

## **Response to comments on NPA-E-16**

### **1 - Justification of the NPA**

JAR-E was not explicit on the intent of the « thrust reverser » requirements. This clarification is provided in JAR-E 10 (c) and the associated ACJ.

The basic requirements applicable to a thrust reverser and its use in an aircraft are contained in the aircraft requirements and are addressed during the certification of the aircraft. The intent of JAR-E is limited to the effects the use of the thrust reverser might have on the engine itself, whether or not the thrust reverser is part of the engine definition.

In many engine certifications, it was found necessary to approve « equivalent safety findings » because the thrust reverser was not available at time of engine certification. This occurred in general when the thrust reverser was provided by the aircraft manufacturer. This revision of JAR-E would avoid the need for almost permanent deviation from the published requirements to address such situations (see current JAR-E 890 (b)(1)(i) which makes mandatory the installation of the thrust reverser during the engine endurance test).

The current requirement of JAR-E 890 (a) on calibration in reverse thrust has been deleted because it was not an airworthiness requirement for engine certification.

The examples of rearrangement of stages in current JAR-E 740 (b)(1)(ii) have been removed. This requirement effectively left the decision on when to conduct the thrust reverser test to the discretion of the applicant. The same flexibility is implicit in the new rule.

Current (b)(1)(iii) provided a means to reduce the test duration. This has been felt unnecessary and therefore deleted.

### **2 - Economic impact analysis**

This NPA proposed clarification to the intent and content of JAR-E, taking account of the experience. It did not introduce fundamentally new requirements.

Therefore, there should not be an adverse economic impact.

### **3 - Comments received during the circulation of the NPA**

Comments were received from the following organisations :

- Authorities of Denmark, France, Slovak Republic, United Kingdom and USA
- SBAC (UK)

## 4 - Response to comments

One commenters provided a « no comment » statement on the proposal.

### General comments

One commenter requested to clarify references to alternative ways of complying with JAR-E 890 (c) and (d). This appeared as being acceptable through JAR-E 890 (f) and ACJ but, contrary to JAR-E 890 (b), this was not obvious from JAR-E 890 (c) and (d). This has been agreed and text has been improved.

One commenter requested to explain, in the justification part of the NPA, the rationale for removing those parts of the current JAR-E 890 (e.g. calibration test in JAR-E 890 (a)) that have not been read across to the NPA. It has been agreed that recording of this justification was necessary.

One commenter noted that the current JAR-E 890 (b)(1)(ii) & (iii) have been deleted with no justification. This commenter thought that these paragraphs were helpful in defining the revised schedule to be used for the endurance test of JAR-E 740 if a thrust reverser is fitted, and should be retained accordingly (either in JAR-E 890 or in JAR-E 740). This has been partially agreed. The first part of (b)(1)(ii), requiring the thrust reverser test to be performed as part of the endurance test, has been retained in JAR-E 890 (c) and (d). The examples of rearrangement of stages in current JAR-E 740 (b)(1)(ii) have been removed. This requirement effectively left the decision on when to conduct the thrust reverser test to the discretion of the applicant. The same flexibility is implicit in the new rule. Current (b) (1)(iii) provided a means to reduce the test duration. This has been felt unnecessary and therefore deleted.

One commenter noted the revision to paragraph (a) of JAR-E 890 dropped the requirements associated with Calibration Test paragraphs JAR-E 170 and JAR-E 730. The commenter, although not objecting to this change, noted that it will further separate the requirements of JAR-E 890 and FAR 33.97. This comment has been noted : however, FAR 33.97 only requires the thrust reverser to be installed and does not require calibration in reverse mode.

One commenter considered that expanding FAR 33.97 to require installation of the thrust reverser on the FAR 33.94 blade out engine test would be necessary to improve blade out test engine configuration and suggested that JAA consider the addition of this test engine configuration requirement to JAR-E 890. This comment has not been accepted : such a change would be well outside the scope of this NPA. This subject could be considered separately if such a need was confirmed.

Although agreeing with the intent of the NPA, i.e. to clarify the JAR-E requirements and to remove the need for equivalent safety findings, one commenter thought that there was still some confusion. This commenter stated that the second paragraph of the justification implied that the thrust reverser cannot be part of the engine definition and asked if this was

the correct interpretation. This interpretation is not correct as clearly specified in ACJ E 890. However, it is agreed that the justification, when speaking of the “effects the use of the thrust reverser might have on the engine itself », could induce such misinterpretation. The justification has been improved.

The same commenter indicated that many of the functions of the reverser, and much of the hardware (air motors, piping etc) are controlled by the FADEC and are more appropriately part of the engine. This comment has been noted. The airworthiness requirements are not in charge of definition of work sharing between aircraft and engine manufacturers. In addition, these functions would be addressed under JAR-E 50.

This commenter also stated that, in certifying the engine, the entire engine part list is being certificated and declared that, if this includes the reverser, it is not clear how it will be qualified. This has been noted. This NPA does not fundamentally change the process currently used for certification of a thrust reverser but clarifies the matter : the engine must be approved for use with a thrust reverser (JAR-E) and the aircraft must comply with the appropriate aircraft requirements. It is also noted that draft NPAs were proposed to change JAR 25.934 and JAR 23.934 in order to further clarify the issue. The ACJ E 10 (c) has been improved.

One commenter indicated that several grammatical errors in the NPA ought to be corrected but did not specify them. Some errors were discovered and corrected.

#### Comments on JAR-E 10 (c)

One commenter, to clarify the intent, proposed to change JAR-E 10 (c) to read:  
*“(c) JAR-E contains appropriate requirements for the approval of the engine with a thrust reverser, if fitted. If compliance is shown, the specific thrust reverser approved for use will be noted in the Engine Certification documentation. Otherwise, the documentation will be endorsed to indicate that the use of a thrust reverser is prohibited. (See ACJ E 10(c))”*. This has been partially agreed and text has been modified.

#### Comments on JAR-E 890 (c) and (d)

One commenter noted that these new paragraphs identify specific tests that have to be done on the engine with thrust reverser fitted. However, they do not specify the objective of the tests. Neither do they specify any pass / fail criteria. This commenter considered that this renders the requirements totally inadequate, as it bases compliance entirely on the fact that a test has been done, rather than on any particular outcome of that test. The commenter suggested to revise the wording to establish an objective based requirement that fully specifies the criteria the Authority must use to determine whether the specified tests have had a successful outcome. Although the pass / fail criteria of JAR-E 740 were implicitly referred to, the comment has been agreed and the text has been accordingly revised.

#### Comments on JAR-E 890 (c)

One commenter, although noting that the wording “ground use only” and “in-flight use” matched JAR 25.933, suggested to include somewhere a definition of “ground use”. This comment has been noted. Because JAR-25 and JAR-E would share a common use of the wording, such a definition should be in JAR-1 : this would then be outside the scope of this NPA to JAR-E. This comment has been transferred to the appropriate people within the JAA system for consideration.

#### Comments on JAR-E 890 (c)(4)

Two commenters noted the superfluous second “to”. One commenter proposed to replace it by “the”. This editorial error has been corrected.

One commenter questioned the spelling of the word “approximatively” (coming from current JAR-E). This has been agreed and changed to “approximately”.

One commenter noted that “Maximum Take-off” was not a defined wording and that there was only one rating called “Take-off”. This commenter requested clarification. This has been agreed and the text has been modified accordingly.

#### Comments on JAR-E 890 (e)

One commenter stated that the one second throttle movement could not be consistent with engine time to return to idle and that this could result in a more severe testing (thrust reverser operating at higher engine speed). This has been noted.

One commenter stated that the proposed JAR-E 890 (e) was impractical as written and suggested to retain the current text of JAR-E 890 (b)(4)(i). This commenter argued that it is only the movement of the power control lever in the reverse thrust range which must take place within one second, not the range of movement from one extreme to another, which could include forward thrust commands. The intent of the comment has been agreed but slightly different wording has been proposed.

#### Comments on ACJ E 10 (c)

One commenter proposed editorial improvements as follows : fourth paragraph, second line, “...requirements should *nevertheless, be* addressed for...” and fifth paragraph, second line, the word “considered” should be replaced by “*specified*”. This has been agreed.

#### Comments on ACJ E 890 paragraph (1)

One commenter recommended to impose the use of a standard thrust reverser without possibility of substitution with another equipment. This commenter argued that only the standard thrust reverser could provide correct results with regard to vibration on the engine carcass. This comment has been not accepted because it was against all the principles

underlining the NPA as put forward in the justification of the NPA. The concern of the commenter was already identified and addressed in the paragraph (1) of the ACJ.