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Executive Summary

New Zealand Type Acceptance has been granted to the International Aero Engines LLC PW1100G-JM and PW1400G-JM Series based on validation of FAA Type Certificate number E00087EN. 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(b).

NOTE: The information in this report is correct as at the date of issue. The report is 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 State-of-Design Type Certificate Data Sheet.

1. Introduction

This report details the basis on which Type Acceptance Certificate No. 17/21B/13 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 model(s) in New Zealand; and

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

2. Product Certification Details

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

TC Holder: International Aero Engines, LLC
Type Certificate: E00087EN
Issued by: Federal Aviation Administration
Production Approval: FAA PC114

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

(i) Models: PW1133G-JM, PW1133G A-JM, PW1130G-JM
PW1127G-JM, PW1127G A-JM, PW1127G 1-JM
PW1124G-JM, PW1124G 1-JM, PW1122G-JM
PW1431G-JM
3. Application Details and Background Information

The application for New Zealand type acceptance of the PW1100G-JM and PW1400G-JM Series was from the type certificate holder, International Aero Engines LLC, dated 6 December 2016. The PW1000G Series is an all-new design high bypass ratio axial-flow twin-spool turbofan with FADEC control incorporating the novel technology of a gear-driven main fan, and is available in three families with thrust ratings of 17,000 lb., 25,000 lb. and 33,000 lb. As part of the type acceptance exercise a team of certification specialists from the CAA Aircraft Certification Unit visited Pratt and Whitney in East Hartford for a validation/familiarisation review.

Type Acceptance Certificate Number 17/21B/13 was granted on 19 October 2017 to the PW1100G and PW1400G Series based on validation of FAA Type Certificate E00087EN. Specific applicability is limited to the coverage provided by the operating documentation supplied. There are no special requirements for import into New Zealand.

The PW1000G Series are all similar in basic engine architecture, and comprise three basic thrust classes. The low-pressure spool consists of a three-stage low-pressure turbine that directly drives a three-stage low-pressure compressor, and a single stage high bypass ratio fan (12:1) through a fan drive gear speed reduction system for improved cycle efficiency. The high-pressure compressor has eight axial stages driven by a two-stage cooled high-pressure turbine. The split-dome combustor incorporates proprietary TALON X technology for low emissions. The new feature of the PW1000G Series engine is a fan drive gear system (FDGS). The fan case is 100% composite construction, and the fan blade is a hollow, bonded, aluminium material with a titanium leading edge sheath.

Type Certificate E00087EN covers the PW1000G high thrust range family (33k) with an 81 inch fan. The PW1100G-JM Series was developed for the Airbus A320 NEO airliner. The basic models are the PW1133G-JM for the A321-271n, the PW1127G-JM for the A320-271n and the PW1124G-JM for the A319-171n. The other models are reduced thrust, alternate climb thrust or hot and high thrust versions. The PW1431G-JM model has been developed for the Irkut MC21-300 airliner. Differences between the PW1100G-JM Series and the PW1400G-JM Series relate to airframe installation differences. Within each Series the different models incorporate the same turbomachinery (identical Bill of Materials). Thrust ratings for each model are achieved by selectable thrust setting logic in the FADEC software, input through the Data Storage Unit (DSU) plug.
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:

- FAA Type Certificate Number E 00087E
- FAA Type Certificate Data Sheet no. E 00087E at Revision 3 dated 06-05-2016
  - Model PW1133G-JM approved December 19, 2014
  - Models PW1127G-JM, PW1127GA-JM approved October 23, 2015
  - Models PW1127G1-JM, PW1124G-JM approved October 23, 2015
  - Models PW1124G1-JM, PW1122G-JM approved October 23, 2015
  - Model PW1431G-JM approved May 6, 2016

(2) Airworthiness design requirements:

(i) Airworthiness Design Standards:

The certification basis of the PW1100G-JM and PW1400G-JM Series geared turbofan engine is 14 CFR Part 33, effective February 1, 1965, including Amendments 33-1 through 33-32. Three ELOS were granted, which have been reviewed and accepted by the CAA. This is an acceptable certification basis in accordance with NZCAR Part 21B Para §21.41 and Advisory Circular 21-1A, as FAR 33 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

Nil

(iii) Equivalent Level of Safety Findings:

TC3289EN-E-P-8-R1 FAR §33.76(c)(7)(i) Bird Ingestion: Requires ingestion of a flock of birds within 1 second. During the test one of seven birds failed to fire. The test was restarted and the final bird ingested, with the 20-minute follow on sequence completed. IAE showed by testing and analysis that the birds impacts act individually, and the re-test would not change the test results.

TC3289EN-E-P-5-R1 FAR §33.77(c) Foreign Object Ingestion-Ice: This requires that ingestion of an ice slab does not cause sustained power or thrust loss, or require engine shutdown. Compliance is shown by test under specific conditions. IAE elected to show compliance to a later Amendment status of the Rule, which allows validated analysis. The analysis was also considered conservative because of a number of factors used, including slab size, thickness and orientation.

TC3289EN-E-P-6-R1 FAR §33.78(a)(1) Rain and Hail Ingestion: Ingestion of large hailstones may not cause unacceptable mechanical damage, power loss or shutdown. Compliance by analysis, similarity and static rig impact testing to predict fan blade damage was accepted in lieu of an engine test. This included assessment of all susceptible components and testing of critical areas.

(iv) Airworthiness Limitations

See PW1100G-JM Airworthiness Limitations Manual P/N 5316993

See PW1400G-JM Airworthiness Limitations Manual Report PWA-9913
(3) Aircraft Noise and Engine Emission Standards:

(i) Environmental Standard
The PW1100G-JM and PW1400G-JM Series has been certificated for fuel venting and exhaust emissions under FAR Part 34, including Amendments 34-1 through 34-5a effective Oct. 23, 2013, and FAR Part 87 effective Oct. 31, 2012. (CAEP/8)

(ii) Compliance Listing

(4) Certification Compliance Listing:

(5) Flight Manual: Not Applicable

(6) Operating Data for Engine:

(i) Maintenance Manual:
PW1100G-JM Engine Maintenance Manual (EMM) P/N 5316994
PW1100G-JM Engine Manual (EM) P/N 5316992
PW1100G-JM Clean, Inspect and Repair Manual (CIR) P/N 5315653
PW1400G-JM Engine Maintenance Manual (EMM) P/N
PW1400G-JM Engine Manual (EM) P/N
PW1400G-JM Clean, Inspect and Repair Manual (CIR) P/N

(ii) Current Service Information
Service Bulletins

(iii) Illustrated Parts Catalogue
PW1100G-JM Illustrated Parts Document P/N
PW1400G-JM Illustrated Parts Document P/N

(7) Agreement from manufacturer to supply updates of data in (5), and (6):
IAE provides CAA access to manuals at www.fleetcare.pw.utc.com

(8) Other information:
PW1100G-JM Series Installation & Operating Manual Report PWA-9851
PW1400G-JM Series Installation & Operating Manual Report PWA-9914
Attachments
The following documents form attachments to this report:

- Copy of FAA Type Certificate Data Sheet Number E00087EN

Sign off

David Gill
Team Leader Airworthiness

Checked - Craig Bamber
Airworthiness Engineer

Appendix 1

List of Type Accepted Variants:

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<th>Applicant</th>
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<td>PW1100G-JM Series</td>
<td>IAE LLC</td>
<td>17/21B/13</td>
<td>19 October 2017</td>
</tr>
<tr>
<td>PW1400G-JM Series</td>
<td>IAE LLC</td>
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<td>19 October 2017</td>
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