Type Acceptance Report

TAR 2/21B/10 – Revision 1

Zlin Z37T Series

RESTRICTED CATEGORY

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Executive Summary

New Zealand Type Acceptance has been granted to the Zlin Z37T/Z137T based on validation of Type Certificate number EASA.A.443. Type Acceptance has been granted in the Restricted Category, because the aircraft is only configured for agricultural operations and the airworthiness standard non-compliances have not been reviewed as appropriate for Standard Category. There are no special requirements for import.

Applicability is currently limited to the Models and/or serial numbers detailed in Section 2, which are now eligible for the issue of an Airworthiness Certificate in the Restricted Category in accordance with NZCAR §21.191, subject to any outstanding New Zealand operational requirements being met. (See Section 5 of this report for a review of compliance of the basic type design with the operating Rules.) 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. 2/21B/10 was granted in the Restricted 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; and

(c) Identify any additional requirements which must be complied with prior to the issue of a NZ Airworthiness Certificate or for any subsequent operations.

The report 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. The history of the Z37T/Z137T type acceptance in New Zealand under type certificate EASA.A.443 is listed in Appendix 1.

2. Aircraft Certification Details

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

Type Certificate Holder:	Zlin Aircraft a.s.
Type Certificate:	EASA.A.443
Issued by:	European Aviation Safety Agency
Manufacturer:	Moravan a.s.
Supersedes:	
Type Certificate:	Type Certificate of Airworthiness 84-01
Issued by:	Czechoslovak Socialist Republic – State Aviation Inspection

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

(i) **Model:**	Z-37T and Z-137T	
MCTOW:	2525 kg (5566 lb) Class for aerial work 2260 kg (4982 lb) Touring 2400 kg (5291 lb) Aerial work – 1st Series (until replacement of the tailwheel)	
Max. No. of Seats:	2	
Noise Standard:	ICAO Annex 16	
Engine:	Walter M601Z	
	Type Certificate:	E.070
	Issued by:	European Aviation Safety Agency
Propeller:	Avia V508Z	
	Type Certificate:	P.028
	Issued by:	European Aviation Safety Agency

Notes: 1. Refer to TCDS EASA.A.443 for specific applicability of engine and propeller combinations to individual aircraft models.

2. Refer to Advisory Circular 21-1 Appendix 2 for the New Zealand type acceptance status of any engines and propellers listed above.

3. Application Details and Background Information

The application for New Zealand type acceptance was from Super Air Ltd dated 13 March 2002. Six Z-37T aircraft are being imported from the Czech Republic, serial numbers 004, 008, 010 (registered ZK-DOZ), 011, 015 and 020 (registered ZK-WLO). The application included the Z-137T, for which a full set of technical data had been supplied by Moravan back in 1996. (At that time the type acceptance application was not processed further because the application fee was never paid.)

Type Acceptance Certificate No.2/21B/10 was granted on 11 November 2002 to the Zlin Models Z37T and Z137T in the Restricted Category, based on validation of Czech Type Certificate number 84-01, and includes the Walter M601Z Series engine based on Type Certificate number 75-03 and the Avia V508Z propeller based on Type Certificate number 75-02. Specific applicability is limited to the coverage provided by the operating documentation supplied. There are no special requirements for import into New Zealand.

The Z-37T "Agro-Turbo" is a turbine-engined development of the earlier LET Z37 Cmelak [Bumble Bee]. (A radial-piston-engined aircraft which was approved under BCAR Section D by the SLI under Czech Type Certificate No.66-05). The main change is the use of the M601Z, de-rated to 360 kW (490 hp). (Identical to the M601D version used on the Walter Fletcher, except for a power take-off to drive agricultural equipment.) Other changes were winglets, a strengthened centre-section to permit a higher all-up weight and a larger hopper of 1000 litres capacity. (The structural limit was initially 800 kg, later increased to 900 kg.)

The Z-37T was built in three series: Serial numbers 1 through 24 were Series 1 and 2 and were essentially identical. Serial number 25 was the Series 3 aircraft, and was effectively the prototype for the Z-137T. All subsequent aircraft were to the Z-137T specification, although Moravan documents suggest some were still called Z-37T. The Z-137T changes were the result of operational experience, particularly the installation of larger wheels. Power is increased from 360kW to 382 kW (520 hp), and a propeller "Take-off" setting is introduced to allow an increase from 1800 to 1900 RPM. In addition electric rudder and elevator trim systems were introduced; aircraft empty weight increased from 1250 to 1315 kg; and the forward empty centre of gravity limit was reduced from 20 to 21.5% MAC.

This report was raised to Revision 1 to update the format and note the change of State-of-Design type certificate jurisdiction to EASA.

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:

Type Certificate Data Sheet number EASA.A.443 at Issue 3 dated 23 July, 2010
– Model Z37T approved December 29, 1985
– Model Z137T approved June 15, 1988

Supersedes:
Z 37T Airplane Type Certificate of Airworthiness No. 84-01 – Issued 29.12.1985
(Typové osvédcení zpusobilosti (TOZ) k leteckemu provozu Z 37T, c.84-01)
Data Sheet to the TC of A No. 84-01 (Príloha k TOZ)
Supplement No.1 to the TC No.84-01 – Deviation from Airworthiness Standards
Supplement No.2 to the TC No.84-01 – Approval of 2-seat (utility) version Z37T-2
Supplement No.3 to the TC No.84-01 – Approval of Z137T and Z137T-2 versions
Supplement No.4 to TC No.84-01 – Increase of engine starting regime (take-off power) from 1800 to 1900 RPM, new additional equipment (atomizers, dusting.)
Supplement No.5 to the TC of A No.84-01 – Approval of aircraft outer noise.
Supplement No.6 to the TC of A No.84-01 – Gliders towing

Type Certificate Data Sheet number EASA.E.070 at Issue 09 dated 21 June 2021
– Model M601Z approved August 18, 1994

Supersedes:
Type Certificate of Airworthiness No.75-03 Walter M 601 A – Issued 29.04.1975
Supplement No.7 to the TC of A No.75-03 – Approval of Walter M 601 Z version
TC Data Sheet to Supp.7 to TC No.75-03 – M 601 Z Turbine engine

Type Certificate Data Sheet number EASA.P.028 at Issue 7 dated 7 Dec 2017
– Model V508Z approved 20 November 1984

Supersedes:
Type Certificate of Airworthiness No.75-02 Propeller Unit VJ8.508 – Issued 17.4.75
Supplement No.9 to the TC of A No.75-02 – Approval of VJ7.508Z version
TC Data Sheet to Supp.9 to TC No.75-02 – Propeller Unit VJ7.508Z

(2) Airworthiness design requirements:

(i) Airworthiness Design Standards:
The certification basis of the Z-37T and Z-137T is BCAR Section K– Light Aeroplanes Issue No. 6 dated April 1974, with some exemptions. This is an acceptable certification basis in accordance with NZCAR Part 21B Para §21.41, as BCAR Section K was the British equivalent to FAR 23, which is the basic standard for small airplanes called up under Part 21 Appendix C. The Czech CAA (Originally called the CAI, then SLI) accepted some non-compliances on the basis of equivalent safety and some Special Conditions were imposed.

These have been reviewed and accepted by the CAA. No additional special conditions have been prescribed by the Director under §21.23.

The M601Z engine, which is a version of the basic M601A, was type certificated under the Czech Regulation L8/C, as was the Avia VJ7.508Z propeller. This corresponds to BCAR Section C – Engines and Propellers. This is an acceptable standard as BCAR C was the British equivalent to FAR 33/35 or its predecessors. Subsequently the Czech CAA re-certificated both products. The M601Z was approved on 18 August 1994 under Type Certificate 90-04 against FAR 33, including Amendments 33-1 through 33-11. The V508Z was approved under TC 91-01 against FAR 35, including Amendments 1-6.

The Z-37T is the first type acceptance application where the foreign type certificate has not been validated by any other recognised national airworthiness authorities. Because of this some additional investigations were made. The Czech CAA was asked to supply an airworthiness history for the type. Of a total of seven accidents since 1986, none were fatal and five were attributed to human factor causes. (One was caused by a brake failure, and details were not available for one accident in South Africa.)

(ii) Special Conditions:

Nil

(iii) Equivalent Level of Safety Findings:

BCAR K 2-8 6.2.1 (Supp.1) – The aileron control force gradient does not increase steadily in certain sideslip manoeuvres. Accepted because the condition cannot be reached in normal operation.

BCAR K 2-10 4.1 (Supp.1) – Static lateral stability is slightly negative in some combinations of sideslip, flap and power settings. Accepted because it does not result in an uncontrolled flight attitude and the probability of reaching the critical angle of sideslip in normal flight operation is remote.

BCAR K 2-10 4.2 (Supp.1) – Static directional stability requirements are not met in certain conditions. Accepted because the rudder control force does not reverse in any case, and its occurrence is remote.

BCAR K 2-10 5.1 – Short period undamped steady oscillation occurs in certain descent conditions. Accepted because it is not divergent or destructive and speed is limited below the affected speed range.

BCAR K 2-10 6 – Tail unit buffeting can occur with the spreader in certain side-slip conditions. Accepted because the effect is temporary and easily stopped. There is a Caution in the Flight Manual.

BCAR K 3-2 2.10.1 – The control surface hinge sliding bearings safety factor is less than 6.67. Accepted because the strength of the hinges was not adversely affected, and more frequent inspections.

BCAR K 4-8 2.1.14b)(iii) – Wing flaps control knob not specified shape. Accepted on the basis that with fixed undercarriage there was no landing gear knob that could cause confusion.

BCAR K 5-2 4.2.2a) – Vibration testing of fuel tank was not carried out to the specified degree. Accepted because stricter testing was done in some cases and based on previous service experience.

BCAR K 5-8 – Function of fire protection equipment in the engine compartment was not fully proved by test. Accepted because equipment is in the fire zone and efficiency was proven by analysis.

BCAR K 6-1 2.10.2 – The aerodynamic correction above 230 km/hr was outside the design standard requirements.

BCAR K 6-1 2.11.3 – The static pressure system piping is only 4 mm inner dia. instead of 6.7 mm. Accepted because the position error has a safe margin, and on the basis of previous service experience.

BCAR J 2-1 9.6 – There is no means to instantly signal failure of the emergency power supply accumulator battery. Equivalent Safety was accepted on the basis of the installation of a volt-ammeter.

BCAR J 3-3 6.1 – There is no automatic device to disconnect the electrical circuit that could ignite spilled fuel. Equivalent Safety was accepted on the basis of the use of the master switch.

(iv) Airworthiness Limitations:
Nil listed in EASA TCDS. (Refers to individual certificates of airworthiness.)
Note: The aircraft has a 3000 hour airframe life

(3) Aircraft Noise and Engine Emission Standards:

(i) Environmental Standard:
L16 Volume 1 Chapter 10 (effective Oct 10, 1990) Average 70.9 dB(A) at MTOW 2260 kg (per TC Supplement 5) – TCDS notes ICAO Annex 16 – Issue 1, including changes 1 and 2 – Average corrected 72.9 dB(A)

(ii) Compliance Listing:
EASA TCDSN.A.443 at Issue 02 dated 24 January 2012

(4) Certification Compliance Listing:

Z37T/Z137T Survey of Compliance with the Airworthiness Standard Requirements – BCAR K; BCAR C (L8/C); BCAR D (L8/D); BCAR J (L8/J); Czechoslovak standard requirements (L6/II); Slovair requirements; Z137T; BCAR K (Fuel Aggregate M84)

CAI Declaration – Statement that BCAR Section K is certification basis of the Z137T for certification of the aircraft in Canada. (Not proceeded with.)

(5) Flight Manual: SAI-Approved Flight Manual Z-137T
CAA Accepted as AIR 2784

Letová příručka Z-37T "Agro-Turbo" (Flight Manual)

Letová příručka Z-37T "Agro-Turbo" 3.série (v.č. 0025)

NOTE: Because Z-37T manuals are not available in English, manuals for the Z-137T were reviewed for applicability and approved for use with the Z-37T. (Copies of the Czech language manuals were provided.)
A Mandatory Flight Manual Supplement was CAA-approved to cover differences between the models.

(6) Operating Data for Aircraft, Engine and Propeller:

(i) Maintenance Manual:
PŘÍRUČKA pro obsluhu a ūdržbu letounu Z-37T (Technical Manual)

Technical Manual of Z 137T Aircraft

Z 137T Aircraft Service and Maintenance Manual

Z 137T Aircraft Post-Seasonal Inspection

M-A Doc.No: IAW014/02 – ICA Applicable to Z37T, Z37T-2, Z137T

Walter M 601Z Turboprop Engine Flight Operation Manual

Walter M 60IZ Turboprop Engine Maintenance Manual (4 books)

Avia-Hamilton Standard V 508Z Propeller Maintenance Manual

(ii) Current service Information:
Set of Mandatory and Informative Service Bulletins for the Z 137T aircraft

(iii) Illustrated Parts Catalogue:
Catalogue of Spare Parts of Z 137T Aircraft

Catalogue of Agricultural Equipment Spare Parts of the Z 137T

Walter M 601Z Engine Illustrated Parts Catalog

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

Manufacturer's Statement from Head, Zlin Service, that manuals handed to CAANZ for Z137T type approval will be updated as necessary. This was re-validated by Michal Sum, Moravan Manager Airworthiness, on 19 June 2002.

(8) Other information:

Technical Description & Directions for the Attendance on the Suspension Aggregate M83.0.0000-0000

Manual of the Dusting Equipment for Forest M 82.0.5000

Manual of the Dusting Equipment for Forest M 82.1.5000, M82.2.5000, M82.3.5000

Handbook for the Z 37T and Z 137T Aircraft Filling with Chemicals

Republic of Hungary Certificate of Airworthiness for Z-137T s/n 045 HA-MGE

DoT Letter Ref. J15/12/170 – Z137T accepted for certification in South Africa

5. New Zealand Operational Rule Compliance

Compliance with the retrospective airworthiness requirements of NZCAR Part 26 has been assessed as they are a prerequisite for the grant of an airworthiness certificate.

Civil Aviation Rules Part 26

Subpart B – Additional Airworthiness Requirements

Appendix B – All Aircraft

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
B.1	Marking of Doors and Emergency Exits	***To be determined on an individual aircraft basis***
B.2	All aircraft certificated in Restricted Category for the purpose of agricultural operations must comply with Crew Protection Requirements of CAM 8 Appendix B # 35 in effect 1 Feb 1965 – Emergency landing loads : Fwd 9.0; Side 3.0; Vertical 6.0 down, 3.0 up; (crew weight 180 lb.) Cockpit hazards; Cargo provisions; Toxic materials;	BCAR Sub-Section K3 Structures Chapter K3-8 Emergency Alighting Conditions - 2. Accelerations: 4.0g down, 4.5g up; 9.0g fwd; 1.5g rear; 2.5g side. This requirement is satisfied by the K3-8 loads plus the K4-4 3.3.2 fitting factor of 1.33 for the seats and restraints. (See fax from Moravan received 21 June 2002)

Civil Aviation Rules Part 91

Subpart F – Instrument and Equipment Requirements

PARA:	REQUIREMENT:		MEANS OF COMPLIANCE:	
91.505	Shoulder Harness if Aerobatic; >10 pax; Flight Training		N/A – Not aerobatic, flight training, less than 10 passenger seats	
91.507	Pax Information Signs – Smoking, safety belts fastened		N/A – Less than ten passenger seats	
91.509 Min. VFR	(1) ASI	BCAR K 6-1 3.1.1 – see TCDS para 6.9.5 – LUN 1107-8	(7) Oil Pressure	BCAR K 6-1 3.2.1(a) – see TCDS para 6.9.5 - LUN 1538-8
	(2) Machmeter	N/A – No Mach No. limitations	(8) Coolant Temp	N/A – Turbine engine
	(3) Altimeter	BCAR K 6-1 3.1.2 – see TCDS para 6.9.5 – LU N 1124.01-8	(9) Oil Temperature	BCAR K 6-1 3.2.1(b) – see TCDS para 6.9.5 – LUN 1538-8
	(4) Magnetic Compass	BCAR K 6-1 3.1.3 – see TCDS para 6.9.5 – LUN 1221-8	(10) Manifold Pressure (11) Cylinder Head Temp.	N/A – Turbine engine N/A – Turbine engine
	(5) Fuel Contents	BCAR K 6-1 3.2.1(c) – TCDS para 6.9.5 – LUN 1626.01-8	(12) Flap Position	BCAR K 4-8 2.2.4(d) – Position shown by actuator LUN 7316.8
	(6) Engine RPM	BCAR K 6-1 3.2.3(a) – see TCDS para 6.9.5 – LUN 1302-8	(13) U/C Position (14) Ammeter/Voltmeter	N/A – Fixed undercarriage LUN 2715-8 Fitted as Standard
91.511 Night	(1)Turn and Slip (2) Position Lights	LUN 1213-8 Fitted as Standard N/A	(3) Anti-collision Lights (4) Instrument Lighting	N/A N/A
91.513	VFR communication equipment		***Operational requirement – compliance as applicable*** Note: Flight Manual Supplement DO-Z137T-1011.2 covers the installation of a Bendix/King KY196A VHF radio	
91.517 IFR	(1) Gyroscopic AH (2) Gyroscopic DI (3) Gyro Power Supply (4) Sensitive Altimeter	N/A LUN 1272 fitted as standard N/A LUN 1124.01-8 complies	(5) OAT (6) Time in hr/min/sec (7) ASI/Heated Pitot (8) Rate of Climb/Descent	N/A ASC 1 fitted as standard N/A LUN 1147-8 fitted as standard
NOTE: The Z-37T Series is approved for Day-VFR only. IFR, Night flights and intentional flight in icing conditions are Prohibited				
91.519	IFR Communication and Navigation Equipment		N/A – Not Instrument Flight Rules approved	
91.523	Emergency Equipment: (a) More Than 10 pax – First Aid Kits per Table 7 – Fire Extinguishers per Table 8 (b) More than 20 pax – Axe readily acceptable to crew (c) More than 61 pax – Portable megaphones Table 9		N/A – Less than 10 passenger seats Type V-05 portable water fire extinguisher fitted as standard N/A – Less than 20 passenger seats N/A – Less than 61 passenger seats	
91.529	ELT - TSO C91a after 1/4/97 (or replacement)		***To be determined on an individual aircraft basis***	
91.531	Oxygen Indicators - Volume/Pressure/Delivery		Oxygen system not fitted as standard	
91.533	Oxygen Equipment for Unpressurised Aircraft >30 min above FL100 – Supplemental for crew, 10% Pax Above FL100 – Supplemental for all Crew, Pax – 120l PBE for each crew member		Oxygen system not fitted as standard Maximum Operating Altitude is specified as 5000 m ISA – see Flight Manual Section 2.9	
91.541	SSR Transponder and Altitude Reporting Equipment		***Operational requirement – compliance as applicable***	
91.543	Altitude Alerting Device – Turbojet or Turbofan		N/A – Not turbojet or turbofan powered	
91.545	Assigned Altitude Indicator		N/A – Not Instrument Flight Rules approved	
A.15	ELT Installation Requirements		***To be determined on an individual aircraft basis***	

Civil Aviation Rules Part 137

Subpart F – Instrument and Equipment Requirements

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
137.255	Seating and Restraints – Shoulder harness required	Four-point harness fitted as standard – see Technical Manual Section 10.5 and Fig. 10-4, and IPC # T37.0.8140.000
137.257	Additional Instruments – Slip indicator required	Complies – See under 91.511(1) above
137.259	Additional equipment	See Appendix D compliance statements
	Appendix B – Overload Weight Determination	
B(a)	Z-37T design load factor is 3.7 @ 2260 kg (Touring Class), 3.2 @ 2525 (Aerial Work Class) – Maximum Recommended Weight Increase per Fig.2 is 129% → Overload MTOW = 2915 kg. (Based on Touring Class)	
	Appendix D – Instruments and Equipment Airworthiness Design Standards	
D.1	Seating and Restraints – Ultimate fwd inertia load of 12g – Complies – requires a fwd load of 9.0g, plus a fitting factor of 1.33 per BCAR K 4-4 3.3.2 – Static load testing of the seat and its clamping confirmed by Moravan – Seat was tested to 1.95 factor of the test loads of 9.0 fwd, or other combinations (7.5 fwd, ±4.5 up, 2.25 side) – See Report Z-2971/85 translation	
D.2	Hopper permitted maximum load Based on empty weight of 1250 kg. (per TCDS), pilot weight 77 kg, one hour fuel at 75% power of 141 kg (sfc at Maximum Continuous Power is 577 g/kWh per TCDS), and oil allowance of 1 kg (average oil consumption per TCDS is 0.1 l/hr), → Max hopper load = 2915-1469 = 1446 kg. (Note the Maximum Hopper Load per Flight Manual is 900 kg.)	
D.3	Hoppers and spray tanks – 12g fwd/1.5 rear/1.0 sideways (If could injure pilot coming loose in a minor crash landing) The hopper is aft of the pilot. Moravan advise that the chemical tank has been tested for a load of 900 kg without perforation or dangerous deformation. (Initial impact testing was carried out in July 1983 at 800 kg. (See Crash Test Report Z37-012.) This was subsequently increased to 900 kg by calculation in Report Z37T-099. (The results were n_x=10.95 fwd, n_y=8.96 down and n_z=1.78 side [Resultant N=13.59] The Safety Factor was 1.95 – See Stress Report Z37T-090)	
D.4	Hopper upper level contents – Indication to pilot, allowing for the likely range of agricultural material densities – The chemicals tank has only internal markings to indicate the volume of the load carried. There is also a LUN 1472.02-8 indicator in the cockpit which shows the weight of the chemicals in the hopper – This will therefore be Required Equipment.	
D.5	Jettison gear – Must be capable of discharging 80% of max. load in 5 seconds; – simple to operate, single action required – BCAR K 4-9 1.71. – Jettison tests carried out – see Report Z37-062 – 4 dump trials carried out with water and sand and four with spreader jettison. The resulting "Time to Jettison" for sand ranged from 3.0 to 4.5 seconds	
D.6	Markings and Placards – Tank maximum loadings, jettison times - passenger location, flight limitations	***To be determined on an individual aircraft basis***

NOTES: 1. A Design Rule reference in the Means of Compliance column indicates the Design Rule was directly equivalent to the CAR requirement, and compliance is achieved for the basic aircraft type design by certification against the original Design Rule.

2. The CAR Compliance Tables above were correct at the time of issue of the Type Acceptance Report. The Rules may have changed since that date and should be checked individually.

3. Some means of compliance above are specific to a particular model/configuration. Compliance with Part 91/119 operating requirements should be checked in each case, particularly oxygen system capacity and emergency equipment.

Attachments

The following documents form attachments to this report:

Copy of Type Certificate Data Sheet EASA.A.443

Sign off

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David Gill
Team Leader Aircraft Inspection

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Checked – Glen Somerville
Certification Engineer

Appendix 1

List of Type Accepted Variants:

Model:	*Applicant:*	*CAA Work Request:*	*Date Granted:*
Z-37T, Z-137T	Super Air Limited	2/21B/10	11 November 2002

Appendix 2

3-view Drawing Zlin Z-137T