Type Acceptance Report

TAR 19/21B/8

CFM56-5B and -5C Series

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Executive Summary

New Zealand Type Acceptance has been granted to the CFM56-5B and CFM56-5C Series turbofan engines based on validation of EASA Type Certificate number E.003 and FAA type certificate number E37NE. There are no special requirements for import.

Applicability is limited to the Models and/or serial numbers detailed in Appendix 1, which are now eligible for installation on a NZ-registered aircraft. Additional variants or serial numbers approved under the foreign type certificate can become type accepted after supply of the applicable documentation, in accordance with the provisions of NZCAR §21.43(c).

NOTE: The information in this report was correct as at the date of issue. The report is generally only updated when an application is received to revise the Type Acceptance Certificate. For details on the current type certificate holder and any specific technical data, refer to the latest revision of the State-of-Design Type Certificate Data Sheet referenced herein.

1. Introduction

This report details the basis on which Type Acceptance Certificate No.19/21B/8 was granted in the Standard Category in accordance with NZCAR Part 21 Subpart B.

Specifically, the report aims to:

(a) Specify the foreign type certificate and associated airworthiness design standard used for type acceptance of the product in New Zealand; and

(b) Identify any special conditions for import applicable to any model(s) covered by the Type Acceptance Certificate.

The report also notes the status of all engine models included under the State-of-Design type certificate that have been granted type acceptance in New Zealand.

2. Product Certification Details

(a) State-of-Design Type and Production Certificates:

Type Certificate Holder: CFM International, S.A.

Type Certificate: E.003
Issued by: European Aviation Safety Agency

Type Certificate: E37NE
Issued by: Federal Aviation Administration

Manufacturer: General Electric
Production Approval: FAA PC 108

Manufacturer: Safran Aircraft Engines (Formerly SNECMA)
Production Approval: FR.21G.0007

(b) Models Covered by the Part 21B Type Acceptance Certificate:

(i) **Models:**

CFM56-5B*x*

CFM56-5B*x*/P, CFM56-5B*x*/P1

CFM56-5B*x*/2P, CFM56-5B*x*/2P1

CFM56-5B*x*/3, CFM56-5B*x*/3B1

CFM56-5C*x*, CFM56-5C*x*/4

CFM56-5C*x*/F, CFM56-5C*x*/F4

CFM56-5C*x*/G, CFM56-5C*x*/G4

CFM56-5C*x*/P, CFM56-5C*x*/1

CFM56-5C*x*/1P

Notes:

CFM56-5B series: single annular combustor (SAC)

CFM56-5B/2 series: double annular combustor (DAC)

CFM56-5B/3 series (“Tech Insertion”): improved emissions SAC

3. Application Details and Background Information

The application for New Zealand type acceptance of the CFM56-5B Series was originally included as part of the type acceptance of the Airbus Single-Aisle family update. The applicant was the airframe manufacturer, Airbus, and type acceptance was granted on 3 June 2013. The CFM56-5 is a high by-pass ratio axial-flow twin-spool turbofan, including a one-stage fan; four-stage low pressure compressor; nine-stage high pressure compressor; either a single annular combustor (SAC) for CFM56-5B and –5C engines or a double annular combustor (DAC) for CFM56-5B*x*/2P engines; one-stage high pressure turbine; either four-stage low pressure turbine (CFM56-5B Series) or five-stage low pressure turbine (CFM56-5C Series); and a dual channel full authority digital engine control unit.

The initial issue of this report separated out the engine from the Airbus single-aisle type acceptance report and added the CFM56-5C Series and any other engine variants on the type certificate not previously covered. The applicant was the type certificate holder dated 31 May 2018.

Type Acceptance Certificate Number 19/21B/8 was granted on 14 September 2008 to the CFM56-5B/C Series based on validation of EASA Type Certificate E.003 and FAA Type Certificate E37NE. There are no special requirements for import into New Zealand.

The CFM56 was developed as a joint venture between General Electric Aviation of the USA and SNECMA of France, with GE developing the high pressure compressor, combustor and high pressure turbine, and SNECMA developing the fan, low pressure compressor and low pressure turbine. The engine first ran in 1974 and initial applications were retrofitting of older turbojet powered transports and military tankers.

The CFM56-5A was developed specifically for the Airbus A320 and was certificated in 1987. The CFM56-5B was developed specifically for the A321 but with a thrust range of 22,000 to 33,000 pounds it can power all models in the Airbus range and has superseded the CFM56-5A series. The CFM56-5C engine is a higher power version with a thrust range of 31,200 to 34,000 pounds developed for the Airbus A340. The CFM56-5B/-5C variants are physically identical. The designation is defined by the engine thrust rating, which is determined (or changed) by the ID plug.

In 2004 CFM launched the improved “Tech Insertion” variants (CFM56-5B*x*/3) of the engine offering improved economy and reduced emissions. The configuration includes improvements to the HP compressor, combustor and HP and LP turbines.

GE Aviation and SNECMA both manufacture the engines under their own type certificate under licence from the type certificate holder, CFM International, who is responsible for type certification and customer support. The individual engine comes under the State-of-Design type certificate for whichever country in which it is produced. Engine variants produced under either type certificate are identical and interchangeable.

4. NZCAR §21.43 Data Requirements

The type data requirements of NZCAR Part 21B Para §21.43 have been satisfied by supply of the following documents, or were already held by the CAA:

(1) State-of-Design type certificate:

EASA Type Certificate E.003 (replacing DGAC Type Certificate No. M17)
EASA Type Certificate Data Sheet E.003 Issue 04 dated 28 September 2017

FAA Type Certificate E37NE issued 31 December 1991
FAA Type Certificate Data Sheet No.E37NE at Revision 13 dated May 1, 2014
- Models CFM56-5C2 approved 31 December 1991
- Models CFM56-5C2/F and -5C3/F approved 1 March 1993
- Model CFM56-5B2 approved 28 May 1993
- Models CFM56-5B1 and -5B4 approved 2 February 1994
- Models CFM56-5C2/G, -5C3/G and -5C4 approved 27 October 1994
- Models CFM56-5B5 and -5B6 approved 11 March 1996
- Models CFM56-5C2/4, -5C2/F4, -5C2/G4, -5C3/F4, -5C3/G4 and -5C4/1 approved 17 April 1996
- Models CFM56-5B1/P, -5B1/2P, -5B2/P, -5B2/2P, -5B3/2P, -5B4/P, -5B4/2P, 5B5/P, -5B6/P, and -5B6/2P approved 20 June 1996
- Model CFM56-5B3/P approved 10 September 1996
- Model CFM56-5B7 approved 7 June 1999
- Model CFM56-5B7/P approved 3 November 1999
- Models CFM56-5B8/P, -5B9/P and -5B9/2P approved 25 July 2002
- Models CFM56-5C2/P, -5C3/P, -5C4/P and -5C4/1P approved 6 August 2003
- Models CFM56-5B3/P1, -5B3/2P1, -5B4/P1, -5B4/2P1 approved 25 October 2004
- Models CFM56-5B1/3, -5B2/3, -5B3/3, -5B3/3B1, -5B4/3, -5B4/3B1, -5B5/3, -5B6/3, -5B7/3, -5B8/3, -5B9/3 approved 15 September 2006

(2) Airworthiness design requirements:

(i) Airworthiness Design Standards:

FAA TC E37NE – The certification basis of the CFM56-5B/C Series was 14 CFR Part 33, effective February 1, 1965, with Amendments 33-1 through 33-11.

EASA TC E.003 – For the initial CFM56-5C model the certification basis was JAR-E at Change 7, plus NPA-E-10. For the next CFM56-5 models, NPA-E-5, NPA-E-7 and Blue paper C830 were added. For CFM56-5 models type certificated in 2002 or later, selected paragraphs of JAR-E at Change 10 or Change 11, or CS-E have been added. See TCDS E.003 for details. There were two Special Conditions, and three equivalent safety findings relating to bird strike and ingestion.

This is an acceptable certification basis in accordance with NZCAR Part 21B Para §21.41 and Advisory Circular 21-1A, because JAR E is equivalent to FAR 33, which is the basic standard for Aircraft Engines called up under Part 21 Appendix C. There are no non-compliances and no additional special conditions have been prescribed by the Director under §21.23.

(ii) Special Conditions:

SC No 1 (EASA CFM56-5B/C pre-2002 models) – Birds Ingestion: Medium Bird – It shall be demonstrated by engine and rig test or be shown by analysis, based on rig and/or engine test evidence, that the engine can meet the proposed revised Medium Bird requirements to address the two and a half pound Medium Bird threat discussed at the Authorities/Industry meeting at Gatwick in May 1991. Proposed bird weights in relation to inlet size for the engine and rig tests were defined.

SC No 2 (EASA CFM56-5B/C pre-2002 models) – Water and Hail Ingestion (Inclement Weather) – It shall be demonstrated by engine test or be shown by analysis based on testing of similar engine types that the engine can meet the hail and water ingestion threats defined in AIA "Advisory Circular proposal" PC 338-1.

(iii) Equivalent Level of Safety Findings:

Three ESF are also listed on the EASA TCDS, but it is understood these all relate to Special Condition 2 above, and were never issued separately.

(iv) Airworthiness Limitations:

See Chapter 5 Airworthiness Limitations section of the applicable Shop Manual

(3) Environmental Certification:

FAA TC E37NE – The first CFM56-5C2 model complies with the fuel venting and emissions requirements of SFAR No. 27-5. Models subsequent to that comply with 14 CFR Part 34 effective September 10, 1990, including Amendments 34-1 through 34-3. The latest CFM56-5B/3 Series and CFM56-5B/3B1 Series comply with 14 CFR Part 34 at Amendment 5 effective December 31, 2012.

EASA TC E.003 – ICAO Annex 16 Vol II, second edition, including Amendment 4, effective 04 November 1999, as applicable to turbofan engines. NOx Standard in accordance with Part III, Chapter 2, § 2.3.2, c) (CAEP/4) For the CFM56-5B/3 Series and CFM56-5B/3B1 Series this was updated to ICAO Annex 16 Volume II, third edition, including Amendment 7, effective 17 November 2011. NOx Standard in accordance with Part III, Chapter 2, § 2.3.2, e) (CAEP/8)

(4) Certification Compliance Listing:

CFM56-5B/3 Certification CCL. CR-2000A/3 August 2006

(5) Flight Manual: N/A

(6) Operating Data for Engine:

(i) Maintenance Manual:

CFM56-5 Engine Shop Manual – SM.9 (CFM56-5B Series)
SM.8 (CFM56-5C Series)
CFM56-5B/-5C Standard Practices Manual – SPM.02
CFM56-5B/-5C Consumable Products Manual – CPM.03
CFM56-5B/-5C Illustrated Tools & Equipment Manual – ITEM.10
CFM56-5B/-5C Non-Destructive Test Manual – NDTM.11

(ii) Current service Information:
CFM56-5B/C Service Bulletins

(iii) Illustrated Parts Catalogue:
CFM56-5B Illustrated Parts Catalog – PC.12

(7) Agreement from manufacturer to supply updates of data in (5), and (6):

CAA 2171 form J Blazey, CFM International DER/CVE dated 18/1/2011

CFM now provides access through the Customer Web Center
https://cwciportal.cfm56.com

(8) Other information:

Installation Manual – 6-7536 (CFM56-5C Series)
2129 (CFM56-5B Series)

Specific Operating Instructions – TP.OI-12 (CFM56-5C Series)
TP.OI-13 (CFM56-5B Series)

Attachments

The following documents form attachments to this report:

Copy of EASA Type Certificate Data Sheet Number E.003
Copy of FAA Type Certificate Data Sheet Number E37NE

Sign off

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David Gill Checked – Greg Baum
Team Leader Airworthiness Airworthiness Engineer

Appendix 1

List of Type Accepted Variants:

Model:	*Applicant:*	*CAA Work Request:*	*Date Granted:*
CFM56-5B Series	Airbus	10/21B/30	3 June 2013
CFM56-5C Series	CFM International S.A.	19/21B/8	14 September 2018