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# **Type Acceptance Report**

**TAR 99/18**

**PZL-104 Wilga 35A**



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## Introduction

This report details the basis on which Type Acceptance Certificate No.99/18 was granted in the standard category in accordance with NZCAR Part 21 Subpart B. Specifically it aims to:

- (a) Record the airworthiness certification standard used for type acceptance of the applicable model in New Zealand;
- (b) Summarise any outstanding requirements which must be complied with for the issue of an Airworthiness Certificate to any models covered by the Type Acceptance Certificate.

## Foreign Type Certificate Details

Type Certificate: Nr BB-55/1

Issued by: Polish People's Republic MoT Civil Aviation Inspection Board

Manufacturer: Panstwowe Zaklady Lotnicze Warszawa-Okecie

Model: PZL-104 Wilga 35

Engine: AI-14R [260 hp @ 2350 RPM]

Propeller: US-122000

MCTOW: 1230 kg (2712 lb.) – Increased to 1300 kg (2866 lb.) per supplement No.3 to BB-55, issued March, 1969 - (The LFV Import Report states the increase is applicable to serial number 85218 and on.)

Noise Category: N/A

The certification basis of the PZL-104 Wilga 35 is British Civil Airworthiness Requirements Section D, 1959. This is an acceptable airworthiness standard for the standard category in accordance with Advisory Circular 21-1A, as BCAR Section D is the predecessor to BCAR Part 23. The latter is equivalent to FAR Part 23, which is the basic standard for Normal Category Airplanes called up under NZCAR Part 21B Appendix C. There are no non-compliances and no special conditions have been prescribed by the Director under §21.23.

## Type Acceptance Application

The application for New Zealand type acceptance was from the New Zealand agent for the aircraft, Alternate Aviation, dated 12 November 1998. The PZL-104 Wilga 35 was originally type accepted in New Zealand on 15 May 1992, in the Restricted Category. This application sought an amendment to the type acceptance certificate to re-categorise the aircraft in the standard category. (See later discussion.)

Type Acceptance Certificate No.99/18 was granted to the PZL-104 Wilga 35 in the Standard Category on 22 January 1999.

The prototype PZL-104 Wilga first flew in April 1962 with a 180hp Narkiewicz WN-6 piston engine. This aircraft proved to have disappointing performance and the revised Wilga II flew in August 1963 with a completely redesigned fuselage and 220hp WN-6R engine. PZL subsequently developed the Wilga C version fitted with a 220 hp Continental O-470 engine, which was type certificated in 1964 at a MTOW of 1150 kg. After further development and modifications PZL introduced the Wilga 3 series. The Wilga 32 has the Continental O-470 while the Wilga 35 is equipped with the Russian AI-14RA radial. (The Wilga 32 was license-manufactured in Indonesia as the Lipnur Gelatik.) As with all Wilga models the 35 is produced in two models; the Version A,

for aero club, glider towing and carrying of parachutists; and the Version P, for executive transport. The exact differences between the versions is unknown and the TCDS lists a common Flight Manual, although AIR 2437 is applicable to the 35A Version: Aeroclub – Dual Control.

## Type Data

The type data requirements of the then NZCAR Section B.9 were satisfied by supply of some type data, as listed in the original TA Report No. 6/91. This included:

(1) *Type certificates and associated Data Sheets:*

Polish MoT/CAIB Type Certificate Form No. 004 Type PZL-104CP Issued 7.11.1964  
MoT/CAIB Type Certificate Nr BB-016 for “Wilga” Type PZL-104CA Issued 4.06.1966  
MoT/CAIB Type Certificate Nr BB-55/1 for Type PZL-104 “Wilga” Issued 31.03.1969  
Polish CAIB Aircraft Type Certificate Data Sheet BB-55 – Issue 1, March 1969  
Supplement No 3 dated September 1985 to aircraft data sheet BB-55  
List of Divergencies of the PZL-104 Wilga 35 with the BCAR Part D Edition 1959  
German LBA Type Certificate Nr. 745 PZL-104 “Wilga 35” issued 08 September 1976  
Luftfahrt-Bundesamt Gerätekenntblatt Nr. 745 Ausgabe Nr.:4 dated 11.02.1991

(2) *Flight manual:* PZL-104 “Wilga 35A” Flight Manual – bearing s/n from 85218  
Version: Aeroclub – Dual Control - CAA Approved as AIR 2437  
(The NZ pages were re-issued, removing the mandatory Supplement B)

The following additional data has been provided in support of the present application:

Letter from Mr W. Gadomski B.Sc.Eng. Chief Designer PZL-104 Airplane – Information on Differences Between the PZL-104 Wilga 35 and Wilga 80 Airplanes – Warsaw, 1997  
Luftfartsverket Import Inspection Report Nr 13/86 – PZL-104 Wilga 35 21/6/86  
Luftfartsverket Test Flight Report type PZL-104 Wilga 35 SE-IUU dated 19.08.1986  
Sweden Board of Civil Aviation Type Acceptance Certificate No. 13/86 - Wilga 35/35A  
Fax from Deputy Chief Section, Airworthiness, Federal Office for Civil Aviation 5-11-98  
Fax from Head, Certification Section, Luftfahrt Bundesamt dated 1 October 1998

## Background

Type Acceptance Report No.6/91 was issued after extensive investigations by the CAA, including contact with the Polish authorities. (See their letter dated 17 April, 1992 on file 61/203/1.) However although GILC acknowledged the inquiry no follow-up or answer was ever received. The only supporting type data provided was a report titled Abstract from Calculations of External Loads of the PZL-104 Wilga Airplane Advisory Circular BCAR Part D dated December 1985 and a fatigue results report No. BZW-35-30-16 dated February 1985. The translated text of a letter [Ref.BK/40101/305/12899/91] signed by the Chief Designer PZL-104 and Director Aircraft Developments states “All sections (clauses) of BCAR Part D Edition 1959 have been complied with except divergencies, total number sixteen as listed”. A complete set of technical publications, including an electrical load analysis and list of Technical Bulletins were also supplied.

TA Report 6/91 provided a very comprehensive summary of the evaluation process and detailed two primary issues which prevented acceptance in the standard category:

1. There was insufficient data to confirm compliance with the certification basis; and
2. Flight Manual performance data could not be shown as complying with CASO 4.

The Report was reviewed by the Controller Aircraft Certification, Mr Steve Douglas, who ruled in his memo dated 29 June 1992 that full compliance had not been shown, although the non-compliances were “fairly vague”.

In May 1998 Alternate Aviation asked Brian Farrell to explore again the possibility of the Wilga 35 being approved in the standard category. The CAA advised that this would be considered, but in light of the effort already expended the review would only be made on the basis of new information supplied. Suggested avenues included a comparison with the FAA type certificated Wilga 80, which was accepted in the standard category, or data to show the Polish TC for the PZL-104 Wilga 35 had been validated in the Air Transport category by other countries whose airworthiness requirements or national airworthiness authorities were recognised by the CAA.

## Additional Information Review

### WILGA 35/WILGA 80 DESIGN DIFFERENCES

The applicant has provided a letter from the PZL-104 Chief Designer listing the differences between the Wilga 35 and Wilga 80 models, as follows:

- increased strength of wing spars and skins resulting from increased load factor,  $n=3.5$  to  $3.8$ ;
- modified fuel system with the fuel tank provided with two vents and lower fuel fillers, as well as a modified fuel valve drawing fuel separately from each tank and installed under the floor;
- modified power plant systems: delivery of heated air to the carburettor, air intake with automotive filter elements, steel oil container with venting to the engine crankcase, additional steel fire-resisting division, and the engine with the carburettor reinstalled backwards.

### OTHER FOREIGN COUNTRY ACCEPTANCE

Information was provided from the Swedish LFV, comprising translations of their Test Flight Report, Import Inspection Report and the Type Acceptance Certificate. Mr Eskil Wikland, Manager Aircraft Engineering Office, confirmed the report classified the aircraft as “Normal/Standard/Passenger approved for VFR/IFR day and night but not for icing conditions” and that the aircraft could be “used commercially in Sweden”.

The LBA were contacted requesting details of the basis of their Wilga 35 type certificate. (At the time Germany, like NZ, used the FARs as their basic airworthiness standard.) The LBA replied that the Wilga 35 was certificated in the “normal” category on the basis of compliance with BCAR Section D and additional LBA requirements comprising some FAR 23 paragraphs at the latest (1974) amendments. Applicability was to serial number 85218 on, and it is eligible in the category “TP3” which means “commercial operation under VFR rules”. Unfortunately the former type certification report is not available, and the LBA was unable to say whether any changes were required to the basic type design. Three s/n aircraft complied at the time with the additional requirements, except the LBA accepted the BCAR  $n=3.5$  instead of the FAR  $n=3.8$  on the basis of equivalent safety. The reason of acceptance “was the fact that based on very high stick-force the g-value of 3.8 was nearly impossible to reach in normal operation”. Note under the Reunification Treaty all Wilga type aircraft are now eligible for registration in Germany.

The Swiss Federal Office for Civil Aviation were also contacted as the Wilga 35 was known to be accepted there. BAZL replied that model acceptance was based on validation of the Polish Type Certificate and inspection of some additional documentation. They believe the additional data was that required under US FAA AC 21-2H, but this could not be confirmed for certain due to a fire in their archives some five years ago. The only additional requirements imposed were to meet noise regulations. “If properly equipped the Wilga 35 is eligible for commercial operations in Switzerland”.

In the UK AAN 12267 states the Wilga 32 was accepted for validation in the Transport Category (Passenger), provided a stall warning system was fitted. The Wilga 35 was also considered acceptable, but could not be given a full clearance in the General Purpose Category because the

Engine Department of the CAA had insufficient knowledge to clear the engine. The engine and propeller have subsequently been type certificated by the FAA. An informal inquiry by the CAA in 1995 elicited the response that the UK CAA did not see a problem accepting the Wilga 35 in principle, but the exercise would only be done if there was a [paying] applicant. Note a UK CAA modification (DWG BAE210) was required for the centre attachment of the front seat belts, following a fatal accident due to failure of the original attachment fixture.

## Discussion

The refusal by CAC Steve Douglas to grant standard category type acceptance to the PZL-104 Wilga was unprecedented. In doing so the CAA was not accepting at face value a type certificate issued against an acceptable airworthiness standard (per NZCAR C.2) by a previously recognised national airworthiness authority. (Many Polish glider type certificates have been accepted in NZ and the aircraft operated with a satisfactory airworthiness history.) The exact reason for the non-acceptance was not clear and this made it difficult for the applicant to address.

One of the two specific issues identified in TAR 6/91, compliance with CASO 4, is no longer required under Part 91. As explained in Advisory Circular 91-3 a pilot is only required to fly using the performance data specified in the Flight Manual. (Compliance with Air Transport performance requirements under NZCAR Part 119 has now become the responsibility of the aircraft operator.) A Flight Manual, per NZCAR Part 21 Appendix C, must contain as a minimum “the operating limitations and information required to be provided by the applicable airworthiness design standard, in the form of a manual, markings or placards”. The PZL-104 Flight Manual approved as AIR 2437 is quite a comprehensive document and easily comparable with equivalent US and UK aircraft manuals. The layout of the manual is very similar to the modern accepted GAMA format. (The points noted under remarks in the NZCAR B.10 review of the manual are all of a relatively minor nature.)

The lack of reports confirming the certification basis is satisfied by the aircraft being accepted by the UK CAA (Wilga 32 and 35 by inference) and the German LBA, both of which involved more than a superficial appraisal. (The LBA assessed the aircraft against FAR 23. In addition the Wilga 35 is very similar to the Wilga 80, except for changes to the fuel system, carburettor and firewall. PZL state that the original Wilga 35 design features have been well proven in service.) Validation has also been given by Sweden and Switzerland, in both cases by recognised airworthiness authorities who have a history, and thus expertise, of certification programmes of their own. In the sixties a single compliance checklist, as envisioned by §21.43(a)(3) was not generally produced, and is thus just not available. The main FAA reports were usually the Type and Flight Inspection Reports, plus a separate structural analysis. These are not always available either, especially for older aircraft or where the original manufacturer is no longer in business. The type data provided with the Wilga 35 in fact is not untypical for the class and era of aircraft.

In summary if the total Wilga 35 information available was supplied now under a new type acceptance application it would certainly be granted a type acceptance certificate in the Standard Category. The two main issues identified in TAR 6/91 from the previous investigation have now been addressed by either the additional data which has been provided, or have been superseded by a Rule change, as noted above.

## Current New Zealand Certification Requirements

Since this application is being made under NZCAR Part 21B full compliance with that Rule has been assessed. In addition compliance with other NZ requirements which have come into effect since the original type acceptance has been reviewed and were found to be covered by either the original certification requirements or the basic build standard of the aircraft, except as noted:



## Civil Aviation Rules Part 21

### Subpart B – Type Acceptance Certificates

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
21.41	(1) Meets an airworthiness design std. Per Appendix C (2) Meets any special conditions imposed by Director (3) Any non-compliances have equivalent safety  (4) No unsafe design features or characteristics	Polish Type Certificate BB-55 – BCAR Section D No Special Conditions imposed under §21.23 No non-compliances – The list of Polish Divergencies was not reviewed because they were accepted by the GILC for the issue of the type certificate, and were not an issue for other authorities, including Germany and the UK. None identified during First-of-Type inspection 22 Nov 1991
21.43(a)	(1) Evidence of a type certificate by a contracting state (2) Details of the Airworthiness Requirements satisfied (3) List of data submitted for certification  (4) Copy of the Flight Manual (5) The illustrated Parts Catalogue (6) Maintenance Data for aircraft, engine and propeller (7) Evidence of a revision service for (4),(5) and (6)	Poland is an ICAO Country Type Certificate BB/55 plus foreign validation Data provided is consistent with what has been accepted in other cases for older aircraft. (See discussion) Supplied with original application – See TA Report 96/1 Supplied with original application – See TA Report 96/1 Supplied with original application – See TA Report 96/1 Statement from Director PZL Warszawa-Okecie 1991
21.43(b)	Director may specify a range of serial numbers or models of aircraft to which the application relates.	Type acceptance applicability is dependant on Flight Manual coverage. Hence this application shall apply to Wilga 35A aircraft serial number 85218 and on. This also corresponds to the serial number range covered by the LBA type certificate. (Polish serial numbers relate to batches. For the Wilga 35, 85218 means a/c no. 218 of batch 8 manufactured in 1975.)

## 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	<i>To be determined on an individual aircraft basis</i>
B.2	Crew Protection Requirements - Agricultural Aircraft	CAM 8 Appendix B Section .35 – Not Applicable

## 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 – Less than 10 pax, non-aerobatic, not used for training
91.507	Pax Information Signs - Smoking, safety belts fastened	N/A – Less than 10 passenger seats
91.509 Min. VFR	(1) ASI Fitted as standard – see Flight Manual Section 6 Fig.2 #9 N/A Fitted as standard – see Flight Manual Section 6 Fig.2 #10 NOTE – original Polish metric instrument replaced (4) Magnetic Compass Fitted as standard – see Flight Manual Section 6 Fig.2 #22 (5) Fuel Contents Underwing float-type gauges See Flight Manual §1.2.7 (6) Engine RPM Fitted as standard – see Flight Manual Section 6 Fig.2 #14	(7) Oil Pressure Fitted as standard – see Flight Manual Section 6 Fig.2 #16 N/A – Air Cooled (8) Coolant Temp (9) Oil Temperature Fitted as standard – see Flight Manual Section 6 Fig.2 #9 (10) Manifold Pressure Fitted as standard – see Flight Manual Section 6 Fig.2 #9 (11) Cylinder Head Temp. Fitted as standard – see Flight Manual Section 6 Fig.2 #9 (12) Flap Position Indicatr Notched Lever (13) U/c Position N/A – Fixed undercarriage (14) Ammeter/Voltmeter Fitted as standard – see Flight Manual Section 6 Fig.2 #9
91511 Night	(1) Turn and Slip Fitted as standard – see Flight Manual Section 6 Fig.2 #25 (2) Position Lights See Flight Manual §1.2.13	(3) Anti-collision Lights (4) Instrument Lighting <i>Not standard equipment</i> Fitted as standard – see Flight Manual §1.2.13
91.513	VFR Communication Equipment	The original Polish PS6102 VHF radio was found unsuitable and had to be replaced by Western style equipment.
91.517 IFR	(1) Gyroscopic AH Fitted as standard – see Flight Manual Section 6 Fig.2 #12 (2) Gyroscopic DI Gyro Compass Type GB-1 or GB-27 standard equipment <i>To be determined as required</i> (3) Gyro Power Supply Polish instrument replaced (4) Sensitive Altimeter	(5) OAT (6) Time in hr/min/sec <i>To be determined as required</i> Fitted as standard – see Flight Manual Section 6 Fig.2 #24 (7) ASI/Heated Pitot See Flight Manual §1.2.9 (8) Rate of Climb/Descent Fitted as standard – see Flight Manual Section 6 Fig.2 #13
91.523	(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	<i>Only required for Air Transport operations</i> Fitted as standard – see Flight Manual §1.2.12 and Fig.1 #28 N/A – Less than 20 passenger seats

	(c) More than 61 pax - Portable Megaphones per Table 9	N/A – Less than 61 passenger seats
91.529	ELT - TSO C91a after 1/4/97 (or replacement)	<b>To be determined on an individual aircraft basis</b>
91.531	Oxygen Indicators - Volume/Pressure/Delivery	Oxygen system not fitted as standard
91.533	>30 min above FL100 - Supplemental for crew, 10% Pax - Therapeutic for 3% of Pax Above FL100 - Supplemental for all Crew, Passengers; Therapeutic for 1% Pax; 120l pbe for each crew member	Oxygen system not fitted as standard
91.543	Altitude Alerting Device - Turbojet or Turbofan	N/A – Reciprocating-engine powered
91.545	Assigned Altitude Indicator	<b>To be complied with as required</b>
A.15	ELT Installation Requirements	<b>To be determined on an individual aircraft basis</b>

## Civil Aviation Rules Part 135

### Subpart F - Instrument and Equipment Requirements

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
135.355	Seating and Restraints – Shoulder harness for each crew seat	A shoulder harness is not fitted as standard. For operation in the Restricted category for aerial work one was required by NZCAR C.4. Modification RAL 1054 was subsequently approved by Aaleda Systems as AS1211.
135.357	Additional Instruments (Powerplant and Propeller)	Has the instruments required by FAR §23.1305
135.359	Night Flight	Landing light, Pax compartment <b>To be complied with as required</b>
135.361	IFR Operations	Speed, Alt, spare bulbs/fuses <b>To be complied with as required</b>
135.363	Emergency Equipment (Part 91.523 (a) and (b))	<b>To be complied with as required</b>
135.365	Public Address and Crew Member Intercom System	N/A – Less than 10 passenger seats
135.367	Cockpit Voice Recorder/TSO C84 or C123	N/A – Less than 10 passenger seats
135.369	Flight Data Recorder/TSO C124	N/A – Less than 10 passenger seats
135.371	Additional Attitude Indicator	N/A – Not turbo jet powered
135.373	Weather Radar/TSO C63	N/A – MCTOW less than 5700 kg.
135.375	Ground Proximity Warning System/TSO C92	N/A – Less than 10 pax seats and MCTOW under 5700 kg.

## Summary

Type Acceptance Certificate No.99/18 has been granted to the PZL-104 Wilga 35A and serial numbers 85218 and on are eligible for the issue of a New Zealand Airworthiness Certificate in the Standard Category in accordance with CAR §21.177, subject to any outstanding operational requirements noted above being met.

## Attachments

The following documents form attachments to this report:

Photographs PZL-104 Wilga 35 serial no.140548 ZK-PZN

Three-view drawing PZL-104 Wilga 35

Copy of Type Certificate/Type Certificate Data Sheet BB-55

## Sign off

David Gill  
Airworthiness Engineer

Date: 22 January 1999