

BRITISH MICROLIGHT AIRCRAFT ASSOCIATION
HOME BUILT AIRCRAFT DATA SHEET (HADS)

NO: HM5 ISSUE: 11

TYPE	Raj Hamsa X' Air Falcon (UK) * (<i>X' Air Mk.2 Falcon</i>)	
(1)	MANUFACTURER:	Individual aircraft are amateur constructed, BMAA is responsible for continued airworthiness.
(2)	UK IMPORTER:	UK Importer of Kits, The Wessex Light Aeroplane Company Limited, 7 Fullands Avenue, Taunton, TA1 3DE
(3)	CERTIFICATION:	BCAR SECTION S, (in the modification state at the date of manufacture or modification of any example)
(4)	DEFINITION OF BASIC STANDARD:	“RAND KAR s.a.r.l Manuel de Montage, X' Air <<F>>”, as amended by BMAA list of amendments to comply with BCAR Section S (available from importer but summarised in Annex A to this HADS)
(5)	COMPLIANCE WITH THE MICROLIGHT DEFINITION	
	(a) MTOW	450 kg
	(b) No. Seats	2
	(c) Maximum Wing Loading	31.5 kg/m ²
	(d) V _{so}	35 kn CAS
	(e) Permitted range of pilot weights	55 – 90 kg per seat.
	(f) Typical Empty Weight (ZFW) (912 engine)	265 kg
	(g) ZFW + 172 kg crew + 1 hr fuel (16 litres/11.5 kg) (912 engine)	448.5 kg
	(h) ZFW + 86 kg pilot + full fuel (63 litres/45.4 kg)	396.4 kg
	(i) Max allowed ZFW at initial permit issue [#]	266.5 kg (912) 262 kg (Jabiru 2.2) 263 kg (Verner 133M) 260 kg (582)

* Note: During aircraft construction, this HADS is to be used with the X' Air stage inspection sheets, form BMAA/AW/022 (X' Air Falcon). If there is a conflict between the two, the latest HADS will always take precedence.

[#] The maximum ZFW is the lower of [(a)-(172kg+1hrs fuel@MCP)] or [(a)-(86kg+full fuel)].
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(6) POWER PLANTS

Designation	X' Air Falcon Jabiru(1) ¹	X' Air Falcon Jabiru(2) ¹	X' Air Falcon Jabiru(3)	X' Air Falcon Jabiru(4)
Engine Type	Jabiru 2.2L serial numbers >22A710	Jabiru 2.2L serial numbers <22A710	Jabiru 2.2L serial numbers >22A710	
Engine mounts	X' Air France design			
Reduction Gear	Direct Drive			
Exhaust System	Jabiru part No. CM02580			
Intake System	Bing type 64/32 carb + K&N filter (interior vented to carb vent)			
Propeller Type	Arplast Ecoprop 166 R 4T 110/2 (2-blade)	Warpdrive, GA 2-blade	Newton laminated wood	GT laminated wood
Propeller Dia x Pitch	166cm x 6° at tip	64", x 7° at tip	60" x 40"	157cm x 98cm
Noise Type Cert No.	164M issue 13	164M issue 13	164M issue 15	164M issue 15
MAAN approving	1616	1643	1718	1758

Designation	X' Air Falcon 912 (1)			
Engine Type	Rotax 912 UL DCDI			
Engine mounts	Wessex LAC Dwgs 1-16			
Reduction Gear	Rotax 1:2.273			
Exhaust System	Wessex LAC Part E1			
Intake System	K&N			
Propeller Type	Duc windspoon 3-blade			
Propeller Dia x Pitch	68" x 11°			
Noise Type Cert No.	164M issue 11			
MAAN approving	1554			

¹ Note: Jabiru 2.2L engines pre serial number 22A710 have different characteristics from post 22A710.
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Designation	X' Air Falcon V2(1)	X' Air Falcon 582 (1)	X' Air Falcon 582 (2)	X' Air Falcon 133(1)
Engine Type	Simonini Victor II	Rotax 582/48-2V	Rotax 582/48-2V	Verner 133M
Engine mounts	Kit standard			WLAC Verner mounts
Reduction Gear	Simonini C-type 2.76:1	B-type 2.58:1	C-type 3:1	2:1
Exhaust System	Simonini	Rotax straight exhaust with double ball-joint, plus 6" vertical extension. ²		Verner
Intake System	Simonini	K&N	K&N	Twin Dellorto
Propeller Type	Duc windspoon 2-blade	Ivoprop 3-blade	Duc windspoon 2-blade	Duc windspoon 2-blade
Propeller Dia x Pitch	68", pitch 16° @ spoon	65", pitch 14.5°	68", pitch 16° @ spoon	68", pitch 12° @ spoon
Noise Type Cert No.	164M issue 13	164M issue 15	164M issue 15	164M issue 14
MAAN approving	1638	1792	1686	1683

(7) MANDATORY LIMITATIONS:

(A) Max Take-Off Weight	450 kg												
(B) CG Limits	<i>Aft limit</i> 4.5" fwd of datum <i>FWD Limit</i> 10" fwd of datum												
(C) CG datum	Mainwheel axle centreline (see annex C).												
(D) Cockpit Loadings	<table> <thead> <tr> <th></th> <th>Port</th> <th>Starboard</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>Min</td> <td>55 kg</td> <td>-</td> <td>55 kg</td> </tr> <tr> <td>Max</td> <td>90 kg</td> <td>90 kg</td> <td>180 kg</td> </tr> </tbody> </table>		Port	Starboard	Total	Min	55 kg	-	55 kg	Max	90 kg	90 kg	180 kg
	Port	Starboard	Total										
Min	55 kg	-	55 kg										
Max	90 kg	90 kg	180 kg										

² Extension essential to prevent fume ingress into cockpit at high power settings. Note that this requires modification to the exhaust from the standard Rotax part.

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(E) Never Exceed Speed	85 kn CAS ³
(F) Manoeuvring Speed	70 kn CAS
(G) Flap Limiting Speed	70 kn CAS
(H) Permitted Manoeuvres	Max 60° bank. Non Aerobatic Normal acceleration limits, +4 / -2g
(I) Fuel Contents (Max Useable)	63 litres (28 litres with single tank mod)

³ Flight test limit, V_{DF} 95 kn CAS.
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(J) Power Plant

See Table

Engine	Rotax 912UL	Jabiru 2.2L	Simonini Victor II	Verner 133M	Rotax 582/48-2V
Max RPM	5800	3,300	6500	5000	6800 (6500 continuous)
Max CHT	150 °C	250°C	120°C (20°C differential)	220°C	150°C
Max EGT	900 °C	N/A	620°C (20°C differential)	820°C	650°
Fuel Spec	83 MON or 90 RON minimum unleaded to BE(EN)228 or 97+ octane MOGAS leaded fuel to BS4040, or AVGAS 100LL				
Engine Oil Spec	SAE 20/50 for 0-25°C See engine manual for other operating conditions	See engine operators manual	See engine operators manual	See engine operators manual	See engine operators manual
Gearbox oil spec	See gearbox manual	N/A	See gearbox manual	As per engine (integral)	See gearbox manual
Fuel/Oil Mix	4-stroke, add no oil		33:1 (unleaded) 40:1 (leaded)	4-stroke, add no oil	50:1
Max. Coolant Temperature	150°C by CHT gauge	N/A	N/A	N/A	80°C
Max Oil Pressure	1.5 bar	525kPa / 76psi	N/A	70 psi	N/A
Min Oil Pressure	5.0 bar	220 kPa / 31psi – normal use. 80 kPa / 11psi @ idle	N/A	15 psi	
Oil Temperature	50 – 140°C	118°C cont.	N/A	50-95°C	
Fuel pressure at cruise power	0.2 → 0.5 bar at 3000 RPM		0.2 – 0.4 bar	2.2-10.1psi	0.2 – 0.4 bar

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(8) INSTRUMENTS REQUIRED:

ASI*	Altimeter*	RPM	EGT	Compass	Coolant temp	CHT	Fuel Pressure	VSI	Slip ball
Required to 100 kn	Required to 10,000 ft	Required to 1000 beyond engine limit	Required (2 strokes)	Required	At least one required**		Required	Optional	Optional

*Unless specifically approved otherwise, an exterior static vent is to be fitted immediately forward of a leading edge wing strut at least 8 inches vertically below the wing lower skin, serving both the ASI and altimeter, + if fitted, the VSI. If a 2-tube combined pressure head is used, the static must be shorter than, and directly below, the pitot tube.

**CHT, Oil temperature and oil pressure are mandatory for 4-stroke engines.

(9) CONTROL DEFLECTIONS:

Elevator UP:	25°±2°	Tailplane trim UP:	60°-15°
Elevator DOWN:	35°±2°	Tailplane trim DOWN:	60°-15°
Ailerons* UP:	30°±3°	Rudder LEFT:	20°±2°
Ailerons* Down:	28°±3°	Rudder RIGHT:	20°±2°
Flaps:	Within 2° of 21° and 35° as shown on cockpit indicator.		

Notes: (1) Ailerons to be set central (lower surface 2° trailing-edge down compared to wing lower surface near tips), not reflexed as the Mk.1

(2) Maximum 2° freeway between the two sides of the elevator.

(10) PILOT'S NOTES, MAINTENANCE MANUALS REFERENCES:

10.1 Manuals approved for use with this aircraft.

- (a) Construction to X' Air Falcon (UK) Construction Manual, issue 1, 26 Feb 2002.
- (b) Raj Hamsa X' Air (UK) Falcon Operators Manual issue 1 AL0.
- (c) Engine manual to be at Annex B to the Operators Manual.
- (d) Maintenance to be to MMS-1 (TIL 020) as amended by the operators manual.

10.2 The following placards are to be fitted:-

- (a) Flight Limitations Placard (to be visible to pilot) See Annex D.
- (b) Engine Limitations Placard (to be located near to engine instruments)
See Annex D.
- (c) Fuel Limitations Placard (to be located near to filler cap)

A placard is to be fitted showing fuel capacity, fuel type(s), fuel:oil ratio (if relevant) and if MTOW can be exceeded with full fuel and 180kg cockpit weight, the fuel loads at MTOW for cockpit weights of 180kg / 170kg / 160kg etc. at 10kg (or less) intervals down to the maximum fuel load. An example is shown at Annex D.

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(d) ASI Placard

Unless at in-flight calibration all ASI readings were within 2 kn of CAS, a correction placard from 30 kn CAS to V_{NE} at no more than 10 kn intervals, and at V_{so} , V_a and best glide speed, must show the corrections from IAS to CAS. For values, see the approval MAAN for the particular aircraft. An example is shown at Annex D.

The ASI must also be marked with a white arc from V_S to V_A / V_{FE} , an amber arc from V_A / V_{FE} to V_{NE} and a radial red line at V_{NE} .

(e) Pitch Trimmer Instructions

See Annex D.

(f) Switches

See Annex D.

Note: It is recommended that airspeed placards are not fitted to new aircraft until after flight testing, due to the requirement for pitot-static system calibrations.

(11) MANDATORY MODIFICATIONS / SERVICE BULLETINS / AIRWORTHINESS DIRECTIVES ETC:


See Annex A for required modifications.

Annual Bettsometer test is to be carried out to 1360 grammes / 1.2mm needle with wing sails fitted and tensioned to flight. Test must be to both upper and lower surfaces.

(12) MINIMUM PERFORMANCE AT MAX TAKE-OFF WEIGHT

Rate of climb: See Annex F.

Stall or minimum flying speed: 35 kn CAS at MTOW/6" fod CG/idle

BMAA Approval:		G B Gratton Chief Technical Officer	12 September 2005
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Issue History

HM5 issue A (draft)	Preliminary build standard document, to permit construction of prototype.
HM5 issue B (draft)	Flight test draft
HM5 issue C (draft)	Post flight test, pre final approval. Draft to permit construction of further examples of the type.
HM5 issue 1	On approval of first example, showing first formal approval standard 912(1), authorised by MAAN 1554 issue 1.
HM5 issue 2	Approval of configuration Jabiru(1), authorised by MAAN 1616. Minor editorial changes. Addition of Simonini V2 and Rotax 582 engines. Removal of requirement for EGT gauge for 4-stroke variants. Addition of inspection note for tears in aileron hinge brackets and baggage compartments. Change to optional modification 4 and introduction of optional modification 14, approval of WLAC wide doors. Addition of points 9 & 10 in Annex E.
HM5 issue 3	Approval of configuration Jabiru(2), authorised by MAAN 1643.
HM5 issue 4	Approval of configuration V2(1), authorised by MAAN 1638. Addition of Annex F.
HM5 issue 5	Approval of configuration 133(1), authorised by MAAN 1683. Addition of Verner 133M engine details.
HM5 issue 6	Addition of configuration Jabiru(4), approval of configuration 582(2), approved by MAAN 1686. Also modification to optional mods 13, 22 due to changes to kit standard.
HM5 issue 7	Approval of configuration Jabiru(3), approved by MAAN 1718. Addition of optional modification 15, wheel spats, read across from X'Air approval, modification to notes regarding pitot-static placement and aileron setting
HM5 issue 8	Approval of configuration Jabiru(4), approved by MAAN 1758; correction of incorrect TODR for 133 configurations.
HM5 issue 9	Modification to Verner engined aircraft MZFW. Correction to aileron neutral setting.
HM5 issue 10	Approval of configuration 582(1), authorised by MAAN 1792.
HM5 issue 11	Correction of typographical error in configuration 582(1).

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Illustration of Aircraft



ANNEX A – MANDATORY MODIFICATIONS

No. Brief Description

1. Alteration of the flap lever mechanism to give a more robust and smoother action.
2. Pivot bolts secured using split pins
3. Link tube to fuel tanks of petrol proof material
4. Addition of Curtis drain cocks on fuel tank drains, by means of thread adapters
5. Replacement of pod retaining nuts with nyloc types.
6. Addition of nylon cable guides to totally enclose trim cables
7. Trim cable locking nut on trim pulley
8. Lug soldered onto trim cable to engage with pulley in order to prevent slipping
9. Addition of curved large diameter washers to re-enforce seat back bolting arrangement.
10. Modification of throttle operation and cable arrangements, addition of throttle spring at cockpit control. (Rotax and Jabiru engined aircraft only).
11. Covering of tube between seats with durable tape to protect from over-running control cables.

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No. Brief Description

12. Plastic spacers between floor and pod
13. Either (a) Insertion of nylon washers at pin-jointed ends of jury struts, *or*
(b) Confirmation that slots are too small to allow any significant movement of joints.
14. Re-arrangement of aileron cable pulleys and the addition of an extra cable retainer to prevent side-rubbing of the pulley flanged caused by mis-alignment.
15. Centralising bracket for exhaust. (912 engined aircraft only).
16. Replacement of lower tailplane cable support bolt with an AN aircraft bolt.
17. Shimming with washers of the centre aileron bearing support to prevent significant freeplay between the two ailerons.
18. Lightweight chest straps with quick-release clips to be attached just above the harness front-buckles.
19. Retaining chains to be fitted to water and oil caps. (If required by specific engine type)
20. (Blank, see optional mod No.13)
21. Replace front end of elevator operating tube with new 150 mm long insert. Drill to give correct elevator deflections.
22. Either (a) Penny washers used as shims to retain centre-line operation of elevator fork in horns. *or*
(b) Confirmation that slots are too small to allow any significant movement between the two elevators.
23. Battery compartment to be installed as per approved design. This may be purchased from WLAC or manufactured to the drawings issued with the Mod Manual.

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ANNEX B - APPROVED OPTIONAL MODIFICATIONS

The installation of all optional modifications is to be inspected by a BMAA inspector and an entry made in the appropriate logbook(s). Note that other approved modifications may exist which are not listed here – however these should be described in other BMAA approval documentation.

No. Brief Description

1. Installation of curved shim washers at lower of 3 rudder hinges to ensure alignment of hinges and reduce wear.
2. Parking brake, supplied by Wessex Light Aeroplane Company. Inspectors must confirm that this will hold the aircraft still on grass with cruise power set.
3. Installation of a separately switched electric booster pump, located between and below the two fuel tanks. This modification becomes MANDATORY if the fuel pressure is unable to remain above 0.2 bar / 3 psi between 3500 and 6500 rpm (2-stroke engines) or between flight idle and max-continuous (4-stroke engines) and the problem cannot be fixed by other means.
4. Fitment of alloy tube framed doors for the **narrow** door opening (to be of Wessex Light Aeroplane Company manufacture, or other as approved by BMAA modification). The original Rand Karl / Raj Hamsa lightweight doors are **unacceptable**. (see optional modification 14 for the wide door option).
5. Bend to top edge of wing support stainless steel brackets to avoid weld confliction i.a.w. and Wessex Light Aeroplane Company drawings and instructions
6. Filing 1.0 - 1.5mm from mainwheel bearing distance-piece to ensure stub-end is flush with wheel casting at the other side.
7. Landing light of approved WLAC design fitted under the forward part of the Pod and supplied with a switch, indicator instrument panel warning light, and fused. This should be wired after the main key switch to avoid being accidentally left on
8. Combined Pitot and Static pressure head to WLAC drawing in the mod manual.
9. Wide door opening.
10. Removal or non-fitment of port fuel tank, blocking of base connection of stbd tank.
11. Fitment of lightweight CFRP floor pan, replacing original plywood floor pan.
12. Fitment of lightweight alloy wheels in place of original Indian-supplied wheels.
13. Windscreen fairing (1.5 mm thick Lexan) between cabin roof and under wing to alleviate flutter at high speed.

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No. Brief Description

- 14.** Fitment of composite framed doors for the **wide** door opening (to be of Wessex Light Aeroplane Company manufacture, or other as approved by BMAA modification), which include catches at the bottom and mid positions. (see optional modification 4 for the narrow door option).
- 15.** Spats, of type supplied by Wessex Light Aeroplane Company. If fitted after manufacture, a new W&CG report is to be prepared; if this is done using existing weighing data, add 0.45kg to the recorded load at each Mainwheel.

Note

Although not mandatory, mods. 10-12 and non-use of mod 9, are likely to be required with a 912 engine in order to remain within weight limits.

ANNEX C

WEIGHING INFORMATION

1. CG Datum: Mainwheel axle centreline (positive forward)
2. Weighing attitude: All 3 wheels on a level surface.
3. Mainwheel moment arm: 0
4. Nosewheel moment arm: 55" fwd of datum
5. Fuel moment arm: 10" aft of datum (63 litres maximum capacity)
6. Crew moment arm: 6" fwd of datum
7. Crew weights: Minimum 55 kg / maximum 90 kg
(maximum reducible, not below 86 kg, if required).
8. Aft CG Limit: 4.5" FoD
9. Fwd CG Limit: 10" FoD

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ANNEX D

EXAMPLE PLACARDS

- (a) Flight Limitations Placard (to be visible to pilot)

<u>X' Air Falcon [Engine] [Registration]</u>	
Never Exceed Speed:	_____ IAS *
Manoeuvring Speed :	_____ IAS *
Stall Speed:	_____ IAS *
Best climb speed:	_____ IAS *
Best glide speed:	_____ IAS*
Bank angle limits:	+/- 60°
Maximum Stall entry rate:	5 kn/s
Normal Acceleration Limits:	+4 / -2g
Empty Weight:	_____ kg **
Max Take-Off Weight:	450 kg
Minimum Cockpit Weight:	55 kg
Maximum Cockpit Weight:	90 kg in each seat.
Aerobatics and deliberate spinning prohibited.	

*Values and units IAS will be given in the approval MAAN for the individual aircraft.

** This must match the most recent W&CG report for the aircraft.

- (b) Engine Limitations Placard (to be located near to engine instruments)

All engine parameter limitations are to be shown as coloured markers (red for danger, amber for caution) on the instrument displays. A placard mounted close to the engine instruments showing these limitations is also recommended.

- (c) Fuel Limitations Placard (to be located near to filler cap)

FUEL	
Capacity 28 / 63 Litres	
(ratio): 1 2-stroke oil / 4-stroke, add no oil	
<u>Cockpit Weight (kg)</u>	<u>Max. Fuel Load (litres)</u>
180	
170	
....	
.... Or below	63 litres
83 MON or 90 RON minimum unleaded to BS(EN)228 or AVGAS 100LL	

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(d) ASI Placard

kn CAS (Calibrated)	30	35 V _S	36 Best climb angle	40	50	51 Best glide, Best Climb, Approach	60	70 V _A V _{FE}	80	85 V _{NE}
Kn / mph IAS (Indicated)										

(e) Pitch Trimmer Instructions

PITCH TRIM nose down ← → nose up
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(f) Switches

All switches are to be marked with function and sense (up=on, down=off).

(g) Flaps

The flap operating lever is to be marked, in view of a pilot strapped into the left hand seat, with each flap setting in degrees.

(h) Baggage Compartment

To be placarded “MAX 3 kg”

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ANNEX E

POINTS FOR SPECIAL ATTENTION

In service, the following points have been found to be commonly recurring faults, and Inspectors must give special attention to the following both during initial approval, and during later inspections.

No. Brief Description

1. Visible scores, from the manufacturing process, to stainless steel wing-strut brackets. Any parts found to display visible scores are faulty and must be replaced with new parts before any further flight.
2. Failure to ensure a leak-free external static source, or inadvertent deletion of the external static source
3. Failure to properly apply a proprietary threadlocking compound to the wheel hub bolts
4. Poor hole fitting at tailplane bolts, which tends to cause chafing. Acceptable solutions are part replacement (recommended at initial construction) or drilling through, deburring, and fitment of a slightly larger, AN type bolt.
5. Placards and limitations must be as stated in the approval **MAAN**, and **not** use CAS values as given in the HADS.
6. Failures to take into account the requirements of BMAA TIL 007 and 027 during the design and installation of the engine and instrument fittings.
7. Jury strut brackets contain sharp corners and are potentially prone to fatigue cracking. These are to be carefully checked and if necessary subject to a dye-penetrant inspection.
8. Manufactured tear at corner of rudder and elevator hinge brackets. These should be checked during construction, and a tear, if found, is to be removed by introducing a smooth internal radius using appropriate hand tools. Subject this area to a thorough visual inspection during permit renewal / annual inspection; if fatigue crack propagation is found, replace the bracket before further flight.
9. Inspectors should ensure that operators have a copy of the approved Operators Manual (reference AL0 issue 1, signed on the front cover by the CTO and the Test Pilot) and should not be using the manual issued by Rand Kar.

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No. Brief Description

10. The baggage compartment that may come with the kit may not be approved. The only baggage compartment that is approved on this aircraft is the one that is formed from a zipped pouch in the fabric bulkhead at the rear of the cockpit and should be placarded for a maximum load of 3kg. Any other baggage compartment should not be used, and preferably not installed or permanently disabled. Inspectors should particularly look out for one type that has been supplied to some customers, which may be placarded for 20kg and is supported by attachment points to the rear fuselage area.

ANNEX E

SCHEDULED PERFORMANCE FOR APPROVED CONFIGURATIONS

<u>Configurations</u>	<u>TODR, metres</u> <i>(unfactored in italics)</i>	<u>LDR, metres</u>	<u>Climb Rate, fpm</u>	<u>Glide Ratio</u>
Rotax 582(2)	409m <i>(315m)</i>	299m	670 fpm	7:1
Rotax 912 engine	308m <i>(237m)</i>	299m	700 fpm	5.3:1
Jabiru 2.2L engine serial 710 or earlier	404m <i>(311m)</i>	299m	477 fpm	7:1
Jabiru 2.2L engine serial after 710	302m <i>(232m)</i>	299m	550 fpm	7:1
Simonini Victor II	456m <i>(351m)</i>	299m	625 fpm	7:1
Verner 133M	320m <i>(246m)</i>	299m	936 fpm	7:1

All scheduled performance values are for ISA, sea-level, still-air conditions, with a short dry – grass runway surface. Take-off and landing values are over a 15m (50ft) obstacle clearance height.