AIRWORTHINESS APPROVAL NOTE NO: 29466

APPLICANT:	Horizon Aircraft Services Ltd
AIRCRAFT TYPE:	Yak-52
REGISTRATION NO:	G-CJBV CONSTRUCTOR'S NO: 867203
OPERATOR:	-
INSTALLER:	-
DESIGN ORGANISATION	-
CERTIFICATE CATEGORY:	CAA Permit to Fly
MODIFICATION NO:	-
MODIFICATION TITLE:	**To Approve the Yak-52 Registration G-CJBV, Serial No. 867203 for the Issue of a Permit To Fly**

1. Introduction

The YAK-52 is a two seat piston engined primary trainer aircraft which is a tandem cockpit variant of the single seat Yak-50 aeroplane. It was announced in 1978 as a replacement for the Yak-18 and made it's first flight less than a year after commencement of the design work. The Yak-52 is designed by the Russian company, Yakovlev, although all Yak-52 aeroplanes have been produced in Romania under licence. Manufacture of the type began in 1979 and the 1000th aeroplane was delivered in 1987.

This Yak-52 was constructed in 1986 and entered service in Russia with first flight on 26th June 1986. It served with DOSAAF and underwent a major overhaul on 17th November 2008 at 518 hours 35 minutes. It was released for a further 500 hours and operated until 14th August 2012 when it had flown a total of 581 hours 27 minutes. The aircraft was registered in France as F-WRUP on 18th June 2013 and flew a further 61 hours 56 minutes before being ferried to the UK. It has now flown a total of 640 hours 23 minutes

The purpose of this AAN is to approve this Yak-52 for the issue of a Permit to Fly.

2. Aircraft Build Standard

This aircraft has not been type-certificated and there is no TCDS.

The Yak-52 is a single engined two seat (tandem configuration) low wing primary trainer aeroplane of nominally all-metal construction with full aerobatic capability.

The fuselage is of a conventional light alloy semi-monocoque construction with a cantilever light alloy tail structure. The wings are of a single spar all metal stressed skin construction with trailing edge split flaps. The control surfaces are fabric covered. There is a ground adjustable tab on each aileron and on the rudder, and a controllable trim tab in the port elevator.

The landing gear is semi-retractable and is pneumatically operated. The nose gear retracts rearwards and the main gear forwards but all remain exposed against the under surface of the aeroplane to offer greater safety in the event of a wheels up

landing. Emergency operation of the landing gear is via an independent pneumatic system which is charged on the ground. The pneumatic system works at a pressure of 50 bars (720psi). The brakes system are also operated by the pneumatic system via a pressure reducer to 8 bars (120psi).

The aeroplane is powered by a nine cylinder Vedeneyev M-14P air cooled radial engine nominally 360 hp manufactured by Ivchenko. The aircraft/engine has a fully inverted fuel and oil system. The propeller is a two bladed V530TA-D35. Cowl flaps are fitted to assist in the warming up of the engine by selecting them closed. Once at running temperatures, they must be selected open. The controls are in the front cockpit which is the "command" cockpit.

The fuel system consists of two tanks in the wings, each of 60 litres capacity feeding a small collector tank in the fuselage. The engine draws its fuel from the collector tank. There is a single on-off fuel cock in each cockpit. Engine priming is accomplished by a two position injector pump operated from the front cockpit. A fuel drain is provided under the aircraft centre section and drains from the collector tank.

The electrical system is supplied by a nominal 28 volt engine driven generator with an associated voltage regulator. The system is protected by cartridge fuses.

Other modifications installed on this aircraft are:

a)	Yak/7C	Replacement batteries (via CAA Minor Modification Approval 9/217/9103AV)
b)	Yak/13	Training springs removed. (via AAN 24351 Add 1)
c)	-	Smoke System (see paragraph 5.1.3 (c))
d)	YAK 52 003	Barrier on Rear Cockpit Floor to comply with MPD 2008-005 (via CAA Minor Modification Approval 9/203/M/0175)

3. Approval Procedures

This aircraft approval has been carried out in accordance with BCAR A3-7. Although this is a foreign product, the absence of a foreign type approval requires reference to BCAR Section A rather than BCAR Section B.

4. Basis of Approval

4.1 CAA Approval Basis For The Aircraft

This aeroplane is an example of the same type granted a Permit to fly by virtue of the issue of AAN 24089. The basis of approval for this aeroplane is the extensive operating experience of the type as a basic training aeroplane for the Russian military (over 1800 examples of this type have been produced), together with an investigation of the design standard and operational aspects of the aeroplane. In addition, a significant number have been operating on the UK register for a number of years, and have demonstrated appropriate standards of airworthiness.

4.2 CAA Design Requirements For Permit to Fly

CAP 747	GR No. 6	Electrical generation systems low volts
CAP 747	GR No. 25	Aerobatic Smoke Systems

Any installed equipment for which the Air Navigation Order requires approval must be approved by the CAA.

4.3 Environmental Requirements

A Noise certificate is not currently required for an ex-military aircraft operating on a Permit to Fly.

4.4 Design Requirements Associated With Operational Approvals

Not applicable.

5. Compliance With The Basis Of Approval

5.1 Compliance With The Approval Basis For The Aircraft

This aeroplane was imported into the UK with a French Certificate of Airworthiness. The generic design of this aeroplane was accepted under AAN 24089 on the basis of satisfactory service history.

5.1.1 Manufacturers Modifications required for Airworthiness

The data sheet for the aeroplane generated by the aircraft manufacturer defines a V_{NE} of 450 km/hour for aeroplanes modified in accordance with their "Bulletins 59R, 60R & 107BD". This aeroplane is modified in accordance with the above bulletins, 107BD being fitted at overhaul.

The applicant has provided a check list of manufacturers modifications/service bulletins required for airworthiness and confirmed that all applicable to this aircraft (on serial number basis) have been embodied.

The applicant has also confirmed compliance with MPDs to date.

5.1.2 Modifications required for CAA Approval

A review of the first aeroplane revealed a number of features of the design of this aeroplane which were deemed unacceptable for approval on the aeroplane for the issue of a Permit to Fly. These features concerned the ability to disable or override a number of control and instrumentation functions from the rear cockpit, given that the front cockpit is designated as the "command" cockpit.

These concerns have been addressed by a number of modifications initiated by the applicant which have been reviewed by CAA and have been found acceptable.

Modification No.	Description
YAK/01/AEROBUILD	To disable the simulated failure switches (rear cockpit)
YAK/02/AEROBUILD	To disable the starter isolation switch (rear cockpit)
YAK/03/AEROBUILD	To disable the brake arming switch (rear cockpit)
YAK/06/AEROBUILD	English Placarding

The aircraft must have its original fabric-covered control surfaces recovered with appropriate western materials, unless it can be shown that this has been carried out since import (see MPD 1998-020). Applicant states that this aircraft was covered with appropriate material.

5.1.3 Other Modifications

Modifications carried out to comply with manufacturer's SBs are covered in 5.1.1 above.

a) The original 'Varley' Battery is not suitable for aerobatics unless drained of acid prior to each flight. It has been replaced by two smaller "Hitachi" batteries in accordance with a customer modification approved as a minor modification. Applicants modification YAK 07 AEROBUILD, Replacement of Varley Battery (CAA Minor Modification 9/217/9103AV refers).

b) The "training springs" in the control circuits have been removed from this aircraft in accordance with modification Yak/13 which is approved under AAN 24351 Addendum No. 1.

c) A smoke system was found installed upon import but there is currently no design information available. The Applicant has therefore opted to make the system inoperative by removing the fuse and placarding the cockpit switch. Once design information is available and operation of the smoke system is required, a new application for a major change to this AAN will be required.

d) A barrier on the rear cockpit floor to comply with MPD 2008-005 has been installed in accordance with modification YAK 52 003 and approved by CAA Minor Modification Approval 9/203/M/0175.

5.1.4 Structural Life Limits

The airframe structural limitations and life are determined by the modification standard as follows.

Yak-52 serial numbers are made up as follows:

Example 866703	made up of	86	Year of manufacture
		67	Series
		03	Sequential aircraft number

Group	Series	Modification State	Limitations
1	01 to 64 inclusive	Without Bulletins 59-R, 60-R and 107-BD incorporated	Load factors +5/-3g, non-aerobatic, initial airframe life 1000 flying hours, 5000 landings or 15 years from new.
2	01 to 64 inclusive	With Bulletins 59-R and 60-R incorporated and without Bulletin 107-BD incorporated	Load factors +7/-5g, aerobatic, no flick manoeuvres, initial airframe life 1000 flying hours, 6000 landings or 15 years from new.
3	1 to 64 inclusive --- 65 to 112 inclusive --- 113 and later	With Bulletins 59-R, 60-R and 107-BD incorporated --- With Bulletin 107-BD incorporated --- As factory built	Load factors +7/-5g, aerobatic, initial airframe life 1500 flying hours, 7000 landings or 20 years from new.

Modifications listed above are:

(59-R) Reinforcement of wing junction
(60-R) Replacement of fuselage beam
(107-BD) Fitting of reinforcement strap for the wing spar

This example is Series 72 with Bulletin 107-BD incorporated. This aircraft is therefore in Group 3. To extend the airframe life beyond these limits, see CAA MPD 1998-017, currently at Revision 5.

This aircraft was overhauled by Termikas on 17 November 2008 at 518 hours 35 minutes and released for a further 500 hours.

5.1.5 Life Limited parts

The applicant has presented a list of lifed items applicable to the aeroplane as generated by the aircraft manufacturer. These lives (as follows) must be incorporated in the maintenance schedule for the aeroplane.

Description	**Part Number**	**Life Limit hr's/years**
Propeller	V530TA-D35	500/6
Air Bottle	LM-375a-11-50	-/5
Air Bottle	LM-375a-3-50	-/5
Speed Indicator	US-450K	Per LAMS/LAMP*
Meter	AM-9S	On condition
Vacuum Pressure Gauge	MV-16K	On condition
Cylindrical Thermometers	TTT-13	On condition
Fuel Pressure Transducers	P-1B	On condition
Oil Pressure Transducers	PM-15B	On condition
Bottles Pressure Gauge	2M-80K	On condition
Flexible pipes	as fitted*	-/6**

* The current LAMS/LAMP requirement for the ASI is for an annual function check and calibration using appropriate test equipment.
**A service bulletin from the manufacturer states that the flexible pipes have a finite life of 10 years from date of manufacture with no limit on the number of flight hours. Within this period the use of the pipes is subject to the requirements in LAMS.

5.1.6 Engine and Propeller

The Vedeneyev M-14P engine serial number KR841037 has completed a total time of 254 hours 04 minutes since new and 131 hours 48 minutes hours since major overhaul. Subsequent overhauls are due every 500 hours thereafter to a maximum life of 2250 hours in accordance with MPD 1998-001.

Engine modifications required for airworthiness are embodied at the time of overhaul of the aircraft.

The standard V530TA-D35 propeller serial number 5000280 has been newly overhauled and lifed for 500 hours or 6 years.

5.1.7 Radio

The following avionic equipment is installed:

Manufacturer	Type	Category	Approval No
Becker	AR6201	VHF Comm	EASA.21O.1249
Becker	BXP6401-2	Transponder	EASA.21O.322

5.2 Compliance With Design Requirements For Permit to Fly

A generator failure light is fitted along with a voltmeter as standard, and Generic Requirement No. 6 is satisfied as loss of electrical power would not prejudice continued safe flight and landing and the aircraft is restricted to Day/VMC.

Load shedding with modification YAK/07C gives 2.03 hours given 75% battery condition.

The undercarriage is all pneumatic as per all services. The undercarriage has mechanical indicators that protrude from the wings when gear is down.

5.3 Compliance with Environmental Requirements

Not applicable.

5.4 Compliance with Design Requirements Associated With Operational Approvals

Not applicable.

5.5 Required Manuals And Other Documents Including Mandatory Placards

a. Flight Manual - The applicant has provided a set of Pilot's Notes based on a translation of the Pilots Notes for the aeroplane as modified (Reference Aerobuild Limited Yakovlev Yak 52 Flight Manual AB/FA/52-Issue 3) which are considered acceptable.

Later issues accepted by CAA are also considered appropriate provided the limitations as defined in this section of the AAN are not changed.

b. Placards - see section 6 below

c. Electrical Load Analysis - An electrical load analysis in accordance with Generic Requirement No. 6, although not required, has been carried out, see 5.2 above.

d. Maintenance Manual - The applicant has elected to use a Maintenance Manual translated from original data recommended by the aircraft manufacturer.

e. Maintenance Schedule – The schedule is defined as Horizon Aircraft – Yak Annual Service MP/03265/P Initial Issue 01 September 2013.

f. Weight and Balance Schedule - This aeroplane has been weighed to establish the empty weight and cg position and confirm the relative cg positions of fuel and pilots. Planeweighs Limited report number 17247 dated 1 June 2016 refers.

The applicant has presented a Planeweighs Limited Weight and Centre of Gravity Schedule reference PWL 17247 based on the Planeweighs Limited report.

6. Conditions Affecting This Approval

The applicant has placarded the aeroplane where appropriate in English

The following limitations shall apply:

Maximum Take-Off Weight	1315 kg (2899 lb)	
*Manoeuvre load limits	+7g/-5g	
Centre of Gravity Limitations	One Pilot	17.5%-27% MAC
	Two Pilots	23%-27% MAC

This corresponds to: 17.2cm -32.8 cm forward of datum (One Pilot)
17.2cm -23.78cm forward of datum (Two Pilots)
Where the datum is a point 61.5 cm aft of the leading edge of the wing 210.8cm from the centreline of the aircraft corresponding to frame 5.

*Never Exceed Speed (V_{NE})	420 km/hr (227 knots)
*Maximum Manoeuvring Speed (V_A)	360 km/hr (194 knots)
*Maximum Speed Flaps Extended (V_{FE})	170 km/hr (92 knots)
*Maximum Speed Gear Extended (V_{LE})	200 km/hr (108 knots)

*Solo flight from front cockpit only

Aerobatics and spinning are permitted except as detailed below:

Aerobatics are prohibited	a)	with flaps and/or landing gear extended
	b)	With a fuel load of 20 litres or less

Maximum permitted altitude 10,000 feet

Powerplant Limitations:

	Prop Actual	Gauge rpm
*Maximum	1975 rpm	100% (5 minutes max)
Maximum Continuous	1580 rpm	82%

Those limitations above marked (*) must be indicated in both cockpits (where appropriate) by means of appropriate placards or instrument markings.

Additional placards stating the non certified nature of this aeroplane (in accordance with Article 42 (2) of The Air Navigation Order 2016) must be installed in both cockpits and defined on the Permit to Fly.

7. Continued Airworthiness

All relevant Service Bulletins and MPDs shall be complied with.

8. Survey

In the particular areas examined during the survey the aircraft was found to conform with the standard recorded by this AAN.

9. Issue of Permit to Fly

The following actions must be completed prior to initial issue of the Permit to Fly:

a. All actions and ground test procedures specified by the maintenance schedule must be completed satisfactorily.

b. It must be verified that the documents or amendments to documents, and the placards defined under Section 5.5 above are as specified, including any changes specified under Section 8 above.

c. The first aeroplane of this type was the subject of a flight test by CAA. The performance and handling of the aeroplane was considered to be acceptable. Flight Test Report FTR 8838P refers. Other examples have been flown by CAA. CAA flight test of this example is not required.

For G-CJBV, an airworthiness flight test must be carried out in accordance with CAA Check Flight Schedule CFS 2 Issue 2. This test flight may be performed by the installer's nominated pilot, who must be acceptable to the CAA. The results of this assessment must be sent to the CAA and the outcome must be satisfactory to the CAA prior to the issue of the Permit to Fly. The test flight was carried out on 6 October 2016 by Mr R Oliver and was accepted by the CAA on 17 October 2016.

10. Approval

Subject to the conditions of Section 6 above, this aircraft is approved for the issue of a CAA Permit to Fly, provided that it is operated in accordance with the limitations specified/referenced and that it conforms with the contents of this AAN. and provided it is maintained in accordance with a maintenance schedule approved by the CAA.

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N J Davis
For the Civil Aviation Authority
Date 8th September 2016