) access points include, but are not limited to, Magnetic Chip Detectors and gearbox turning cover plates.* This has been accepted with improvement.