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| EASA | CERTIFICATION MEMORANDUM |
|  | <p>EASA CM No.: EASA CM - PIFS – 002 Issue: 01</p> <p>Issue Date: 8th of March 2012</p> <p>Issued by: Propulsion section</p> <p>Approved by: Head of Products Certification Department</p> <p>Regulatory Requirement(s): CS-E 10(b), CS-E 890, CS 25.934</p> |

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Subject

Approval of Engine Use with a Thrust Reverser

Log of Issues

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1. INTRODUCTION

1.1. PURPOSE AND SCOPE

The purpose of **this** Certification Memorandum is to provide specific guidance for allowing the use of a turbine engine with a thrust reverser.

This Certification Memorandum describes how it can be allowed that a turbine engine is equipped and used with a thrust reverser, even when this thrust reverser is not part of the engine type design.

1.2. REGULATORY REFERENCES & REQUIREMENTS

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

| Reference | Title | Code | Issue | Date |
|------------|---|-------|-------|------|
| CS-E 10(b) | Applicability | CS-E | --- | --- |
| CS-E 890 | Thrust Reverser Tests | CS-E | --- | --- |
| CS-25.934 | Turbo-jet engine thrust reverser system tests | CS-25 | --- | --- |

1.3. ABBREVIATIONS

The following abbreviations are used in this Certification Memorandum:

| Abbreviation | Meaning |
|--------------|---|
| AMC | A ccceptable M eans of C ompliance |
| CM | C ertification M emorandum |
| CS | C ertification S pecification |
| EASA | E uropean A viation S afety A gency |
| ESF | E quivalent S afety F inding |
| TCDS | T ype C ertificate D ata S heet |

1.4. DEFINITIONS

The following definitions are used in this Certification Memorandum:

| Definition | Meaning |
|------------|---------|
| --- | --- |

2. BACKGROUND

On many aeroplanes, the turbine engines are equipped with a thrust reverser. This thrust reverser is usually not part of the engine Type Design but is certificated with the aeroplane.

In many cases, the engine Type Certificate applicant does not plan to test the engine with the aeroplane thrust reverser during engine certification. Instead an equivalent duct is used that simulates the mechanical and aerodynamic characteristics of a representative production thrust reverser. This duct generally cannot simulate all the thrust reverser functions.

This Certification Memorandum describes how it can be allowed that a turbine engine is equipped and used with a thrust reverser, even when this thrust reverser is not part of the engine Type Design.

3. EASA CERTIFICATION POLICY

3.1. EASA POLICY

This policy is applicable when the applicant to an engine Type Certificate requests that the engine Type Certificate Data Sheet allows the use of the engine with a thrust reverser, but does not plan to test the engine with the actual thrust reverser. Instead an equivalent duct can be used taking advantage of CS-E 890(g) which allows "alternative evidence" which "may come from the applicant's experience". The equivalent duct will simulate the mechanical and aerodynamic characteristics of a representative aeroplane thrust reverser.

AMC E 10(b) clarifies that when the thrust reverser is not included in the engine Type Design, the CS-E specifications should nevertheless be addressed for approval of the use of the engine with this thrust reverser. If this is not done, then the engine certification documentation is endorsed so that the use of a thrust reverser is prohibited.

In CS-E, paragraph 9 of AMC E 650 "Vibration Surveys" specifically advises to include the thrust reverser as one of the installation features which should be considered during the surveys.

CS-E 890 "Thrust Reverser Tests" requires testing of the engine, together with the thrust reverser, during the CS-E 740 Endurance test. CS-E 890(g) also allows "alternative evidence" which "may come from the applicant's experience".

In the showing of compliance with CS-E 10(b), the applicant is requested to explain how they will demonstrate that the use of the thrust reverser does not affect the endurance, the durability, or the operability of the engine. This should include a justification that the applicant's experience is actually available and relevant for the considered engine / thrust reverser combination because of similarities of the new engine and thrust reverser designs with previously certificated ones.

Subject to the evidence which will be provided, engine use with the thrust reverser may be approved and annotated in the engine TCDS. In this case the TCDS would state that the engine has been approved for use with the particular thrust reverser, but that this would not constitute an approval of the thrust reverser itself.

CS 25.934 requires for aeroplane approval that the thrust reverser meets the requirements of CS-E 890. For showing compliance of the thrust reverser system to CS 25.934, which refers to CS-E 890, it is EASA general policy to require actual testing of the system during aircraft certification. Typically, for certifying aircraft powerplant installations incorporating a thrust reverser system, EASA will not accept the provisions of CS-E 890(g). If the thrust reverser system has not been actually tested during the engine certification in accordance with CS-E 890(b), (c) and (d), an Equivalent Safety Finding will be required against CS 25.934. The ESF will allow the relevant CS-E 890 thrust reverser tests to be conducted as part of the aircraft certification process, under the responsibility of the aircraft applicant.

3.2. WHO THIS CERTIFICATION MEMORANDUM AFFECTS

Applicants to an engine Type Certificate when they request the engine Type Certificate Data Sheet to allow the use of the engine with a thrust reverser.

This Certification Memorandum should also be considered in case of changes to the thrust reverser. It is expected that the engine Type Certificate holder will be informed of such changes.

4. REMARKS

1. Suggestions for amendment(s) to this EASA Certification Memorandum should be referred to the Certification Policy and Planning Department, Certification Directorate, EASA. E-mail CM@easa.europa.eu or fax +49 (0)221 89990 4459.
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