
Type Acceptance Report

TAR 19/21B/9

CFM56-7B Series

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Executive Summary

New Zealand Type Acceptance has been granted to the CFM56-7B Series turbofan engines based on validation of EASA Type Certificate number E.004 and FAA type certificate number E55NE. 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/9 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 which 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.004
Issued by: European Aviation Safety Agency

Type Certificate: E55NE
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:** CFM56-7Bxx, CFM56-7Bxx/2
CFM56-7Bxx/B1, CFM56-7Bxx/B2
CFM56-7Bxx/B3, CFM56-7B27A
CFM56-7Bxx/3, CFM56-7Bxx/3B1
CFM56-7Bxx/3B2, CFM56-7Bxx/3F
CFM56-7Bxx/3B3, CFM56-7Bxx/3B1F
CFM56-7Bxx/E, CFM56-7BxxE/B1
CFM56-7B27A/3, CFM56-7B27AE
CFM56-7BxxE/B2, CFM56-7BxxE/B2F
CFM56-7BxxE/B3, CFM56-7BxxE/B1F

Notes:

CFM56-7B series: single annular combustor (SAC)

CFM56-7B/2 series: double annular combustor (DAC)

CFM56-7B/3 series (“Tech Insertion”): improved emissions SAC

CFM56-7B/3F series Tech Insertion plus increased EGT

CFM56-7BE and 7BE/F series: improved HPC diffuser, HPT and LPT performance

3. Application Details and Background Information

The application for New Zealand type acceptance of the CFM56-7B Series was originally included as part of type acceptance of the Boeing 737-800. The applicant was Polynesian Airlines and type acceptance was granted on 14 November 2000. The CFM56-7B is a high by-pass ratio axial-flow twin-spool turbofan, including a single-stage fan; three-stage low pressure compressor (LPC); nine-stage high pressure compressor (HPC); either single or double annular combustion chamber; single-stage high pressure turbine (HPT); four-stage low pressure turbine (LPT); and a dual channel full authority digital engine control (FADEC).

The initial issue of this report separated out the engine from the Boeing 737-800 type acceptance report and added 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/9 was granted on 31 October 2018 to the CFM56-7B Series not previously covered, based on validation of FAA Type Certificate no. E00055EN and EASA Type Certificate number E.004. There are no special requirements for import into New Zealand.

The CFM56 is a high-bypass turbofan engine 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 transports and military tankers.

The CFM56-7B was developed specifically for the Boeing 737 NG and was certificated in 1996. (The fan diameter had to be reduced to fit under the wing of the 737.) The xx number in the variant designation CFM56-7Bxx indicates the engine thrust rating in 1000 pounds. The variants are physically identical, the thrust rating is determined (or changed) by the ID plug. The CFM56-7B27A Series is only used on military 737 applications.

In 2004 CFM launched the improved “Tech Insertion” CFM56-7Bxx/3x variants of the engine offering improved economy and reduced emissions. The configuration includes improvements to the HP compressor, combustor and HP and LP turbines. In 2010 CFM introduced the CFM56-7BxxE/x “Enhanced” variants. Improvements include a new HPC outlet guide vane diffuser, high-pressure turbine blades, disks and forward outer seal. The package also includes a new design of low-pressure turbine blades, vanes and disk.

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.004 (replacing DGAC Type Certificate No. M21)
- EASA Type Certificate Data Sheet E.004 Issue 05 dated 1 March 2016
- FAA Type Certificate E55NE issued 17 December 1996
- FAA Type Certificate Data Sheet No. E55NE at Rev 10 dated May 1, 2014
 - Models CFM56-7B20, -7B22, -7B24, -7B26, -7B27 approved 17 December 1996
 - Models CFM56-7B20/2, -7B22/2, -7B24/2, -7B26/2, -7B27/2 approved 14 November 1997
 - Models CFM56-7B26/B1, -7B27/B1, -7B27/B3 approved 30 October 1998
 - Model CFM56-7B22/B1, -7B24/B1 approved 9 May 2000
 - Model CFM56-7B27A approved 27 April 2001
 - Models CFM56-7B26/B2 approved 25 April 2003
 - Models CFM56-7B20/3, -7B22/3, -7B22/3B1, -7B24/3, -7B24/3B1, -7B26/3, -7B26/3B1, -7B26/3B2, -7B26/3F, -7B26/3B2F, -7B27/3, -7B27/3B1, -7B27/3B3, -7B27/3F, -7B27/3B1F approved 14 June 2006
 - Model CFM56-7B27A/3 approved 17 October 2008
 - Models CFM56-7B20E, -7B22E, -7B22E/B1, -7B24E, -7B24E/B1, -7B26E, -7B26E/B1, -7B26E/B2, -7B26E/F, -7B26E/B2F, -7B27E, -7B27E/B1, -7B27E/B3, -7B27E/F, -7B27E/B1F, -7B27AE approved 30 July 2010

(2) Airworthiness design requirements:

(i) *Airworthiness Design Standards:*

FAA TC E37NE – The certification basis of the CFM56-7B Series is 14 CFR Part 33, effective February 1, 1965, with Amendments 33-1 through 33-15.

EASA TC E.003 – For the CFM56-7B “SAC” and “DAC” models the certification basis was JAR-E Change 8 (4 May 1990), as amended by Orange Papers E/91/1 (27 May 1991) and E/93/1 (10 May 1993). For the next CFM56-7Bxx/B2 models, JAR-E 790 "Ingestion of Rain and Hail" and JAR-E 800 "Bird Strike and Ingestion" (at Amendment 11 dated 01 November 2001) were added.

For the Tech Insertion (TI) and Enhanced (E) models JAR-E 515 "Critical Parts Integrity" (at Amendment 11 dated 01 November 2001), plus selected paragraphs of CS-E dated 24 October 2003 have been added. See TCDS E.004 for full details. Two Special Conditions were initially applied, but later replaced by CS-E provisions. Similarly three equivalent safety findings relating to rotor integrity and thrust reverser tests were progressively replaced by CS-E for the later versions. A deviation against JAR-E Change 8 (04 May 1990) JAR-E 890(a): Thrust Reverser Tests was given for all the engine models up to the Enhanced versions.

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 – SAC and DAC 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 – SAC and DAC 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:*

EASA SAC and DAC Models: JAR-E Change 8 (04 May 1990) JAR-E 840(a)(2): Compressor and Turbine Rotor Integrity Tests – Rotor integrity capability for the booster, HPC and HPT was demonstrated by analyses with respect to predecessor engine models.

EASA SAC, DAC and TI Models: JAR-E Change 8 (04 May 1990) JAR-E 890(b): Thrust Reverser Tests – The Thrust Reverser planned for use with the CFM56-7B engine is provided by the aircraft constructor and will be certified to FAR 25 and JAR 25 requirements as part of the aircraft certification.

(iv) *Exemptions:*

EASA SAC, DAC and TI Models: JAR-E Change 8 (04 May 1990) JAR-E 890(a): Thrust Reverser Tests – See the ESF decision above.

(v) *Airworthiness Limitations:*

See Chapter 5 of the CFM56-7B Engine Shop Manual CFM-TP.SM.10.

(3) Environmental Certification:

FAA TC E55NE – The first CFM56-7B models comply with the fuel venting and emissions requirements of 14 CFR Part 34, effective September 30, 1990, including Amendments 34-1 through 34-4. The Tech Insertion and Enhanced variants comply with 14 CFR Part 34 at Amendment 5 effective December 31, 2012 and CFR Part 87 effective July 18, 2012. (See the TCDS for full details.)

EASA TC E.003 – For the SAC and DAC models, ICAO Annex 16 Vol II, second edition, including Amendment 2, effective 11 November 1993, as applicable to turbofan engines. NOx Standard in accordance with Part III, Chapter 2, § 2.3.2, b) (CAEP/2) For TI variants this was updated to ICAO Annex 16 Volume 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 Enhanced variants this was further 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:

Certification Report CR.901 – Grand Livre – FAA/DGAC Certification
Compliance Checklist CFM56-7B18, -7B20, -7B22, -7B24, -7B26 and -7B27

(5) Flight Manual: N/A

(6) Operating Data for Engine:

(i) *Maintenance Manual:*

CFM56-7B Engine Shop Manual – SM.10

CFM56-7B Standard Practices Manual – SPM.25

CFM56-7B Consumable Products Manual – CPM.25

CFM56-7B Illustrated Tools & Equipment Manual – ITEM.10

CFM56-7B Non-Destructive Test Manual – NDTM.11

Maintenance Manual – Boeing Manual D633A101-CFM

Fault Isolation Manual – Boeing Manual D633A103-CFM

(ii) *Current service Information:*

CFM56-7B Service Bulletins

(iii) *Illustrated Parts Catalogue:*

CFM56-7B IPC – Document PC.14

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

CAA 2171 dated 25-10-00 from B Mungin – GE Customer Support Manager

CFM now provides access through the Customer Web Center

<https://cwcportal.cfm56.com>

(8) Other information:

Turbofan Engine Installation Manual – 7B01

Specific Operating Instructions – TP.OI.14

Attachments

The following documents form attachments to this report:

Copy of EASA Type Certificate Data Sheet Number E.004

Copy of FAA Type Certificate Data Sheet Number E55NE

Sign off

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David Gill
Team Leader Airworthiness

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Checked – Greg Baum
Airworthiness Engineer

Appendix 1

List of Type Accepted Variants:

<i>Model:</i>	<i>Applicant:</i>	<i>CAA Work Request:</i>	<i>Date Granted:</i>
CFM56-7B Series	Polynesian Limited	1/21B/2	14 November 2000
CFM56-7B2x/2 Series	CFM International S.A.	19/21B/9	31 October 2018
CFM56-7B2x/3 Series	CFM International S.A.	19/21B/9	31 October 2018
CFM56-7B2xE Series	CFM International S.A.	19/21B/9	31 October 2018