
Type Acceptance Report

TAR 18/21B/36 – Revision 1

ROLLS-ROYCE TRENT 800 Series

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1. INTRODUCTION	1
2. PRODUCT CERTIFICATION DETAILS	2
3. APPLICATION DETAILS AND BACKGROUND INFORMATION	3
4. NZCAR §21.43 DATA REQUIREMENTS	4
ATTACHMENTS	6
APPENDIX 1	6

Executive Summary

New Zealand Type Acceptance has been granted to the Rolls-Royce Trent 800 Series turbofan engines based on validation of EASA Type Certificate number E.047. There are no special requirements for import.

This report covers all the engine Models currently listed on the EASA Type Certificate, which are now eligible for installation on a NZ-registered aircraft. Subsequent models approved under the EASA 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.18/21B/36 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 State-of-Design type certificate which have been granted type acceptance in New Zealand. This includes Models covered by the type acceptance certificate issued under Part 21B at Amendment 6 or later and Models which were accepted prior to that as part of an aircraft validation.

2. Product Certification Details

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

TC Holder: Rolls-Royce Deutschland Ltd & Co KG
(Transferred from Rolls-Royce plc on 21 February 2019)

Manufacturer: Rolls-Royce plc

Type Certificate: E.047
Issued by: European Aviation Safety Agency

Production Approval: UK.21G.2003

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

(i) Models: RB211 Trent 875-17
RB211 Trent 877-17
RB211 Trent 884-17
RB211 Trent 892-17
RB211 Trent 892B-17
RB211 Trent 895-17
RB211 Trent 884B-17

3. Application Details and Background Information

The application for New Zealand type acceptance of the Rolls-Royce Trent 800 Series was from Air New Zealand Ltd dated 17 May 2018. The Trent 800 is a three-shaft high bypass-ratio axial flow turbofan with take-off thrust ratings in the range 75-95,000 lb.

Type Acceptance Certificate Number 18/21B/36 was granted on 6 June 2018 to the Rolls-Royce Trent 875, 877 and 892 Series engines based on EASA Type Certificate E.047. There are no special requirements for import into New Zealand.

The Trent 800 was the second Trent family derived from the original RB211 engine, and was developed for the Boeing 777-200. When originally envisaged it consisted of four versions, the 875, 877, 884 and 890. (The engine mark number indicates the engine family and the nominal Maximum Take-Off (MTO) thrust rating.) In July 1996, following an extensive period of aircraft testing, the required thrust ratings for the Boeing 777-200 were revised by Boeing. For the Trent 875, 877 and 884 engine variants, the thrust levels were reduced. For the Trent 890 the thrust level was unchanged, but the engine and thrust rating was renamed the Trent 892. These four engine models have an identical Bill of Materials (BoM), but use a different Data Entry Plug (DEP). The change of DEP configuration defines the thrust rating through the Electronic Engine Control (EEC) software.

In response to customer requirements, a "bump" thrust rating was created for the Trent 800. This revised rating is known as the Trent 892B rating, and provides additional take-off thrust at higher altitudes. At sea level conditions, the 892B rating is identical to the 892. At altitudes between 2000 ft and 8000 ft, the Trent 892B rating provides an increase in take-off thrust, although this increase is restricted to a maximum of 5.2%. A similar "bump" rating was also developed for the Trent 884.

A further development was the Trent 895 rating, which provides an increase in take-off thrust of approximately 1.6% at sea level conditions. The certification hardware standard for the Trent 895 was based upon the Trent 892B, but a number of existing modifications were added, including changes to support the incorporation of a high flow fuel pump.

Rolls Royce has also produced an Enhanced Performance (EP) Package for the Trent 800 engine series. This incorporates the "elliptical leading-edge" (ELE) high- and intermediate-pressure compressor (HPC and IPC) blades from the Trent 1000, which reduce fuel burn. There is no change in engine model designation when the EP package is incorporated.

The Trent 800 Series engine has been type accepted based on the State of Design EASA type certificate, but is fitted to the Boeing 777 under an FAA Import type certificate. Rolls Royce has advised that the same engine BoM is specified under both type certificates.

Revision 1 was issued to note transfer of the type certificate from Rolls-Royce plc to Rolls-Royce Deutschland Ltd & Co KG, and was actioned under Work Request 19/21B/21.

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) ICAO Type certificate:

EASA Type Certificate Number E.047

EASA Type Certificate Data Sheet No. E.047 at Issue 04 dated 21 February 2019

- Models 884-17, 877-17 and 875-17 approved 27 January 1995
- Model 892-17 approved 13 November 1996
- Model 892B-17 approved 16 April 1997
- Model 895-17 approved 22 June 1999
- Model 884B-17 approved 26 November 1999

Replaces:

UK CAA Engine TC for RB211 Trent Series, Serial No. 093/4 dated 26 Nov 1999

- Trent 895-17 added 22 June 1999 under Serial No. 093/3

UK CAA Engine TCDS No. 1051 – Issue 13 dated 12 November 2002

(2) Airworthiness design requirements:

(i) *Airworthiness Design Standards:*

The certification basis of the Rolls-Royce Trent 800 Series is JAR-E Change 8, plus Orange Paper E/91/1. This is the European equivalent to FAR Part 33, which is the basic airworthiness standard for aircraft engines called up by Part 21 Appendix C and Advisory Circular 21-1A.

(ii) *Special Conditions:*

JAR-E 790 Ingestion of Rain – Following a number of incidents in which the engine has run down following a severe rain or hail encounter, a study concluded the rain threat should be revised to include a rain density of 20 g/m³ liquid water content up to 20000 ft altitude. This should not result in unacceptable mechanical damage or cause an unacceptable loss of engine performance.

JAR-E 790 Ingestion of Hail – Following a number of incidents a study concluded the hail threat should be revised to include a test condition of 10 g/m³ hail water content at 12-15000 ft altitude. The engine should not run down or flame out and have sufficient performance margin to enable it to accelerate from the minimum conditions while ingesting hail at the defined rates.

JAR-E 800 Medium & Large Bird Ingestion – After a study of in-service bird ingestion events determined that the current 1½ lb and 4 lb bird requirements did not adequately reflect the bird threat, this was replaced by an 8 lb large bird and flocking medium birds using either one 2½ lb bird and six 1½ lb birds or four 2½ lb birds, under specified test conditions and outcomes.

(iii) *Equivalent Level of Safety Findings:*

JAR-E 740(f) Speed Limitations at Maximum Continuous Rating – A maximum continuous speed limit for any rotor system is not required to be declared and displayed where a 'notional' limit will not be exceeded before the maximum continuous temperature limit is reached, or if it is exceeded in a fault condition it can be shown no hazard will arise before this is corrected.

(iv) Exemptions:

JAR-E 890(a) Engine Calibration in Reverse Thrust – The requirement to define the levels of reverse thrust available at the beginning and end of the 150 hour endurance test was exempt because it had not previously been invoked by the CAA or DGAC, or noticed as missing from the certification documents; FAR §33.97 was not interpreted by the FAA to achieve this result; and any deterioration during the test could be identified during the post-test inspection.

JAR-E 570(a)(3) Scavenge Pump Inlet Strainers – The requirement for a strainer on the suction side of each pressure and scavenge pump was replaced by requiring that pumps must be adequately protected. This was allowed because although Rolls-Royce had found that in some instances carbon shed on start-up could block a strainer, the engine could cope with the loose carbon.

(v) Airworthiness Limitations:

See Time Limits Manual – T-Trent-2RR

(3) Environmental Certification:

All the Trent 800 Models except the 895-17 have been initially approved under ICAO Annex 16 Volume II (1st Edition 1981), with the 895-17 meeting ICAO Annex 16 Volume II (2nd Edition 1993).

Approved 14 Dec 2012:

EASA CS-34 Issue dated 17.10.2003

ICAO Annex 16, Volume II (Third Edition, including Amendment 7), for NOx:
NOx Standard in accordance with Part III, Chapter 2, § 2.3.2, d) (CAEP/6)

Rolls-Royce Technical Report DNS59304 – RB211 Trent 895-17 – Emissions Compliance with ICAO Annex 16 Volume II Issue 2 (CAEP2) Requirements
ICAO Engine Exhaust Emissions Data Bank – Trent 895

(4) Certification Compliance Listing:

Rolls-Royce Mechanical Development Report DNS 56253 – RB211 Trent 895-17
Certification Type Approval Strategy – Issue 2 dated 13 May 99

(5) Flight Manual: N/A**(6) Operating Data for Engine (Trent 800 all models):***(i) Maintenance Manual:*

Engine Manual – E-Trent-2RR

Maintenance Manual – D633W101-RRY

Rolls-Royce Trent 800 publications available on their website include:

Component Maintenance Manual Electrical Harnesses and Cables	CMM Tubes, Hoses and Ducts
CMM Miscellaneous Mechanical	Overhaul Materials Manual
Overhaul Processes Manual	Time Limits Manual
Standards Practices Manual	
Visual Access Diagrams	

(ii) Current service Information:

Service Bulletin Index for the RB211-Trent 500/700/800 Series

(iii) *Illustrated Parts Catalogue:*

Rolls-Royce Trent 800 Engine Illustrated Parts Catalogue

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

CAA has access to Rolls-Royce www.Aeromanager.com for all engine publications

(8) Other information:

Operating Instructions – F-Trent-777

Installation Manual – EL 2839

EASA Certification Information No.: 2019-04 – Issued: 16/01/2019 – Subject:
Intention to transfer all EASA civil Type Certificates held by Rolls Royce plc to
Rolls Royce Deutschland

Attachments

The following documents form attachments to this report:

Copy of EASA Type Certificate Data Sheet Number E.047

Sign off

.....
David Gill
Team Leader Airworthiness

.....
Checked – Greg Baum
Team Leader Product Certification

Appendix 1

List of Type Accepted Variants:

<i>Model:</i>	<i>Applicant:</i>	<i>CAA Work Request:</i>	<i>Date Granted:</i>
RB211 Trent 895-17	Air New Zealand Ltd	5/21B/17	27 October 2005
Trent 875-17; Trent 877-17			6 June 2018
Trent 884-17; Trent 884B-17			6 June 2018
Trent 892-17; Trent 892B-17	Air New Zealand Ltd	18/21B/36	6 June 2018