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# **Type Acceptance Report**

**TAR 14/21B/3**

**TURBOMECA Makila 2 Series**



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## Executive Summary

New Zealand Type Acceptance has been granted to the Turbomeca Makila 2 series engines based on validation of EASA Type Certificate number E.006. 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(c).

## 1. Introduction

This report details the basis on which Type Acceptance Certificate No.14/21B/3 was granted 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.

## 2. ICAO Type Certificate Details

Manufacturer:	Turbomeca
Type Certificate:	E.006
Issued by:	European Aviation Safety Agency
Model(s):	Makila 2A, 2A1

### 3. Type Acceptance Details

The application for New Zealand type acceptance was from the manufacturer dated 29 July 2013. The Makila 2 series is fitted to the Eurocopter Super Puma EC225/EC725 model helicopter. The Makila 2 series is a turboshaft engine with three-stage axial and final-stage centrifugal compressor, both driven by a two-stage turbine; and a direct-flow annular combustion chamber. The accessory gearbox, located at the front, is driven by the gas generator. A two-stage power turbine provides power at the rear of the engine. The engine is controlled by a dual channel FADEC Engine Control Unit (ECU).

The Makila 2 series engines uses the same architecture to the Makila 1 series engines but with improved axial compressor, new bleed valve, new single crystal gas turbine blades and new power turbine technology. The Makila 2A1 is an up-rated power derivative of the Makila 2A, achieved by a re-calibrated 1<sup>st</sup> stage power turbine nozzle guide vane and new ECU software parameters.

Type Acceptance Certificate No. 14/21B/3 was granted on 2 October 2013 to the Makila 2 series based on validation of EASA Type Certificate E.006. Specific applicability is limited to the coverage provided by the operating documentation supplied. There are no special requirements for import into New Zealand.

#### 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 EASA.E.006

EASA Type Certificate Data Sheet number E.006, Issue 06 dated 15 October 2012

– Model Makila 2A approved 12 July 2004

– Model Makila 2A1 approved 5 May 2008

(2) Airworthiness design requirements:

(i) *Airworthiness Design Standards:*

The certification basis of the Makila 2A is JAR-E amendment 11, dated 1 November 2001. There were three special conditions, no deviations and two equivalent safety findings. These have been reviewed and accepted by the CAA.

The certification basis of the Makila 2A1 is JAR-E amendment 11, dated 1 November 2001 and CS-E initial issue dated 24 October 2003, paragraphs CS-E 50(f), CS-E 570(b)(2) and CS-E 570(c)(2). There were two special conditions, no deviations and one equivalent safety finding.

These are acceptable certification bases in accordance with NZCAR Part 21B Para §21.41 and Advisory Circular 21-1A, because JAR-E and the superceding CS-E specification is the European equivalent of FAR 33, the basic standard for aircraft engines called up under Part 21 Appendix C.

(ii) *Special Conditions:*

Makila 2A

CRI T1 issue 1 dated 19 December 2002: SC n<sup>o</sup>1 - 30 seconds and 2 minutes OEI ratings.

This condition defined requirements for OEI for assurance of power availability, instructions for continued airworthiness, automatic availability and control, pilot alerting and additional test requirements.

CRI T2 issue 1 dated 19 December 2002: SC n<sup>o</sup>2 - AEO 30 min rating.

Condition to provide alerting for the pilot when the 30 minute allowable continuous time spent at AEO-30min rating has expired. Additional procedures were also required to ensure engine deterioration in service would not exceed the level assumed for declaring TBO when using AEO-30 min rating.

CRI T3 issue 3 dated 12 February 2004: SC no3 – Software and programmed logic devices (PLD).

Condition to clarify and expand on the use of ED-80: design assurance guidance for civil aviation equipment (technically equivalent to RTCA/DO-254) for the design of the PLD since they are considered as complex as software.

Makila 2A1

CRI T1 issue 3 dated 14 April 2008: SC n<sup>o</sup>1 - 30 seconds and 2 minutes OEI ratings.

This condition defined requirements for OEI for assurance of power availability, instructions for continued airworthiness, automatic availability and control, pilot alerting and additional test requirements.

CRI T2 issue 3 dated 14 April 2008: SC n<sup>o</sup>2 - 30 min AEO rating.

Condition to provide alerting for the pilot when the 30 minute allowable continuous time spent at AEO-30min rating has expired. Part of the condition was a requirement to ensure engine deterioration in service would not exceed the level assumed for declaring TBO when using AEO-30 min rating.

(iii) *Equivalent Level of Safety Findings:*

Makila 2A

CRI-T4 issue 2 dated 24 April 2003: Equivalent Safety Finding – Indication to the flight crew of impending blockage for oil filter with a by-pass.

Equivalency to JAR-E570(a)(4)(ii) and (5)(ii) by incorporating a by-pass and ground pre-clogging indicator in accordance with JAR/FAR29.1019(a)(3).

CRI-T5 issue 1 dated 19 December 2002: Equivalent Safety Finding – Availability of 30 second OEI rating during transition from the OEI training mode.

Special condition CRI-T1 required automatic availability and control of the 30second OEI power, but inadvertent and unexpected application of this power when transitioning from OEI training mode could lead to an inappropriate crew response. Equivalency is provided by inhibiting automatic control but allowing pilot activation during the transition from training mode and by providing appropriate operating instructions.

Makila 2A1

CRI-T4 issue 3 dated 14 April 2008: Equivalent Safety Finding – Automatic availability of 30 second OEI rating when exiting training mode.

Special condition CRI-T1 required automatic availability and control of the 30second OEI power, but inadvertent and unexpected application of this power when transitioning from OEI training mode could lead to an inappropriate crew response. Equivalency is provided by inhibiting automatic control but allowing pilot activation during the transition from training mode and by providing appropriate operating instructions.

(iv) *Deviations:*

None

(v) *Airworthiness Limitations:*

See applicable Makila 2 Maintenance Manual Section 05-10

(3) Environmental Certification:

The Makila 2 series has been shown to meet the fuel venting requirements of ICAO Annex 16. Vol II, Part II, Chapter 2, Amendment 5 dated 24 November 2005.

(4) Certification Compliance Listing:

Makila 2A –Compliance Check List – 05/0704 – NT 685-2004

Makila 2A1 – Compliance Check List – NT AA018771 version D

(5) Flight Manual: N/A

(6) Operating Data for Engine:



Refer to TCDS E.006 for part numbers of manuals. Access to publications is provided at the [www.turbomeca-support.com](http://www.turbomeca-support.com) TOOLS website.

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

Letter from Turbomeca ref JL/AT no 34563 dated 26 August 2013.

## Attachments

The following documents form attachments to this report:

Copy of EASA Type Certificate Data Sheet Number E.006

## Sign off

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Greg Baum  
Airworthiness Engineer

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Checked – Peter Gill  
Airworthiness Engineer

## Appendix 1

### List of Type Accepted Variants:

<i>Model:</i>	<i>Applicant:</i>	<i>CAA Work Request:</i>	<i>Date Granted:</i>
Makila 2A	Turbomeca	14/21B/3	2 October 2013
Makila 2A1	Turbomeca	14/21B/3	2 October 2013