
Type Acceptance Report

TAR 17/21B/16 – Revision 1

Pratt & Whitney PW1500G/1900G Series

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Executive Summary

New Zealand Type Acceptance has been granted to the Pratt & Whitney PW1500G and PW1900G Series geared turbofan engines based on validation of FAA Type Certificate number E00090EN. 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/16 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.

The report also notes the status of all models included under the State-of-Design type certificate which have been granted type acceptance in New Zealand. Models covered by the type acceptance certificate issued under Part 21B at Amendment 6 or later are listed in Section 2 of this report. Models which were accepted prior to that or under the Transitional Arrangements of Part 21 Appendix A are detailed in Appendix 1 of this report.

2. Product Certification Details

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

Manufacturer: Pratt & Whitney
Type Certificate: E00090EN
Issued by: Federal Aviation Administration
Production Approval: Transport Canada CMA 4-58 [s/n P735922-P735943]
FAA PC02 [s/n P735944 and up]

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

(i) Model: PW1524G, PW1524G-3
PW1519G, PW1521G, PW1525G
PW1521G-3, PW1525G-3
PW1919G, PW1921G, PW1922G, PW1923G
PW1521GA, PW1923G-A
Noise Standard: Not Applicable

3. Application Details and Background Information

The application for New Zealand type acceptance of the PW1500G and PW1900G Series was from the type certificate holder, Pratt & Whitney, 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 basic 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, Connecticut, for a validation/familiarisation review.

Type Acceptance Certificate No. 17/21B/16 was granted on 19 October 2017 to the PW1500G and PW1900G Series based on validation of FAA Type Certificate E00090EN. 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 E00090EN covers the PW1000G family in the middle thrust range (25k) with a 73 inch fan. The PW1500G Series was developed for the Bombardier C Series airliner. The basic models are the PW1524G for the CS-100, and the PW1524G-3 for the CS-300 stretched version. The other models are reduced thrust or alternate climb thrust versions. The PW1900G Series was developed for the Embraer E190-E2 Series airliner, and is available in a range of thrust values. Differences between the PW1500G Series and the PW1900G 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.

The PW1500G Series was initially certificated by Pratt and Whitney Canada under Transport Canada type certificate E-38. The first models were approved on February 20, 2013. The type certificate was subsequently transferred to Pratt and Whitney under FAA type certificate E00090EN, who became State-of-Design on December 6, 2016.

This report was raised to Revision 1 to add the PW1521GA and PW1923G-A engines, after application from the manufacturer dated 02 February 2022. Type Acceptance of

the Model PW1521GA and PW1923G-A was granted on 09 June 2022. The differences to the PW1500G series and PW1900G Series are noted below.

The PW1521GA Engine Model

All maximum permissible speeds and temperatures previously defined in the TCDS remain unchanged. The newly added engine models expand upon the rating structure offered on the Airbus A220 Aircraft. All new rating structures fall within the previously certified envelope.

The PW1923G-A Engine Model

All maximum permissible speeds and temperatures previously defined in the TCDS remain unchanged. The newly added engine models expand upon the rating structure offered on the Embraer E2 Aircraft. All new rating structures fall within the previously certified envelope.

This Revision 1 also includes the review for the Special Installation Requirements for Extended Twin Engine Operations (ETOPS) eligibility. ETOPS eligibility is granted through an Equivalent Safety Finding for the PW1500G engine models only through the Memorandum No. TC3047EN-E-P-11

Note 1: ETOPS eligibility does not constitute airplane or operational level approvals necessary to conduct ETOPS flights

Note 2: The PW1900G Engine models are not eligible for Extended Twin Engine Operations, (ETOPS) Operation

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 E00090EN

FAA Type Certificate Data Sheet number E00090EN at Revision 10 dated June 2, 2022

- Models PW1519G, PW1521G approved January 22, 2016
- Models PW1524G, PW1525G approved January 22, 2016
- Models PW1521G-3, PW1524G-3, PW1525G-3 approved Oct 31, 2016
- Models PW1919G, PW1921G approved April 28, 2017
- Models PW1922G, PW1923G approved April 28, 2017
- Models PW1521GA approved January 29, 2018
- Models PW1923G-A approved November 27, 2018

(2) Airworthiness design requirements:

(i) *Airworthiness Design Standards:*

The certification basis of the PW1500G and PW1900G Series is 14 CFR Part 33, effective February 1, 1965, including Amendments 33-1 through 33-34. This is an acceptable certification basis in accordance with NZCAR Part 21B Para §21.41 and Advisory Circular 21-1A, as FAR Part 33 is the basic standard for aircraft engines called up under Part 21 Appendix C. Three ELOS was granted, which has been reviewed and accepted by CAA. 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:*

PW1500G and PW1900G Engine models:

TC3047EN-E-P-5 FAR §33.78 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.

PW1500G Engine models

ELOS Memorandum No. TC3047EN-E-P-11 FAR 33.201(c) and (e), Design and Test Requirements for Early ETOPS eligibility, documented in section 33.201(c) states that the applicant must conduct a simulated ETOPS mission cyclic endurance that includes a minimum of 3,000 representative service

start-stop mission cycles. The safety objectives of §33.201(c) and (e) were demonstrated by a simulated ETOPS mission cyclic endurance test that the design features of the engine minimize the occurrence of failures, malfunctions, defects, and maintenance errors that could result in an IFSD (In-Flight Shutdown), loss of thrust control, or other power loss for an engine to be installed on a two engine airplane.

PW1900G Engine models

ELOS Memorandum No. MEC19CZ145-P-1 FAR 33.27(c) and (e), Turbine, Compressor, Fan, and Turbo supercharger Rotor Overspeed.

Pratt & Whitney has shown that implementation of an engine shaft shear logic interlock design feature will reduce the probability of a catastrophic aircraft event (dual engine shutdown) for a common mode threat. The assumptions and limitations of the shaft shear logic interlock system has been documented in the PW1900G Engine Installation and Operating Manual.

(iv) Airworthiness Limitations:

See PW1500G Airworthiness Limitations Manual PN 5305816

See PW1900G Airworthiness Limitations Manual PN 5321709

(3) Aircraft Noise and Engine Emission Standards:

(i) Environmental Standard:

The PW1500G and PW1900G Series have been certificated for fuel venting and exhaust emissions under FAR Part 34, including Amendments 34-1 through 34-5a effective October 23, 2013, and FAR Part 87 effective October 31, 2012 (CAEP/8).

(ii) Compliance Listing:

PWA-8827 PW1500G Turbofan Engine Family Civil Certification Smoke And Gaseous Emissions Test Report – October 2012

PWA-8859 PW1500G Turbofan Engine Family Civil Certification Fuel Venting Report (Fuel Nozzles with Primary System Check Valves) – July 2014

(4) Certification Compliance Listing:

PWA-8826-04 – Engineering Report No. 7287 Revision D – PW1500G Turbofan Engine Family Civil Certification Compliance Plan & Record

PWA-11467 – PW1900G Turbofan Engine Family Civil Certification Summary of Compliance Report – Original Issue April 2017

PWA-11594 – Compliance Report to amend PW1500G Type Certificate for the Addition of the PW1521GA Model

PWA-11818 – Compliance Report to amend PW1900G Type Certificate for the Addition of the PW1923G-A Model

PWA-12772 – Major Engineering Change 19CZ145 Substantiation Summary
V9.6 Software Revision

ECCN 9E991 – PW1500G ETOPS Report Summary

(5) Flight Manual: Not Applicable

(6) Operating Data for Engine / Propeller:

(i) *Maintenance Manual:*

PW1500G Series Engine Manual (EM) P/N 5305815

PW1500G Series Engine Maintenance Manual (EMM) P/N 5305818

PW1500G Series Engine Cleaning, Inspection, Repair Manual (CIR) P/N
5305817

PW1900G Series Engine Manual (EM) P/N 5321708

PW1900G Series Engine Maintenance Manual (EMM) P/N 5321705

PW1900G Series Engine Cleaning, Inspection, Repair Manual (CIR) P/N
5321706

(ii) *Current service Information:*

Service Bulletins

(iii) *Illustrated Parts Catalogue:*

PW1500G Illustrated Parts Document P/N 5305819

PW1900G Illustrated Parts Document P/N 5321707

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

Pratt & Whitney provides CAA access to manuals at www.fleetcare.pw.utc.com

(8) Other information:

PW1500G Series Installation & Operating Manual Report PWA-8828

PW1900G Series Installation & Operating Manual Report PWA-10649

Attachments

The following documents form attachments to this report:

Copy of FAA Type Certificate Data Sheet Number E00090EN

Sign off



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Kavita Vanmari
Certification Engineer



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Checked – Glen Somerville
Certification Engineer

Appendix 1

List of Type Accepted Variants:

<i>Model:</i>	<i>Applicant:</i>	<i>CAA Work Request:</i>	<i>Date Granted:</i>
PW1500G Series	Pratt &Whitney	17/21B/16	19 October 2017
PW1900G Series	Pratt &Whitney	17/21B/16	19 October 2017
PW1521GA	Pratt & Whitney	22/21B/18	09 June 2022
PW1923G-A	Pratt & Whitney	22/21B/18	09 June 2022