
Type Acceptance Report

TAR 15/218/2 – Revision 1

ROLLS ROYCE 250 Series III and IV

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Executive Summary

New Zealand Type Acceptance has been granted to the Rolls Royce Model 250 Series III and IV turbo-shaft engines based on validation of FAA Type Certificate number E1GL. There are no special requirements for import.

All models listed under the FAA type certificate have been type accepted in New Zealand, except for models which were only fitted to military helicopter applications. (250-C30U; 250-C30R Series, 250-C47E and 250-C47E/1)

Subsequent new variants or serial numbers approved under the State-of-Design 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.15/21B/2 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 models included under the foreign type certificate which have been granted type acceptance in New Zealand, which are listed in Section 2. (Models which were accepted prior to Part 21 under NZCAR Section B.9 are noted in Appendix 1.)

2. Product Certification Details

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

Manufacturer: Rolls Royce Corporation *(since 1 September 2000)*
Type Certificate: E1GL
Issued by: Federal Aviation Administration
Production Approval: PC310

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

- (i) **Models:** 250-C28, 250-C28B, 250-C28C
250-C30, 250-C30G, 250-C30M, 250-C30P
250-C30S, 250-C30U, 250-C30G/2
250-C40B, 250-C47B, 250-C47M
250-C47B/8, 250-C47E/4

3. Application Details and Background Information

The application for type acceptance of the 250-C47B/8 was from the manufacturer, Rolls Royce Corporation, under covering letter dated 22 July 2014. The 250 Series III/IV engine family is a turbo-shaft of modular construction with a centrifugal compressor, reverse flow single can combustion liner and two-stage gas generator turbine with single rectangular exhaust stack. A 2-stage free power turbine connects to a power and accessories gearbox, providing a reduced output speed consistent with helicopter gearbox input requirements.

Type Acceptance Certificate Number 15/21B/24 was granted on 26 August 2014 to the Rolls Royce 250-C47B/8 engine based on validation of FAA Type Certificate E1GL. Specific applicability is limited to the coverage provided by the documentation supplied. There are no special requirements for import into New Zealand.

The Allison 250 Series was first developed as the T63 for the US Army Light Observation Helicopter competition in the early 1960s, and was the selected powerplant for all three contenders. Although the competition was won by the Hughes OH-6, all three went on to become successful civil helicopters as the Hughes 369, Bell 206 and Hiller FH-1100. The 250 Series has since been developed into multiple versions, including turbo-props and turbo-shafts, with over 90 applications. Over 30,000 examples have been produced and fleet operating hours exceed 207 million. It has been in widespread service in New Zealand since the 250-C18 was imported in the first Bell 206A in 1968. The engine has been developed over four Series with increased power outputs. (The "small gearbox" Series I and II are covered by FAA type certificate E4CE and CAA TAR 11/21B/22.)

The larger Series III turboshaft family (250-C28B in the Bell 206L-1 LongRanger and the 250-C28C in the Bolkow Bo105C) was introduced with a 478-500 shp rating, while the Series IV turboshaft family (250-C30 [S-76, MD530, Bell 222]/C40 [Bell 430]/C47 [Bell 407, MD600]) spans 650-715 shp. The 250-C47B/8 is a new derivative of the 250-C47B, which is fitted to the Bell 407, with improved performance in certain "hot and high" operating conditions. The engine includes a performance enhancement kit (revised impeller, diffuser and 1st stage turbine nozzle) to provide an +8% increase in power at 77°F for a minimum (fully deteriorated) engine. As with the Model C47B engine, the C47B/8 uses a Single Channel Full Authority Digital Engine Control (FADEC) system with manual backup.

This report was raised to Revision 1 to include the 250-C47E/4 variant, after application from the manufacturer dated 11 October 2017. The 250-C47E/4 has been developed for the Bell 407GXP helicopter, and is a derivative of the 250-C47B/8. The main difference is a redundant dual channel FADEC, where the HMU is replaced by a new fuel metering unit [FMU] and new fuel pump and power unit [FPPU]. There is also a new scavenge oil filter assembly (SOFA), anti-ice valve assembly, redesigned main and auxiliary harnesses, sensors, and oil and fuel line routings. Both of these models have the same rating of 650 shp at take-off. The 250-C47E/4 is actually the fourth Series IV engine with a dual channel FADEC, but the first on a civil helicopter application. Type Acceptance was granted on 5 February 2018.

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 E1GL

FAA Type Certificate Data Sheet E1GL, Revision 30 dated October 31, 2016

- Model 250-C28 approved April 28, 1976
- Model 250-C28B and C28C approved February 28, 1978
- Model 250-C30 approved March 28, 1978
- Model 250-C30P approved September 15, 1981
- Model 250-C30S approved June 15, 1982
- Model 250-C30M approved January 7, 1983
- Model 250-C30R approved July 15, 1983
- Model 250-C30G approved March 2, 1989
- Model 250-C30U approved August 28, 1989
- Model 250-C30G/2 approved March 4, 1992
- Model 250-C30R/1 approved March 31, 1994
- Model 250-C47B approved January 19, 1996
- Model 250-C47M approved May 14, 1997
- Model 250-C30R approved June 10, 1997
- Model 250-C30R/3M approved 24 September 2001
- Model 250-C47B/8 approved November 15, 2013
- Model 250-C47E/4 approved October 31, 2016

(2) Airworthiness design requirements:

(i) *Airworthiness Design Standards:*

The certification basis of the original Rolls Royce 250 Series III Model 250-C28 and Series IV 250-C47 is FAR Part 33 effective February 1, 1965 as amended by 33-2, 33-3 and 33-4. One exemption from FAR paragraph §33.69 was granted, which has been reviewed and accepted by the CAA. Subsequent models comply with FAR sections at later amendments, in some cases related to continuous OEI and FADEC, as listed in the TCDS.

This is an acceptable certification basis in accordance with NZCAR Part 21B Para §21.41 and Advisory Circular 21-1, because FAR Part 33 is the basic standard for 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:*

Nil

(iv) *Exemptions:*

Exemption 2087B: (Regulatory Docket No. 13294 [amended under 26072]) allows for approval of the 250 Series type design without the engine having at least two igniters and two separate secondary electric ignition circuits as required by FAR 33.69. This was justified because of the unique design which uses a single combustion chamber and a single fuel nozzle. This arrangement is not subject to the flame propagation problems associated with multiple chambers and nozzles. The exemption was later revised to remove the Transport Category A limitation, based on over 20 years of flight experience and 51 million flight hours with no recorded in-flight shutdowns due to failure of an ignition system component. A similar exemption No. 219A was granted for the 250 series I/II.

(v) *Airworthiness Limitations:*

Life limits established for critical rotating components are published in the corresponding Rolls-Royce Operation and Maintenance Manual in Chapter 05. Distributor Information Letters (DIL) 190 and 202 establish acceptable crack limits suitable for return to service of first stage and second stage turbine wheels, respectively, in time continued (repaired) engines.

(3) Environmental Certification:

Not applicable. There are no regulatory limits established for turbo-shaft engines for either emissions or fuel venting.

(4) Certification Compliance Listing:

EDNS04000026561/002 – Model 250-C47B/8 Compliance Summary and Similarity Report, dated April 21, 2014.

EDNS04000069511 – Model 250-C47E/4 Certification Compliance Summary Report, dated October 26, 2016.

(5) Flight Manual: Not Applicable

(6) Operating Data for Engine:

(i) *Maintenance Manual:*

CSP21001 – Model 250-C47B Operation and Maintenance Manual

CSP21017 – Model 250-C47E/4 Operation & Maintenance Manual

* See FAA TCDS EI GL for ICA for other Series III/IV Models

(ii) *Current service Information:*

Commercial Engine Bulletins and Service Letters

(iii) *Illustrated Parts Catalogue:*

CSP23001 – Illustrated Parts Catalog (M250-C40B, C47B, C47B/8, C47M)

CSP23011 – Model 250-C47E/4 Illustrated Parts Catalog

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

Rolls Royce has provided access to FAST (Fleet Administrative Service Tool)

Attachments

The following documents form attachments to this report:

Copy of FAA Type Certificate Data Sheet Number E1GL

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>
250-C30, -C30P, -C30S, -C30M, -C30G, -C30U, -C30G/2			
250-C40	AC 21-1.2/NZCAR Part 21 Appendix A(c)		
250-C47B	Bell Helicopters Textron Canada	97/21B/7	19 March 1997
250-C47M	Faram Helicopters Ltd	4/21B/7	10 October 2003
250-C47B/8	Rolls-Royce Corporation	15/21B/2	26 August 2014
250-C47E/4	Rolls-Royce Corporation	18/21B/21	5 February 2018