Type Acceptance Report

TAR 19/21B/11

Raikhlin RED A03 Series

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Executive Summary

New Zealand Type Acceptance has been granted to the Raikhlin aircraft Engine Developments (RED) A03 Series engine based on validation of EASA Type Certificate number E.150. There are no special requirements for import.

Applicability is limited to the Models and/or serial numbers detailed in Section 2, 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/11 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, which are listed in Section 2. Appendix 1 lists the type acceptance history of the RED A03 engine in New Zealand under EASA Type Certificate E.150.

2. Product Certification Details

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

Manufacturer: Raikhlin aircraft Engine Developments GmbH

Type Certificate: EASA.E.150
Issued by: European Aviation Safety Agency

Production Approval: *Applied for under DE.21G.0247*

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

(i) **Models:** RED A03-003

RED A03-102

3. Application Details and Background Information

The application for New Zealand type acceptance of the RED A03 Series engine was from the manufacturer, dated 22 August 2018. The first application of the engine in New Zealand was the installation in the Fletcher FU24-954 under STC project number 16/21E/41. The RED A03 is a 6-litre water-cooled four-stroke compression-ignition V12 piston engine equipped with dual turbochargers, common rail high-pressure direct fuel injection, and an integral reduction gearbox. The engine utilises single-lever power control through FADEC with integrated dual-lane redundancy.

Type Acceptance Certificate No. 19/21B/11 was granted on 4 August 2021 to the RED A03 Series based on validation of EASA Type Certificate E.150. Specific applicability is limited to the coverage provided by the operating documentation supplied. There are no special requirements for import into New Zealand.

The RED A03 Series is an all-new compression-ignition engine design intended for small aircraft or helicopter applications. It is a V-12 configuration with an included angle of 80º. Both cylinder banks of the engine have separate air induction, fuel injection and water cooling circuits, and are designed to operate independently. Power output is rated at 500 shp at 4000 RPM for take-off and 460 shp at 3750 RPM maximum continuous. The RED A03-003 was the first (basic) version. The second version is the RED A03-102, developed with inverted flight capability for training or aerobatic installations (primarily by use of an external oil tank capable of inverted flight oil supply and some strengthening for higher flight loads).

The RED A03 engine has flown on several development aircraft to date, but has not yet been approved on any aircraft type certificate or STC.

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 Number EASA.E.150

EASA Type Certificate Data Sheet No. E.150 at Issue 02 dated 27 August 2018
– Model RED A03-003 approved 19 December 2014
– Model RED A03-102 approved 27 August 2018

(2) Airworthiness design requirements:

(i) Airworthiness Design Standards:
The certification basis of the RED A03 Series is CS-E at Amendment 3 dated 23 December 2010. This is an acceptable certification basis in accordance with NZCAR Part 21B paragraph §21.41 and Advisory Circular 21-1, as CS-E is the EASA equivalent to FAR Part 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:
CRI-T10: CS-E 40(d) Engine Flame Out during Flight – Service experience has shown unintended flame-outs can occur more easily in diesel engines after prolonged descent at idle power setting and low ambient temperature (OAT). The pilot may not detect this because the engine is still rotating due to the wind milling effect of the propeller in single engine installations. RED showed that an unintended and/or undetected flame-out is not an issue for the RED A03 as the exhaust gas temperature (EGT) is continuously monitored and displayed for both banks as a mandatory output value from the EECU. As soon as EGT approaches the lower limit the indication changes to a yellow display with a yellow warning flag to warn the pilot of flame-out risk. Therefore a continued ignition is established and an imminent flame-out is immediately detectable independent of a rotating propeller. This procedure is published in the Operating Manual. In case of mishandling an engine restart procedure is defined and a maximum restart altitude specified. This approach makes the influence of the fuel cetane number used in testing (and normally recorded on the TCDS) negligible.

(iii) Equivalent Level of Safety Findings:
CRI-T3: CS-E 130(h) Fireproof Engine Attachment Points – The RED A03 engine consists of a cast aluminium crankcase and a gearbox and valve train housing made from aluminium. The engine attachment points, which must be fireproof, are on the parts made from aluminium which is not considered fireproof by definition. Therefore the following conditions must be met:
(1) The engine mounting structure must be failsafe in the event of failure of one element;
(2) The engine mounting structure or the engine attachment points shall at least meet the following fire-resistant criteria:
(a) Sustain limit flight loads for five minutes under the fire test conditions of AMC E 130 (4);
(b) After the 5 minute shutdown loads have to be evaluated, superimposed with flight loads.
(3) After fire testing the engine mounting structure must have sufficient static strength to withstand the maximum loads expected during the completion of the flight, factored as specified.

(iv) Airworthiness Limitations:
See Chapter 71.2 Airworthiness Limitations in the Engine Maintenance Manual

(3) Environmental Certification:

Not required for piston engines.

(4) Certification Compliance Listing:

A03-CCL-000001-B Compliance Checklist A03 V12 Diesel
A03-CEP-000004-B Certification Program A03 / EASA.E.E150

A03-CCL-000002-D Compliance Checklist RED A03-102 Trainer TC
A03-CEP-000006-C Certification Program RED A03-102 / EASA.E.E150

A03-ITR-000025 – CS-E 440 Endurance Test 2nd Test

A03-ITR-000031 – Strip Inspection MT0017

A03-ITR-000032 – System Safety Assessment Report for the RED A03 EECU

A03-ITR-000039 – MC1 Engine Manuals and Description

A03-ITR-000044 – CS-E 380 Low Temperature Starting Test

A03-ITR-000045 – CS-E 470 Contaminated Fuel Test

A03-ITR-000054 – System Safety Analysis F. A03 Engine

(5) Flight Manual: N/A

(6) Operating Data for Engine:

(i) Maintenance Manual:
Doc. Nr. A03-180-03-001-01 – Maintenance Manual RED A03-003

Doc. Nr. A03-180-03-003-01 – Maintenance Manual RED A03-102

(ii) Current service Information:
Doc. Nr. A03-181-03-003-02 – Prelim – List of Valid Service Bulletins

(iii) Illustrated Parts Catalogue:
Doc. No. A03-180-09-001-02 – IPC RED A03-003

Doc. No. A03-180-09-003-01 – IPC RED A03-102

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

CAA 2171 from RED Head of Airworthiness dated 14.AUG.2020

(8) Other information:

Doc. Nr. A03-180-01-001-01 – Installation Manual RED A03-003

Doc. Nr. A03-180-01-003-01 – Installation Manual RED A03-102

Doc. Nr. A03-180-02-001-01 – Operation Manual RED A03-003

Doc. Nr. A03-180-02-003-01 – Operation Manual RED A03-102

Attachments

The following documents form attachments to this report:

Copy of EASA Type Certificate Data Sheet Number EASA.E.150

Sign off

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David Gill
Team Leader Aircraft Inspection

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Checked – Kavita Vanmari
Certification Engineer

Appendix 1

List of Type Accepted Variants:

Model:	*Applicant:*	*CAA Work Request:*	*Date Granted:*
RED A03-003	Raikhlin aircraft Engine Developments GmbH	19/21B/11	4 August 2021
RED A03-102	Raikhlin aircraft Engine Developments GmbH	19/21B/11	4 August 2021