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JABIRU J170-D 2020 PILOT OPERATING HANDBOOK



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Jabiru Aircraft

Model: J170-D

PILOT'S OPERATING HANDBOOK

JP-FM-13

Revision 4

28th February 2020

Airplane Registration Number: _____

Airplane Serial Number: _____

THIS DOCUMENT MUST BE CARRIED IN THE AIRCRAFT AT ALL TIMES

THIS AIRCRAFT MUST BE OPERATED IN ACCORDANCE WITH THE APPROVED DATA AND LIMITATIONS CONTAINED IN THIS MANUAL AT ALL TIMES.

ANY PERSON FINDING THIS MANUAL IS REQUESTED TO RETURN IT TO JABIRU AIRCRAFT

Record of Manual Revisions

This manual is revised as a complete document. All pages must display the same revision number.

Revision Notes:

0	Initial Issue
1	Layout revised as per ASTM F2746 - 12
2	Omissions and Errors corrected Amplified Emergency Procedure added Minimum Take-off Oil temp corrected to be 40ºC (104ºF)
3	Note added to section 8.6 Oil spec changed to SAE J-1899 (MIL-L-22851 obsolete) Add reference to JEM0002 in section 4.6.9
4	Fuel pressure max limit changed (section 2.7) Add header tank fuel volume (section 6.1) Extra Warning against oil & fuel additives (section 8.6) V_O added to terminology (section 0.5) Cruise power adjusted (Section 4.6.9) Charging system procedures amplified (sections 3.3.5, 3.4.7 & 4.6.3). PO Box (section 0.2) Standards List (section 0.4)

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0. INTRODUCTION

0.1 PILOT'S OPERATING HANDBOOK

The POH handbook consists of the following:

Basic POH

The basic POH provides all the information, procedures and limitations required to operate the aircraft as a Light Sport Aircraft. This basic POH is applicable to all Jabiru J170-D Aircraft.

The operating procedures presented herein are the result of Jabiru Aircraft's knowledge and experience gained up to the date of issue of this handbook. The handbook may be used for operational purposes only if kept in a fully amended state. It contains all the information considered necessary to safely operate the aircraft.

The operator must be thoroughly familiar with the aircraft and the contents of this handbook before initial operation. Thereafter the handbook should be reviewed periodically to enable the operator to maintain the highest level of familiarity with the aircraft, its controls and recommended operating procedures.

This POH also includes the information required of the Flight Training Supplement: there is no separate FTS for the J170-D.

Supplements

Self contained supplements are provided in Section 9 of the POH to provide details and procedures associated with the fitment of specified optional and special purpose equipment. Supplements are specific to the particular aircraft S/No. displayed on their title page.

Amendments

This manual is revised as a complete document. When a new issue of the manual becomes available operators must transfer the aircraft-specific data (such as aircraft weight and balance information and supplements) to the new manual. The old manual must not be used for further operation of the aircraft.

Operators must then familiarise themselves with the new revision of the manual. Those sections of the manual which have been revised are shown with red text.

0.2 SUPPORTING DOCUMENTATION

The following manuals are required for correct operation & maintenance of the Jabiru J170-D. The current revisions are available free of charge from the Jabiru Aircraft website www.jabiru.net.au :

- Pilot's Operating Handbook
- Aircraft Technical Manual (incorporating Propeller Maintenance Manual)
- Engine Maintenance Manual
- Engine Overhaul Manual

In addition, the operator and maintainer must be aware of all current supplemental service information issued by Jabiru Aircraft – again, the latest revisions are available from the Jabiru Aircraft website. These documents include:

- Service Bulletins
- LSA Safety Directives
- Service Letters

Finally, operators and maintainers must be aware of any requirements issued by Airworthiness Authorities and available from their respective web sites:

- Airworthiness Directives issued by the Civil Aviation Safety Authority
- Recreational Airworthiness Notice issued by Recreational Aviation Australia

0.3 MANUFACTURER DETAILS

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QLD 4670
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Fax: 07 4155 2669
Email: info@jabiru.net.au

Street Address:

Jabiru Aircraft
5 Squadron Drive
Hinkler Airport,
Bundaberg
QLD 4670

0.4 STANDARDS LIST

Design & Performance	The Jabiru J170-D has been designed to comply with the requirements of ASTM F224.
Quality Assurance	The Jabiru J170-D has been constructed under a Quality System meeting the requirements of ASTM F2279.
Continued Airworthiness	The continued airworthiness of the J170-D is monitored by Jabiru Aircraft P/L in accordance with the requirements of ASTM F3198.
POH	This POH has been prepared to comply with the requirements of ASTM F2746.

0.5 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

A	Ampere
AGL	Above Ground Level
AMSL	Above Mean Sea Level
AVGAS	Aviation Gasoline
BHP	Brake Horse Power
CASA	Civil Aviation Safety Authority (Australia)
CAO	Civil Aviation Order (Australia)
CAR	Civil Aviation Regulation (Australia)
°C	Degrees Celsius
CHT	Cylinder Head Temperature
cm	Centimetre, centimetres
DC	Direct Current
FAA	Federal Aviation Administration (USA)
°F	Degrees Fahrenheit
FAR	Federal Aviation Regulation (USA)
FTS	Flight Training Supplement
ft	Foot, feet
ft/min	Feet per minute
g	Acceleration due to gravity
Gal	Gallon
hPa	Hectopascal, hectopascals
HF	High Frequency
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
in	Inch, inches
in Hg	Inches of mercury
in lbs	Inch pounds
ISA	International Standard Atmosphere
kg	Kilogram
kg/l	Kilogram per litre
kHz	Kilohertz
kts, K	Knots
kPa	Kilopascals
kW	Kilowatt, kilowatts
l	Litre, litres
lb	Pound, pounds
LH	Left hand

LHS	Left hand side
m	Metre
m^2	Square metre
m^3	Cubic metre
mA	Milli ampere
MAC	Mean Aerodynamic Chord
max	Maximum
MHz	Megahertz
mm	Millimetre
min	Minimum or minute
MOGAS	Automotive Fuel
nm	Nautical mile, nautical miles
OAT	Outside Air Temperature
PAX	Passenger
POH	Pilots Operating Handbook
PROP	Propeller
psi	Pounds per square inch
QTY	Quantity
qts	Quarts
RH	Right Hand
RHS	Right Hand Side
RON	Fuel Octane Rating Scale (Research Octane Number)
RPM	Revolutions per minute
SAE	Society of Automotive Engineers
sec	Seconds
SQ	Square
STBY	Standby
TBO	Time between overhauls
T/O	Take Off
U/S	Unserviceable
USG	US Gallon
US Gal	US Gallon
V	Volts
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions

General Airspeed Terminology and Symbols

- **CAS** *Calibrated Airspeed:* the indicated speed of an aircraft corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.
- **KCAS:** Calibrated Airspeed expressed in knots.
- **IAS** *Indicated Airspeed:* the speed of an aircraft as shown on the airspeed indicator. IAS values in this manual assume zero instrument error.
- **KIAS** Indicated Airspeed expressed in knots.
- **TAS** *True Air Speed:* the airspeed of an aircraft relative to the undisturbed air through which it passes.
- **T.O.S.S** *Take-Off Safety Speed:* the airspeed chosen to ensure that adequate control will exist under all conditions, including turbulence and sudden and complete engine failure during the climb after take-off. It is the speed required at 50 feet.
- **V_A** *Manoeuvring Speed:* the maximum speed at which application of full available aerodynamic control will not damage or overstress the aircraft.
- **V_{FE}** *Maximum Flap Extended Speed:* the highest speed permissible with wing flaps in a prescribed extended position.
- **V_O** *Operating Manoeuvring Speed:* the speed that an aircraft will stall in a nose-up pitching manoeuvre before exceeding structural limits. V_O cannot exceed $V_s\sqrt{n}$.
- **V_{NE}** *Never Exceed Speed:* the limiting airspeed that may not be exceeded at any time.
- **V_C** *Maximum Structural Cruising Speed:* the speed that should not be exceeded except in smooth air and then only with caution.
- **V_S** *Stalling Speed:* or the minimum steady flight speed at which the aircraft is controllable.
- **V_{SO}** *Stalling Speed:* or the minimum steady flight speed at which the aircraft is controllable in the landing configuration.
- **V_X** *Best Angle-of-Climb Speed:* the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
- **V_Y** *Best Rate-of-Climb Speed:* the airspeed which delivers the greatest gain in altitude in the shortest possible time.

Meteorological Terminology

- **OAT –** *Outside Air Temperature* – the outside free air static temperature.

- **Airfield Pressure Height –** The height registered at the surface of an aerodrome by an altimeter with the pressure sub-scale set to 1013 hPa (29.92 inches Hg).
- **Pressure Altitude –** Altitude measured from standard sea-level pressure (1013 hPa/29.92 inches Hg) by a pressure or barometric altimeter corrected for position and instrument error.
- **Indicated Pressure Altitude –** the altitude actually read from an altimeter when the pressure barometric sub-scale has been set to 1013 hPa (29.92 inches Hg).
- **QNH –** The local pressure setting that if set on the subscale of an altimeter will cause the altimeter to indicate local altitude above mean sea level.
- **Wind** – The wind velocities to be used as variables on aircraft performance are to be understood as the headwind or tail wind components of the reported winds.

Aircraft Performance and Flight Planning Terminology

- **Climb Gradient** – The ratio of the change in height during a climb, to the horizontal distance travelled.
- **Demonstrated Crosswind Component** – The crosswind component, during take-off and landing, for which adequate control of aircraft was actually demonstrated during certification tests.

Weight and Balance Terminology

- **Datum –** An imaginary vertical plane from which all horizontal distances are measured for balance purposes.
- **Station –** A location along the aircraft fuselage usually given in terms of distance from the reference datum.
- **Arm –** The horizontal distance from the reference datum to the centre of gravity (C of G) of an item.
- **Moment** – The product of the weight of an item multiplied by its arm.
- **Index Unit** – Moment divided by a constant. Used to simplify balance calculations by reducing the number of digits.
- **Centre of Gravity** (C of G) – The point at which an aircraft would balance if suspended. The distance from the C of G to the reference datum can be found by dividing the total moment by the total weight of the aircraft.
- **C of G Arm** – The arm obtained by adding the aircraft's individual moments and dividing the sum by the total weight.
- **C of G Limits –** The extreme centre of gravity locations within which the aircraft must be operated at a given weight.

- **Useable Fuel –** The quantity of fuel available for flight planning purposes.
- **Unusable Fuel –** The quantity of fuel (determined under adverse fuel flow conditions) that is not available for flight.
- **Empty Weight –** Weight of aircraft with unusable fuel and full oil.
- **Useful Load –** Difference between take-off weight, and basic empty weight.
- **Maximum Take-Off Weight –** Maximum weight approved for take-off.
- **Maximum Landing Weight** – Maximum weight approved for the landing.
- **Header Tank –** Fuel tank plumbed between the wing tanks and the engine. Also known as **Collector Tank** or **Sump Tank.**

0.6 USE OF METRIC/IMPERIAL UNITS

This POH uses the metric system as the basic system of measurement. Where common usage or available instrumentation refer to the Imperial/US unit system, both units are quoted. The following conversion factors are presented as a ready reference to the conversion factors that have been used in this manual as well as supplying some others that may be found useful.

1 Pound (lb)	=	0.4536 Kilogram (kg)
1 Pound per sq in (psi)	=	6.895 Kilopascal (kPa)
1 Inch (in)	=	25.4 Millimetres (mm)
1 Foot (ft)	=	0.3048 Metre (m)
1 Statute mile	=	1.609 Kilometres (km)
1 Nautical mile (NM)	=	1.852 Kilometres (km)
1 Millibar (mb)	=	1 Hectopascal (hPa)
1 Millibar (mb)	=	0.1 Kilopascal (kPa)
1 Imperial gallon	=	4.546 Litres (l)
1 US gallon	=	3.785 Litres (l)
1 US quart	=	0.946 Litre (l)
1 Cubic foot (ft^3)	=	28.317 Litres (l)
1 Acre	=	0.4047 Hectares
1 Degree Fahrenheit (EF)	=	[1.8 x EC]+32
1 Inch Pound (in lb)	=	0.113 Newton Metres (Nm)
1 Foot Pound (ft lb)	=	1.356 Newton Metres (Nm)

0.7 WARNINGS, CAUTIONS & NOTES

Definitions used in the POH such as **WARNING, CAUTION, NOTE** are employed in the following context:

WARNING

Operating procedures, techniques, etc. which if not followed correctly, may result in personal injury or death.

CAUTION

Operating procedures, techniques, etc. which if not strictly observed, may result in damage to the aircraft or to its installed equipment.

NOTE

Operating procedures, techniques, etc. which it is considered essential to highlight.

1. GENERAL INFORMATION

1.1 LIGHT SPORT AIRCRAFT NOTIFICATION

There are inherent risks in the participation in recreational aviation aircraft. Operators and passengers of recreational aviation aircraft, by participation, accept the risks inherent in such participation of which the ordinary prudent person is or should be aware. Pilots and passengers have a duty to exercise good judgment and act in a responsible manner while using the aircraft and to obey all oral or written warnings, or both, prior to or during use of the aircraft, or both.

WARNING:

THIS AIRCRAFT WAS MANUFACTURED IN ACCORDANCE WITH LIGHT SPORT AIRCRAFT AIRWORTHINESS STANDARDS AND DOES NOT CONFORM TO STANDARD CATEGORY AIRWORTHINESS REQUIREMENTS.

Jabiru Aircraft Pty Ltd has devoted significant resources and testing to develop the Jabiru J170-D aircraft. The Jabiru J170-D is designed to be operated and maintained only in strict accordance with its supporting documentation – consisting of Pilot's Operating Handbook, Aircraft Technical Manual (Including Maintenance Manual), Engine Maintenance Manual, Propeller Maintenance Manual, Jabiru Australia Service Bulletins, Service Letters and any other documents produced by Jabiru Aircraft Australia or the appropriate regulatory authorities.

Any variation in procedure or failure to operate or maintain the aircraft according to the supporting documentation may cause damage or harm to the aircraft, its parts, or components and may lead to injury or death. Any such actions may render the aircraft un-airworthy and will void any warranty issued by Jabiru.

Any variation to the aircraft of any kind, including alteration to any component at all, whether replacement, relocation, modification or otherwise which is not strictly in accordance with these documents may lead to dramatic changes in the performance of the aircraft, may cause damage or harm to other parts of the aircraft and may lead to injury or death. Jabiru Aircraft Pty Ltd does not support any modifications to the aircraft, its parts, or components. Any such actions may render the aircraft un-airworthy and will void any warranty issued by Jabiru.

Maintenance cannot be supervised by the manufacturer. Maintenance requires extreme cleanliness, exact parts, precise workmanship and proper consumables. It is your responsibility to ensure absolute attention to detail no matter who may become involved in work on this aircraft. Your safety, your life and your passenger's lives rely on precise and accurate following of the maintenance documentation for this aircraft.

1.2 ABOUT THE JABIRU J170-D

Jabiru Aircraft have been built in Bundaberg, Australia since the early 1990's. The original was a small 2 seat aircraft powered by a 2-stroke engine; it had limited range, basic equipment and little room to spare in the cabin. But this aircraft introduced the Jabiru ideal to the world – an aircraft which was light and efficient with good handling, good performance and excellent occupant protection. An aircraft which met all these goals while using modern technology to be cost effective to own and operate and to introduce newcomers to aviation – people who always thought that aviation was beyond their reach. Since the time of those first aircraft, Jabiru Aircraft have evolved dramatically. The current Jabiru models are all far more powerful, spacious and better equipped than their ancestor while still meeting the Jabiru Ideal.

The Jabiru J170-D was developed with hot climate flying schools in mind. It combines the compact inexpensive airframe of a J160 with the large wing and elevator surfaces of the J230. This gives it a very low stall speed making it one of the safest and easiest aircraft for student pilots to learn to land. It is forgiving of learner-pilot mistakes and the side-by-side seating makes the instructor's job easy. The aircraft makes an excellent cross-country machine resulting from the high aspect ratio wing and very low parasitic drag, combined with two large wing tanks gives the J170-D an endurance exceeding 8 hours and cruise speeds of 100knots (TAS). The powerful engine is smooth and quiet so that the crew can fly for hours without fatigue from noise and vibration.

On the ground the J170-D is also an excellent performer – The simple robust design allows maintenance to be carried out quickly and easily to get the aircraft back into the air as soon as possible. The same Jabiru 2200 engine which provides powerful performance in the air is also light, simple, easy to maintain and so quiet that people living near the airport barely hear it. The composite construction allows the aircraft to be both light and very strong – with the J170-D being designed to an ultimate factor of around +8g / -4g. The fibreglass structure won't rust or corrode, has an almost infinite fatigue life and like all Jabirus, the J170-D has been designed with a very strong cabin structure to provide a safety cell for its crew.

Today's J170-D is the latest design of an aircraft model which has been a popular choice with pilots for many years. The design is thoroughly proven and thoroughly tested – both by Jabiru test pilots and demanding customers all over the world. It can be extensively customised and thanks to the wide range of interior options, instrument systems and other optional extras every Jabiru J170-D is unique. Most importantly, the J170-D still embodies the original Jabiru Ideal and continues to show people who never thought they could have an aircraft of their own that anything is possible.

1.3 OWNER/OPERATOR RESPONSIBILITES

The following responsibilities for the owner/operator of a LSA listed are prescribed in the ASTM standard F2295:

- Each owner/operator of a LSA shall read and comply with the maintenance and continued airworthiness information and instructions provided by the manufacturer.
- Each owner/operator of a LSA shall be responsible for providing the manufacturer with current contact information where the manufacturer may send the owner/operator supplemental notification bulletins.
- The owner/operator of a LSA shall be responsible for notifying the manufacturer of any safety of flight issue or significant service difficulty upon discovery.
- The owner/operator of a LSA shall be responsible for complying with all manufacturer issued notices of corrective action and for complying with all applicable aviation authority regulations in regard to maintaining the airworthiness of the LSA.
- An owner of a LSA shall ensure that any needed corrective action be completed as specified in a notice, or by the next scheduled annual inspection.
- Should an owner/operator not comply with any mandatory service requirement, the LSA shall be considered not in compliance with applicable ASTM standards and may be subject to regulatory action by the presiding aviation authority.

1.4 J170-D PERFORMANCE & SPECIFICATION SUMMARY

Gross Weight	600kg (1323 lb)
Top Speed at Sea Level	120 KCAS (at full power)
Cruise Speed at Sea level	90 KCAS (at 2800 rpm)
Full Fuel Range[1]	800nm at 2800 rpm, 5000' ASL (if achieving 15 lt/hr fuel consumption)
Rate of Climb at Sea Level[2]	500 fpm (V_Y) 450 fpm (V_X)
Take-Off Distance	600 m
Landing Distance	513 m
Stall Speed Clean	45 KCAS
Stall Speed Flaps Full Down	40 KCAS
Fuel Capacity	140L (37 USgal) Total Capacity 135L (35.6 USgal) Usable
Approved Fuels	AVGAS 100LL, AVGAS 100/130 or MOGAS with RON of 95 or higher
Maximum Engine Power	80 hp @ 3300 RPM.

Refer to the main body of this handbook below for more information.

[1] Range with 45 minute reserve at stated power setting
[2] At Gross Weight, ICAO Standard Atmosphere

2. LIMITATIONS

2.1 AIRSPEED LIMITS

SPEED	KIAS	ASI MARKINGS	REMARKS
Design Manoeuvring Speed (V_A)	94	-	Do not make full or abrupt control movements above this speed.
Operating Manoeuvring Speed at MTOW ($V_{O\ MTOW}$)*	94	-	Do not make full or abrupt control movements above this speed at MTOW
Operating Manoeuvring Speed at Minimum weight ($V_{O\ MIN}$)**	68	-	Do not make full or abrupt control movements above this speed at Minimum weight
Never Exceed Speed (V_{NE})	140	Red Line at upper end of yellow arc	Do not exceed this speed in any operation.
Max Structural Cruising Speed (V_C)	112	Upper end of green arc/start of yellow arc	Do not exceed this speed except in smooth air and then with caution.
Maximum Flap Extension Speed (V_{FE})	84	Upper end of white arc	Do not exceed this speed with the flaps deployed.
Stalling Speed, Clean (V_S)	47	Lower end of green arc	in Cruise Configuration
Stalling Speed, Full Flaps (V_{S0})	42	Lower end of white arc	in Landing Configuration

***** Operating Manoeuvring speed at **'MTOW'** refers to maximum gross weight = **600kg (1323lb).**

****** Operating Manoeuvring speed at **'Minimum weight'** is calculated based on typical light empty weight (325kg), a single lightweight occupant (55kg) and 45 minutes reserve fuel (10kg) = **390kg (860lb).** Typical operating weight will usually always be much heavier.

Note: Refer to Section 5.4 for conversion to Calibrated Airspeed (KCAS)

2.1.1 ASI Markings:

White Arc: Flap extended speed range (V_{S0} to V_{FE}) – flapped stall speed to maximum allowable with flaps deployed (42-84 KIAS)

Green Arc: Normal operating Speed range (47-112 KIAS)

Yellow Arc: Caution speed range – Do not exceed this speed except in smooth air and then with caution. (112-140 KIAS)

Red Line: Do not exceed this speed in any operation (140 KIAS).

2.2 AIRCRAFT SERVICE CEILING

10 000 feet ASL

2.3 LIMIT LOAD FACTORS

Flap Position	Speed	Positive	Negative
UP	V_A	+ 4g	-2g
UP	V_{NE}	+ 4g	-2-g
DOWN	V_{FE}	+ 2.0g	0g

2.4 FLIGHT OPERATION LIMITATIONS

Manoeuvres in the course of normal flying are approved.
Stalls may be carried out at bank angles of up to 60°.
All aerobatic manoeuvres including spins are prohibited.
Flight Operations are limited to VMC (Visual Meteorological Conditions).
Flight Operations in IMC (Instrument Meteorological Conditions) are prohibited.

2.5 FUEL

Total Capacity: 140L (37 USgal) Total (2 OFF 67.5L Wing Tanks + 5L Header Tank)
Usable Capacity: 135L (35.6 USgal) Useable
Grade: Avgas 100LL, Avgas 100/130 or MOGAS with RON of 95 or higher. See Section 8.6
Max zero wing fuel weight (W_{ZWF}): Equal to gross weight, 600kg (1323 lb)

2.6 FUEL GAUGES (where equipped)

Fuel pickups are in wing roots. Care must be taken to maintain balanced flight at low fuel levels to ensure that fuel can be drawn from both tanks. If the aircraft is flown for extended periods in an unbalanced condition, it is possible to fully drain one tank while there remains fuel in the other.

2.7 POWERPLANT LIMITATIONS

	POWER	RPM	Maximum Temperatures		Fuel Pressure Limits		Oil Pressure Limits	
			Cyl Head	Oil	Min	Max	Min	Max
Absolute Limits	Maximum Take-Off (80 BHP)	3300	200 °C (392°F) (Note #1)	118°C (244°F)	5 kPa (0.75psi)	35 kPa (5.0psi)	220 kPa (31 psi)	525 kPa (76psi)
Continuous Limits	Maximum Cont (80 BHP)	3300	180°C (356°F)	100°C (212°F)	5 kPa (0.75psi)	35 kPa (5.0psi)	220 kPa (31 psi)	525 kPa (76 psi)
Limits For Ground Running	N/A	N/A	180°C (356°F) (Note #2)	100°C (212°F) (Note #2)	5 kPa (0.75psi)	35 kPa (5.0psi)	80 kPa (11 psi)	525 kPa (76 psi)

Note #1 Time with CHT at between 180°C and 200°C is not to exceed 5 Minutes

Note #2 If temperature limits are reached, shut the engine down or cool it by pointing the aircraft into wind.

Other limits are as follows:

- Minimum oil pressure at idle: 80 kPa (11 psi)
- Maximum oil pressure at start: 525 kPa (76 psi)

2.8 CROSSWIND

The maximum allowable crosswind velocity is dependent on many factors including:

- Aircraft limitations
- Pilot capability.
- Ground conditions – i.e. turbulence from structures or trees
- Wind state – i.e. steady wind or gusting / thermal conditions.

With average pilot technique, steady, direct crosswinds of up to 14 knots can be handled with safety.

2.9 OTHER CLIMATIC RESTRICTIONS

Maximum Ambient Operating Temperature	38°C (100°F)
Flight into known icing conditions	Prohibited

2.10 KINDS OF OPERATION

The standard J170-D, as detailed within this POH, is approved for Day VFR Operations only

2.11 POWER GENERATION SYSTEM LIMITATIONS

When the engine is turning at approximately 2000 RPM and above the alternator produces sufficient power for all lights to be run continuously. However, below this RPM the alternator cannot produce this power output and power must be drawn from the battery if all electrical systems are running. To reduce the load on the alternator, Jabiru Aircraft recommend only using the Landing Light for takeoff and landing – turning it off during normal cruise operations and wherever safe while taxiing.

2.12 OTHER LIMITATIONS

- Smoking is prohibited.
- In-cabin noise levels exceed 95db. Hearing protection must be worn.

3. EMERGENCY PROCEDURES

This section describes the procedures to be adopted in the event of an emergency or abnormal situation occurring in the J170-D aircraft.

The procedures are arranged in the sequence considered to be the most desirable in the majority of cases. Steps should be performed in the order listed unless good reasons for deviation exist.

It should be remembered however, that all conceivable eventualities cannot be foreseen by the manufacturer. Particular circumstances such as multiple or unanticipated emergencies, adverse weather etc. may require modification to these procedures. A thorough knowledge of the aircraft and its systems is essential to analyse the situation correctly and determine the best course of action in any particular circumstance.

The following **basic rules** apply to all aircraft emergencies:

1. **Maintain** Aircraft Control.
2. **Analyse** the situation and take appropriate action.
3. **Land** as soon as practicable.

3.1 AIRSPEEDS FOR EMERGENCY OPERATIONS

Maximum Glide ..... 65 KIAS*
Landing Without Engine Power (Flaps Full) ..... 65 KIAS

* - A slightly higher speed may give better distance over the ground if gliding into wind; a slightly slower speed if gliding downwind.

3.2 CARBURETTOR ICING

Carburettor icing occurs when moisture in the air forms ice within the carburettor – typically in the venturi throat and around the throttle butterfly. The ice restricts airflow and prevents the proper function of the carburettor.

Carburettor icing can occur in temperatures between around +30°C (86°F) and -15°C (5°F). Icing most often occurs at cruise, descent or idle power settings, in humid air (including fog, light rain or cloud) and at ambient temperatures between 0°C (32°F) and 20°C (68°F). However, icing can occur at other times and the pilot must be aware of the potential at all times.

Applying carburettor heat is the recommended first corrective measure to be tried in almost any situation for the engine.

Carburettor icing symptoms include:

1. RPM / power reducing for given throttle setting
2. Increased throttle opening required to maintain RPM / power
3. Rough, uneven or surging engine.
4. Engine stoppage

If Carburettor icing is suspected:

1. Throttle.....FULL
2. CARB HEAT.....FULL ON

NOTE

Carburettor heat may be used at any power setting, but will result in a slight power loss. When icing is eliminated, return CARB HEAT to OFF. Carburettor heat should not be used for take-offs.

Maintain carburettor heat in ON position for a minimum of 1 minute to allow all ice to melt.

Carburettor heat may be used on the ground except during take-off.

CAUTION

Do not use partial carburettor heat as this may exacerbate ice accretion.

3.3 EMERGENCY PROCEDURES CHECK LISTS

3.3.1 Engine Failures

Engine Failure During Take-off Run

1. Throttle ..... CLOSED
2. Brakes ..... APPLY
3. Ignition ..... OFF
4. Wing Flaps ..... UP
5. Master Switch ..... OFF
6. Fuel Shutoff Valve ..... OFF

Engine Failure Immediately After Take-off

1. Airspeed ..... 65 KIAS.
2. Ignition ..... OFF (As time permits)
3. Fuel Shutoff Valve ..... OFF (As time permits)
4. Wing Flaps ..... FULL RECOMMENDED
5. Master Switch ..... OFF
6. Braking ..... HEAVY AFTER TOUCHDOWN

Engine Failure During Flight

1. Airspeed ..... 65 KIAS*.
2. Carburettor Heat ..... ON
3. Fuel Pump ..... ON
4. Fuel Shutoff Valve ..... CONFIRM ON
5. Fuel Quantity ..... CHECK
6. Oil ..... CHECK TEMP AND PRESSURE
7. Ignition ..... CYCLE BOTH ON
8. Throttle ..... CHECK LINKAGE OPERATION
9. Airstart ..... ATTEMPT IF PROP STOPPED

* - A slightly higher speed may give better distance over the ground if gliding into wind; a slightly slower speed if gliding downwind.

3.3.2 Airstart & Limitations

In the event that the engine is stopped during flight, it may be restarted by application of fuel & ignition, provided that the propeller is still windmilling. The propeller may stop windmilling below 50 KIAS

The Jabiru engine is a high compression engine & therefore airstarts when the propeller has stopped rotating, without the use of the starter, are unlikely before reaching V_{NE}. Therefore, the following procedure addresses only airstarts by use of the starter motor.

IMPORTANT – NO NOT depress starter button while propeller is rotating.

1. Ignition……OFF
2. Cabin……..CLEAR
3. Airspeed……REDUCE UNTIL PROPELLER STOPS TURNING.
4. Establish Glide……..65 KIAS
5. Fuel……ON
6. Fuel Pump……. ON
7. Master…… ON
8. Ignition Switches…….. ON
9. Starter Button……Depress
10. Throttle……..Open
11. Repeat as necessary, ensuring propeller has stopped before each restart attempt.

Notes:
(a) If engine does not restart commence forced landing procedure.
(b) If clear symptoms of a mechanical failure exist, or if the engine has seized due to the loss of oil pressure, do not attempt a restart.
(c) If engine operates with only L or R ignition selected, leave the ignition switch in this position whilst a suitable landing area is selected.
(d) The engine cools quickly with the propeller stopped. Choke may needed to achieve a start.

3.3.3 Forced Landings

Emergency Landing Without Engine Power

1. Airspeed..... 65 KIAS
2. Ignition.....OFF
3. Fuel Shutoff Valve.....OFF
4. Fuel Pump.....OFF
5. Throttle.....CLOSED
6. Wing Flaps..... FULL PRIOR TO TOUCH DOWN
7. Master Switch..... OFF AFTER LOWERING FLAPS
8. Braking.....HEAVY AFTER TOUCH DOWN

Precautionary Landing With Engine Power

1. Airspeed .....70 KIAS
2. Fuel Pump .....ON
3. Wing Flaps .....TAKE-OFF
4. Selected field.....OVERFLY & INSPECT
5. Wing Flaps .....FULL ON FINAL APPROACH
6. Airspeed .....65 KIAS
7. Braking .....HEAVY AFTER TOUCH DOWN
8. Ignition.....OFF
9. Fuel Shutoff Valve .....OFF
10. Master Switch.....OFF

Ditching

1. Airspeed .....65 KIAS
2. Power (if available) .....ESTABLISH 50 ft/min @ 55 KIAS
3. Approach
   High Winds, Heavy Seas .....INTO WIND
   Light Winds, Heavy Swells.....PARALLEL TO SWELLS
4. Wing Flaps .....FULL PRIOR TO TOUCH DOWN
5. Doors.....OPEN
6. Face .....CUSHION AT TOUCH DOWN
7. Touch Down .....SLOWEST PRACTICAL SPEED
8. Evacuate .....IF REQUIRED BREAK WINDOWS
9. Life Jackets / Life Rafts.....INFLATE
10. EPIRB (If Carried).....ACTIVATE

3.3.4 Engine Fires On Ground

1. Ignition.....OFF
2. Fuel Shutoff valve.....OFF
3. Fuel Pump .....OFF
4. Master Switch .....OFF
5. Abandon aircraft
6. Fire .....EXTINGUISH

CAUTION

If the fire is in the engine bay do not remove the cowlings. Removing cowls will provide more air to the fire, accelerating combustion.

Engine Fire In Flight

1.	Throttle	CLOSE
2.	Fuel Valve	OFF
3.	Fuel Pump	OFF
4.	Ignition	OFF
5.	Master Switch	OFF AFTER FLAPS DEPLOYED
6.	Cabin Heat Vent	CLOSE
7.	Cabin Air Vent	OPEN BOTH
8.	Airspeed	INCREASE UP TO V_{NE}* if required to extinguish fire.
9.	Forced Landing	EXECUTE. Refer 3.3.3

* - If it necessary to increase airspeed above V_{FE} (to no more then V_{NE}) in order to extinguish a fire, the flaps must **NOT** be lowered.

Electrical Fire In Flight

1.	Master Switch	OFF
2.	Ignitions	ON
3.	Electrical Switches	OFF
4.	Extinguisher	ACTIVATE

If fire goes out:

5.	Smoke	VENTILATE CABIN (DOORS MAY BE OPENED SLIGHTLY)
6.	Precautionary Landing	AS SOON AS PRACTICAL

If fire does not go out:

4.	Land	EXECUTE IMMEDIATELY

WARNING

With the Master Switch turned off the wing flaps will not deploy.

Cabin Fire

1.	Master Switch	OFF
2.	Cabin Heat Vent	CLOSE
3.	Cabin Air Vent	OPEN BOTH
4.	Extinguisher (if fitted)	ACTIVATE
5.	Land	AS SOON AS PRACTICAL
6.	Smoke/Fume Evacuation	VENTILATE CABIN. DOORS MAY BE OPENED SLIGHTLY.

Once fire is extinguished:

1.	Power	REDUCE
2.	Airspeed	APPROX 80 KIAS
3.	Cockpit Door(s)	CLOSE
4.	Power	ADJUST to maintain approx 80 KIAS
5.	Land	AS SOON AS PRACTICAL

NOTE

Doors should only be opened for emergency fume evacuation

3.3.5 Other Emergencies

In some of the cases described below there is more than 1 potential cause for a given situation. For example, if the oil pressure gauge indicates zero, it may be due to a failure of the gauge or sender instead of an actual problem with the engine.

The procedures given below in all cases assume that the indications given are true and correct.

It is important to remain calm and think as clearly as possible. Again: The following **basic rules** apply to **all** aircraft emergencies:

1. **Maintain** Aircraft Control.
2. **Analyse** the situation before taking appropriate action. Don't act without thinking.
3. **Land** as soon as practicable.

Loss of Oil Pressure

1. Airspeed.....65 KIAS
2. Power.....IDLE
3. Precautionary Landing.....AS SOON AS PRACTICAL

High Oil Pressure

1. RPM.....REDUCE UNTIL PRESSURE DROPS
2. Precautionary Landing.....AS SOON AS PRACTICAL

Emergency Descent – Type 1

1. Power.....IDLE
2. Carburettor heat.....ON
3. Airspeed.....120+ KIAS (less then V_{NE})
4. Flaps.....UP

NOTE

This descent gives high vertical speeds but may make controlling the aircraft difficult when passing through narrow holes in clouds etc. Type 1 descents are for clear, smooth air only.

Emergency Descent – Type 2

1. Power.....IDLE
2. Carburettor heat.....ON
3. Airspeed.....80 KIAS (V_{FE})
4. Flaps.....FULL DOWN

NOTE

This type of descent gives high vertical speeds while minimising loads on the aircraft structure and improving controllability around obstacles (such as cloud etc).

S-Turns or Side slips may be used to increase descent rate; see Section 0

Precautionary Descent

1. Power.....IDLE
2. Carburettor Heat.....ON
3. Airspeed.....75 KIAS
4. Flaps.....UP
5. Bank Angle.....30º

NOTE

This descent gives moderate vertical speeds. It allows good airspeed control & is suited to a descent in a confined area (such as a hole in a cloud layer).

Alternator Failure

1. Non-essential electrical equipment.....OFF
2. Land.....AT NEAREST AIRPORT

NOTE

The Jabiru Engine does not require external power to run: the engine will not stop if the aircraft battery runs flat.

Overvoltage

1. Electrical equipment.....ALL ON – MONITOR VOLTAGE
2. RPM.....REDUCE – MONITOR VOLTAGE
3. Land.....AS SOON AS PRACTICAL

If the voltage cannot be controlled below 15.5V it is necessary to turn off items such as avionics to prevent damage to them. Items with a high current draw, like landing lights, should be left on.

Inadvertent Spin

Intentional spins are prohibited in this aircraft. Should an inadvertent spin occur, the following recovery procedure should be used:

1. **Retard the throttle to idle**
2. **Centralise ailerons**
3. **Apply and hold full rudder opposite to the direction of rotation**
4. **Move stick progressively forward far enough to break stall**
5. **Hold these control inputs until rotation stops**
6. **As rotation stops, centralise rudder and make a positive, smooth recovery from the resulting dive**

WARNING

If the spin is encountered with flaps extended, DO NOT retract flaps until rotation ceases. Premature flap retraction will delay recovery.

Inadvertent Icing Encounter

1. Carburettor heat.....ON
2. Altitude.....REDUCE IF SAFE
3. Aircraft position / heading.....TURN BACK
4. Aircraft Performance.....MONITOR

Flight into known icing conditions is prohibited. If icing is inadvertently encountered, change flight level or turn back to a region less conducive to icing. Monitor ice formation on the airframe and its effects on aircraft performance.

Inadvertent Operation in Light Rain

1. RPM.....REDUCE: 2200 – 2400 RPM
2. Flaps.....TAKEOFF (First Stage)
3. Carburettor heat.....ON
4. Aircraft position / heading.....AWAY FROM RAIN

WARNING

The J170-D is not designed or approved to fly in heavy rain. The above is included for inadvertent operation in light rain only.

Loss of Primary Instruments

1. Circuit breakers.....CHECK. RE-SET ONCE ONLY
2. Master switch.....CYCLE OFF-ON
3. Land.....AS SOON AS PRACTICAL

WARNING

Breakers should only be re-set once. If there is a serious fault in an electrical system repeated re-setting of the breaker can result in an electrical fire.

Landing With a Flat Main Tyre

1. Landing Area.....SUITABLE
2. Approach.....NORMAL
3. Wing Flaps.....FULL DOWN
4. Touchdown.....GOOD TYRE(S) FIRST, hold aircraft off flat tyre as long as possible with aileron and/or elevator control inputs
5. Ignition.....OFF
6. Fuel Shutoff Valve.....OFF
7. Master Switch.....OFF

Loss of Flight Controls

It is a requirement of the design standard that the following section be included in this manual, however such failures are extremely rare. As always, the 3 key rules apply:

1. **Maintain** Aircraft Control.
2. **Analyse** the situation before taking appropriate action. Don't act without thinking.
3. **Land** as soon as practicable.

Primary flight controls failures can potentially be caused by the following:

1. Failure caused when either end of the cable becomes free of its clamp
2. Failure of the cable connecting hardware (bolts, rod ends etc)
3. Failure of the cable itself.
4. Jamming of the controls within the cabin
5. Jamming of the external controls
6. Structural failure of the control
7. Failure of autopilot mechanism

In an emergency the secondary effect of controls may be used to direct the aircraft:

1. The secondary effect of the rudder is to roll the aircraft. Loss of aileron control can be partially addressed through the use of the rudder.
2. The secondary effect of the aileron is to yaw the aircraft. Loss of rudder control can be partially addressed through the use of the ailerons.
3. The trim mechanism is separate to the elevator system and can be used to control the pitch and attitude of the aircraft.
4. In some cases the autopilot mechanism (where equipped) may still function and can be used to control the aircraft.
5. Wing flap position and engine power setting also affect the pitch of the aircraft and can be used to assist in control.

In some cases, shaking a jammed control can free it. However it can also potentially exacerbate the problem. Shaking is therefore not recommended until other troubleshooting techniques have been attempted.

The following steps are recommended:

1. Secondary control.....APPLY
2. Cabin end of control cable.....CHECK CLAMP & HARDWARE
3. Control mechanism inside cabin.....CHECK. Clear any obstructions
4. Control .....SHAKE
5. Brute Force .....APPLY
6. Land.....AS SOON AS PRACTICAL

WARNING

Where possible have a passenger carry out checks. Complicated or awkward trouble-shooting measures which divert the pilot's attention should be avoided if possible.

3.4 AMPLIFIED EMERGENCY PROCEDURES

This section is provided to supply the pilot with additional information concerning emergency procedures in general. Elaboration of the procedures specified in the EMERGENCY PROCEDURES CHECK LISTS as well as the inclusion of some more generalised emergency procedures that can be better covered by a general descriptive procedure rather than a formal check list are included in this section. This will give the pilot a more complete understanding of these procedures.

3.4.1 Fuel Gauges / Low Level warning Light (where equipped)

The J170-D may be fitted with electronic fuel level indicators on the instrument panel. In addition, the sender units which drive these gauges are visible in the wing root area and incorporate an analogue needle showing fuel level. While the gauges on the instrument panel are designed so that only extended changes in fuel level are shown, the sender units in the tank show the current level directly and so will change in flight as the fuel sloshes in the tank. These senders can be used as a direct confirmation of the level indicated on the gauges. Note that due to the shape of the wing tank the gauges will read full from when the tanks are full (67 Litres) until the level falls below approximately 50 litres.

The optional low fuel level warning light will illuminate when around 3 litres of fuel remain in the header tank. This will allow the crew around 10 minutes (at cruise power consumption) to attempt to fix the problem with the fuel feed (such as flying out of balance, with the wing containing more fuel higher to encourage fuel flow from it into the header tank) or to locate a suitable place for a precautionary landing. While false indications are possible from this system they are unlikely, and unless the pilot is confident that he has sufficient fuel **and** that it is reaching the header tank, he should immediately reduce fuel consumption and seek a suitable place to carry out a precautionary landing. Note that this is a separate system from the fuel pressure warning light.

3.4.2 Engine Failure

If an engine failure occurs during the take-off run, the most important action is to stop the aircraft on the remaining runway. The extra items in the checklist will provide additional safety after an engine failure on take-off.

If the engine fails shortly after lift off the initial response must be prompt lowering of the nose in order to maintain safe airspeed. In most cases, the landing should be executed straight ahead with only small changes in direction to avoid obstructions. After an engine failure on take-off, altitude and airspeed are seldom sufficient to execute a 180° gliding turn to return to the runway of departure. The checklist procedures assume that adequate time exists to secure the fuel and ignition systems prior to touch down.

After an engine failure in flight, the best glide speed should be established as quickly as possible. While gliding toward a suitable landing area, an effort should be made to identify the cause of the failure. If time permits, an engine restart should be attempted. If the engine cannot be restarted a forced landing must be executed.

3.4.3 Forced Landings

If all attempts to restart the engine fail and a forced landing is imminent, a suitable landing area should be selected and the EMERGENCY LANDING WITHOUT ENGINE POWER checklist should be completed if at all possible.

3.4.4 Ditching

The aircraft has not been flight tested in actual ditchings, therefore the recommended procedure is based entirely on the best judgement of the manufacturer.

If available, life jackets should be donned **but not inflated** until after evacuating the aircraft. Inflating the life jackets prematurely increases the risk of damage to them exiting the aircraft. Additionally their bulkiness adds to the difficulty of evacuating the aircraft.

Plan the approach into wind if the winds are high and the seas are heavy. With heavy swells and light winds, land parallel to the swell. If possible maintain a constant descent rate of approximately 50 ft/min almost until touchdown but reducing speed to the minimum practical immediately prior to touchdown. Water pressure may hold the doors closed, so the crew should be prepared to break out windows if necessary to equalise pressure and allow egress. An orderly evacuation of the aircraft should then be conducted.

3.4.5 Fires

Although engine fires are extremely rare in flight, the checklist procedures should be followed if one is encountered. After completion of this procedure, execute a forced landing. Do not attempt to restart the engine after an engine fire.

The initial indication of an electrical fire is usually the smell of burning insulation. Turning off the Master Switch should result in the elimination of the cause of this type of fire, but it will also result in the loss of all power to instruments & controls.

3.4.6 Rough Engine/Loss of Power

1. USE OF POWER Continuous RPM up to 3300 is allowed in normal operations. In emergencies engine RPM in excess of 3300 may be used, but this will only be available at speeds above about 100 KIAS.

2. SPARK PLUG FOULING Slight engine roughness in flight may be caused by one or more spark plugs becoming fouled by carbon or lead deposits. This may be verified by selecting each ignition switches momentarily to OFF. An obvious power loss in single ignition operation is evidence of spark plug or ignition system trouble. Assuming that the spark plugs are the more likely cause, applying full throttle may clear the plug fouling. If this does not solve the engine problem, plan to land at the nearest practical airfield to have the situation investigated.

3. IGNITION MALFUNCTION A sudden engine roughness or misfiring is usually evidence of carburettor icing or ignition system problems. In the case of ignition system trouble, switching each ignition switch off in turn should identify which system is malfunctioning. Different power settings may alleviate the problem. If not, plan to land at the nearest practical airfield to have the situation investigated.

4. CARBURETTOR ICING Rough running and loss of power may be caused by carburettor icing. This is most likely in conditions of high humidity and at low power settings. If not corrected, ice build up in the carburettor throat will cause complete power loss. If carburettor icing is suspected, immediately apply full carburettor heat until normal engine

operation is restored, and the heat can be selected OFF. Carburettor heat should only be selected ON or OFF, as partial heat application may exacerbate ice build-up. The aircraft can be safely operated with carburettor heat applied for indefinite periods, but there will be a slight power loss. Hence, carburettor heat should not be used when full power is required; e.g. for take-off.

5. LOW OIL PRESSURE If low oil pressure is accompanied by normal oil temperature, there is a possibility that the oil pressure gauge or the relief valve is malfunctioning, and an immediate precautionary landing is not warranted. A landing at the closest practical airfield is advisable however so that the source of the trouble can be investigated. If a total loss of oil pressure is accompanied by a rise in oil temperature, an engine failure is probably imminent. Reduce engine power immediately and select a suitable forced landing area. Use only the minimum power required to reach the desired touch down point.

3.4.7 Electrical Systems Malfunctions

The electrical system is straight forward but to obtain the necessary degree of reliability and redundancy the system must be operated correctly. Normal operation is with the Master Switch in the ON position. Should the need to shed electrical loads arise the pilot should use their discretion to turn off all non-essential electrical equipment. More severe electrical system failures, such as those resulting in fire, require the Master Switch to be switched off. In addition to the general guide above specific failures may be dealt with as follows.

1. INSUFFICIENT RATE OF CHARGE If the “CHG FAIL” light illuminates in flight, minimal or no electrical power is being supplied by the alternator. If the battery charge drops sufficiently electrical systems will fail. While the Jabiru engine does not require external power while running, devices such as radios, transponders, GPS units, and intercoms will eventually drain the battery. If the voltmeter indicates that no charge is being supplied, consideration should be given to landing at the nearest practical airfield, though – provided the eventual total loss of electrical services will not affect the safety of flight – the flight may continue.

2. CIRCUIT BREAKERS Failure of an individual circuit will, in most circumstances, result in opening of the relevant circuit/switch breaker. To ensure a permanent fault exists in the circuit the breaker should be reset once. If the breaker again pops the circuit is faulty and the flight should be continued without that service.

4. NORMAL PROCEDURES

4.1 GENERAL

This section describes the procedures to be adopted for normal operations of the J170-D aircraft.

The procedures are arranged in the sequence considered to be the most desirable and therefore steps should be performed in the order listed unless good reasons for a deviation exist. The lists below include checks for all optional equipment, so checks that do not apply to this aircraft may be skipped.

4.2 SPEEDS FOR NORMAL OPERATION

Unless otherwise noted, the following speeds are based on a maximum weight of 600 kg (1323lb) and may be used for any lesser weight.

Note that generally the best rate of climb speed & best angle of climb speed are not used during normal operations. This is because they place a higher degree of stress on the engine & leave a relatively small margin to cope with gusts, turbulence etc. The higher climb speeds below are recommended for all cases where a slight decrease in the aircraft's climb rate is acceptable. In cases where maximum climb performance is required then V_X or V_Y must be used.

Take-Off:

T.O.S.S. (Speed @ 50 ft) .....65 KIAS

Normal Climb Out.....70 KIAS (Take Off Flap)

Climb, Flaps Up:

Initial (scheduled climb) .....80 KIAS

Enroute .....80-90 KIAS

Landing Approach:

V_{REF} (Speed @ 50 ft) .....65 KIAS

Baulked Landing.....65 KIAS Initially

Maximum Recommended in Turbulence:

All Weights .....112 KIAS

4.3 BEST ANGLE OF CLIMB SPEED

V_X – Best Angle of Climb Speed .....65 KIAS

4.4 BEST RATE OF CLIMB SPEED

V_Y – Best Rate of Climb Speed.....68 KIAS

4.5 PREFLIGHT INSPECTION

Before flight, a careful visual inspection is to be carried out to ensure that the aircraft and its systems are serviceable. The following Figure is to be used in conjunction with the preflight inspection checklist:

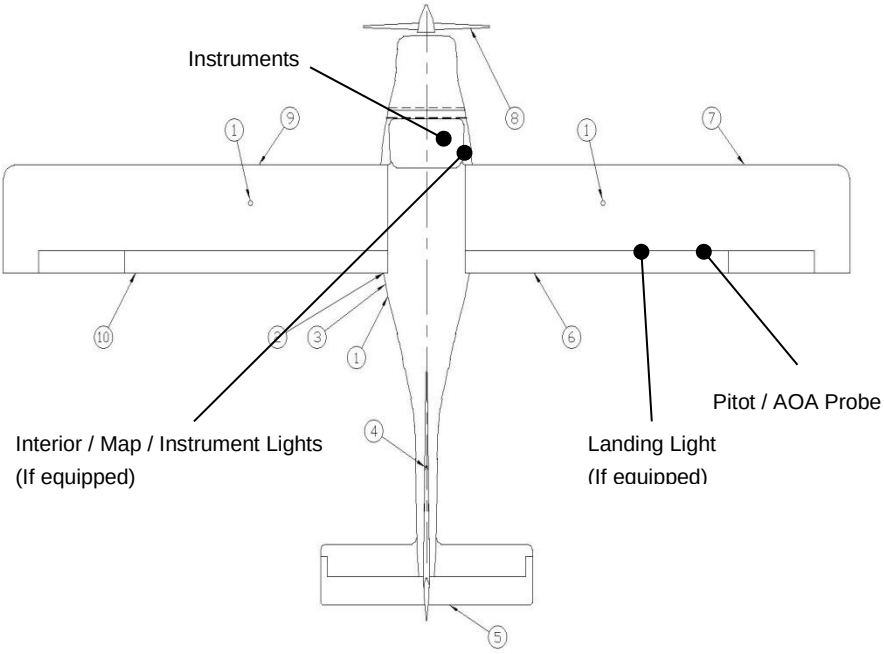


Figure 4-1. Pre-flight Inspection

1. Fuel

Quantity in both tanks ..... Check
Fuel caps ..... Secure
Water Check ..... Both wing tanks and header tank

2. AOA / Pitot Head

All openings open / unobstructed ..... Check
Installation ..... Secure

3. Cockpit

Ignition Switches ..... OFF
Control lock (if fitted) ..... REMOVE
Fuel ..... CHECK CONTENTS
Fuel valve ..... ON
Master switch ..... ON
Alternator Warning Light ..... CONFIRM ON Before Start
Master Switch ..... OFF

Aileron and elevator cables & fasteners....CHECK
Rudder and nose wheel steerage linkage.CHECK
Rudder centring springs .....CHECK
Controls (all).....CHECK full travel, free movement.
Harnesses & Seats.....CHECK CONDITION
Windshield .....CLEANLINESS
Cockpit area.....GENERAL CONDITION
Loose objects.....SECURE
Cockpit Doors/Latches .....CONDITION & OPERATION
POH.....AVAILABLE

Instruments

Heading indicator .....Check
Engine Instruments .....Confirm normal operation

Interior / Map / Instrument Lights

Lights .....Check operation

4. Left Undercarriage

Mount bolts .....CHECK SECURE*
Tyre.....CHECK CONDITION / INFLATION

* - Lock the hand brake on, then pull the aircraft forwards. Some flexing of the undercarriage legs is normal, but there should be no movement of the top of the leg relative to the fuselage.

5. Static Source

Static Source.....CHECK FOR BLOCKAGE

6. Empennage

Tail tie-down.....DISCONNECT
Control surfaces .....CHECK Security & Full & Free Movement
Rudder, Elevator & Trim Cables .....CHECK Security & Full & Free Movement

7. Right Wing – Trailing Edge

Aileron.....CHECK Security & Full & Free Movement
Flap.....CHECK Security
Control rods & cables .....CHECK Security. Check rod ends for freedom of rotation & excess movement.

8. Right Wing

Wing Tie-Down.....DISCONNECT
Wing Strut Mount Bolts.....CHECK Security**
Wing Root Mount Bolts.....CHECK Security***
Pitot Tube.....REMOVE COVER, CHECK for blockage.

** - Wing strut bolts must not be tightened. Nut should just bear on washer.
*** - Holding the wingtip, push the tip up & down, forwards & backwards. If a wing / strut attachment is degrading, slop will be felt.

9. Nose

Propeller & Spinner	CHECK for nicks & security
Cowl	CHECK Security, rubbing on engine.
Engine Oil	CHECK using oil filler door.
Nose Wheel	CHECK condition & pressure.

10. "Pulling Through" The Engine

Before the first flight of the day the engine must be "pulled through" by hand. This is the process of turning the engine over by turning the propeller by hand. The compression of each cylinder in turn will be felt a resistance as the propeller is turned. The engine should be rotated for a count of at least 8 compressions.

Master Switch	OFF
Ignitions	OFF
Throttle	Closed
Propeller	TURN by hand & observe engine for odd noises or heavy movements. Check for regular compression.

CAUTION:

Prior to pulling through the propeller by hand, the engine must be cold, both ignition circuits & the Master Switch must be switched OFF, the brakes applied & throttle closed.

WARNING

A hot engine may fire with the ignition/s switched OFF.

DO NOT pull through a hot engine.

CAUTION

Several causes of irregular compression – such as poorly sealing valves – can lead to extensive engine damage if not addressed. The Jabiru 2200 Engine Instruction & Maintenance Manual provides additional details.

11. Left Wing

Wing Tie-Down	DISCONNECT
Wing Strut Mount Bolts	CHECK Security**
Wing Root Mount Bolts	CHECK Security***

12. Left Wing – Trailing Edge

Aileron	CHECK Security & Full & Free Movement
Flap	CHECK Security
Control rods & cables	CHECK Security. Check rod ends for freedom of rotation & excess movement.

NORMAL PROCEDURES CHECK LISTS

4.5.1 Before Starting Engine

Pre flight Inspection	COMPLETED
Passenger Briefing	COMPLETED
Harnesses	SECURE
Brakes	ON/PARK
Avionics (except EMS)	OFF
EMS	ON
Circuit Breakers	IN
Fuel Level Warning Light (optional)	CHECK using test switch

4.5.2 Starting Engine - Cold

Master Switch	ON
Fuel Shutoff Valve	ON
Carburettor Heat	OFF
Choke	ON*
Throttle	CLOSED
Fuel Pump	ON
Ignition switches	ON
Starter	ENGAGE when engine fires RELEASE**
Oil Pressure	CHECK (pressure to be indicated within 10 secs)
Choke	Closed
Throttle	900 – 1000 RPM
Alternator Warning Light	CHECK OFF
Avionics	ON

* - If the engine is hot, proceed as for cold engine, but do not use choke.

** - If the engine is turning at less than 300 RPM it will not start.

4.5.3 Taxiing

Power	1000-1200rpm
Speed	FAST WALKING PACE MAXIMUM
Strobe	ON
Landing Lights	OFF UNTIL ENTERING RUNWAY
Position	STAY RIGHT on taxiways
Carburettor heat	AS REQUIRED
Brakes	AS REQUIRED. Do not apply continuously.

If required, brakes should be applied periodically: allow the speed to build up to a fast walking pace then apply brakes to reduce to a slow walking pace. Release the brakes and allow the speed to gradually build up again. This allows the brakes time to cool down between applications & minimises wear.

For more details regarding taxiing refer to section 8.2

4.5.4 Before Take-Off

Park Brake ..... ON

Ground Check & Run Up

Warm Up ..... 1000-1200 RPM avoid prolonged idle at low RPM
Ignition Check ..... 2000 RPM Both-L-Both-R-Both. Max drop 100RPM
Carburettor heat ..... 2000 RPM – ON – slight drop in RPM
Carburettor heat ..... 2000 RPM – OFF – RPM restored
Power Check ..... 2850 RPM +/- 150 RPM
Idle Check ..... 700 – 900 RPM
Trim ..... SET – Neutral
Avionics ..... Check (pitch, heading, etc)

Pre Take-Off

Master Switch ..... ON
Ignition switches ..... BOTH ON
Fuel Shutoff Valve ..... ON
Fuel Quantity ..... CHECK sufficient for task**
Fuel Pump ..... ON
Flaps ..... TAKE OFF (first stage)
Instruments ..... SET AND CHECK ALL
Switches ..... SELECTED as required
Circuit Breakers ..... CHECK
Controls ..... FULL & FREE TRAVEL, CORRECT SENSE
Hatches ..... CLOSED & LOCKED
Harnesses ..... SECURE all seat belts correctly fastened and adjusted
Oil temperature ..... ABOVE 40^{0}C (104^{o}F)

4.5.5 Take-Off

Carburettor heat ..... OFF
Throttle ..... FULL OPEN (3000 rpm)*
Elevator Control ..... NEUTRAL
Directional Control ..... NOSEWHEEL STEERING & RUDDER
Rotate ..... 30 – 40 KIAS raise nosewheel clear of ground
Take Off Safety Speed ..... 65 KIAS
Accelerate to flapped Climb Speed ..... 70 KIAS
Flaps ..... UP
Accelerate to clean climb speed ..... 80 KIAS
Fuel Pump ..... OFF at top of climb.
Power ..... SET as required.

* - 3000 rpm is typical at full power on takeoff. Variation will exist between individual aircraft and depending on atmospheric conditions. Regardless FULL POWER should always be used at takeoff so long as maximum continuous engine speed (3300 rpm) is not exceeded.

** See Amplified proceedures for more details.

4.5.6 Initial Climb

Throttle ..... FULL OPEN
Airspeed ..... 80 KIAS

4.5.7 Cruise

75% Power.....2800 RPM (14-16 L/hr)

4.5.8 Descent

Power.....As required
Carburettor heat.....As required

4.5.9 Before Landing (and flight below 1000ft AGL)

Brakes.....OFF
Harnesses.....SECURE
Fuel Pump.....ON

4.5.10 Normal Landing

Airspeed @ 50ft .....65 KIAS
Wing Flaps .....FULL
Directional Control.....RUDDER & NOSEWHEEL STEERING
Power .....AS REQUIRED
Touchdown .....MAINS FIRST. Hold nose wheel off*.
Braking.....AS REQUIRED

*- In cross winds lower nose wheel earlier for better directional control.

NOTE

If the aircraft is contaminated by build up of insects or other debris, increase approach speed @ 50ft to 68 KIAS

4.5.11 Baulked Landing

Power.....FULL THROTTLE
Carburettor heat .....OFF (COLD)
Wing Flaps .....RETRACT **SLOWLY**
Airspeed.....ESTABLISH NORMAL CLIMB SPEED

4.5.12 After Landing/Securing

Wing Flaps .....UP
Fuel Pump.....OFF
Parking Brake.....ON/AS REQUIRED
Avionics.....OFF
Ignition .....OFF
Master Switch.....OFF
Controls.....SECURE

4.6 AMPLIFIED PROCEDURES

This section is provided to supply the pilot with additional information concerning normal procedures in general. Elaboration of the procedures specified in the NORMAL PROCEDURES CHECK LISTS as well as the inclusion of some more generalised procedures that can be better covered by a general descriptive procedure rather than a formal check list are included in this section. This will give the pilot a more complete understanding of these procedures.

4.6.1 Preflight Inspection

The Preflight inspection as covered by the PREFLIGHT INSPECTION CHECKLIST is recommended prior to the first flight of the day. Inspection procedures for subsequent flights can be abbreviated provided essential items such as fuel and oil quantities, security of fuel and oil filler caps are satisfactory. After refuelling fuel samples must be taken from all drain points, three in total, one in each of the two wing fuel tanks and one under the fuselage.

Aircraft operated from rough strips, especially at high altitudes, are subject to abnormal undercarriage abuse. Frequent checks of all undercarriage components, tyres and brakes is warranted in these situations.

4.6.2 Electric Fuel Gauges (where equipped):

The fuel gauges used in the J170-D use a sender unit which has a built-in analogue needle indicator for fuel level. These senders are located in the wing roots and are visible to the crew. these units may be used to confirm the fuel level being displayed by the indicators fitted to the instrument panel. Note that due to the shape of the wing tanks, the gauges will read full from when the tank is full until it's level has dropped below around 50 litres. This must be taken into account by manually checking fuel quantity (dipping the tanks) before a long flight.

4.6.3 Starting Engine

The Jabiru 2200 engine is fitted with a dual electronic ignition system. The engine will not start below 300 RPM, which precludes the option of hand swinging or "propping" an engine when there is insufficient charge available in the aircraft battery for a normal start. Starting using an external power source involves removing the upper engine cowl, attaching jumper leads to the battery terminals or using jump start connector (if fitted). Then proceed with the normal start sequence. It is recommended that the battery is charged before flight is undertaken.

WARNING

If cowl was removed for engine starting, shut down before re-fitting the engine cowl.

After starting, oil pressure should start to rise within 10 seconds. If it does not rise within this time stop the engine and investigate the cause.

WARNING

Flight should not be undertaken with a faulty battery. It could cause failure of the electrical system.

The charging system in the Jabiru is not designed to be flown with a flat or faulty battery. If external power is required to start the engine the batteries condition should be verified.

4.6.4 Taxiing

Positive control is available to the pilot when taxiing the J170 due to the direct linkage type nosewheel steering. Care should be exercised in strong winds, particularly in quartering tail wind conditions. As with any high wing configuration aircraft, appropriate elevator and aileron control positions are essential during taxiing operations particularly during strong tail wind conditions.

Taxiing over loose gravel or stones should be done at low engine RPM to minimise propeller damage.

4.6.5 Engine Management – Ground Running

The 2200 engine fitted to the J170-D is cooled by air flowing over the engine and oil cooler. During ground running care must be taken to ensure that there is adequate airflow and that safe engine temperatures are maintained. The guidelines presented below will assist in controlling temperatures.

- Minimise ground running times – especially in hot weather[3].
- Carry out as many checks as possible before starting the engine.
- Always carry out engine run-up tests with the aircraft pointing into wind.
- In hot weather, after performing run-up checks, leave the aircraft pointing into wind and idling at 1200rpm for 30 seconds to aid cooling.
- If the aircraft is required to wait – such as for runway clearance – temperatures must be monitored, and if they approach ground running limits (listed in Section 2 of this flight manual & displayed as yellow markings on engine gauges) the aircraft must be turned into wind or shut down to prevent any further temperature increase.
- Wind must be coming from within approximately 45° of the aircraft heading to be effective in aiding engine cooling.
- If there is no wind or low wind the engine must be shut down if ground-running temperature limits are reached.

4.6.6 Warm Up

Most of the warm up will have occurred during taxiing and whilst conducting the Before Take-Off checks. The engine is warm enough for take-off when the cylinder head and oil temperatures are in the green arcs.

Ignition System Check

The magneto check should be made at 2000 RPM as indicated by the tachometer with the carburettor heat set to COLD. Select the LEFT ignition OFF and note the RPM drop, return to BOTH until the engine regains speed. Select RIGHT ignition OFF and note the RPM drop, return to BOTH. Drop in RPM should not exceed 100 RPM. Do not operate on a single ignition source

[3] 30°C and above

for an extended period; a few seconds is usually sufficient to check RPM drop and will minimise spark plug fouling.

4.6.7 Take-Off

Power Check

Full throttle runups over loose gravel are especially harmful to the propeller and should be avoided. When take-offs must be made from a gravel surface, it is very important that the throttle be advanced slowly and a rolling start take-off technique be used to minimise propeller damage.

It is important to check full throttle engine performance early in the take-off run. Any sign of rough engine operation or sluggish acceleration is good cause for discontinuing the take-off and conducting a full power runup to confirm normal engine operation prior to the next take-off attempt.

Wing Flap and Power Settings

Normal take-offs are accomplished at full throttle, and TAKE-OFF flap selected. The flaps should not be retracted until a safe height is achieved and all obstacles have been cleared. Take-offs may be made with flaps up but this will increase the take-off distance and will result in a more pronounced nose up attitude at lift off.

4.6.8 Climb

Enroute climb

Enroute climbs are performed with flaps up, full throttle, and at speeds 5 to 10 knots higher than the best rate of climb speed. This provides better engine cooling with little loss of climb performance.

4.6.9 Cruise

The power setting and cruising altitude are the two major factors that will affect the cruising speed and range of the J170. Other influencing factors include the weight and loading, temperature and equipment installed in a given aircraft. The power setting normally used for cruise is 2800-2850 rpm. Power settings below this will result in increased range and endurance corresponding with the reduced fuel consumption. At a power setting of 45% the J170 is capable of attaining an endurance of close to 13 hours, for a range of over 1000 nautical miles. For efficient and economical operation as well as to achieve maximum engine service life the engine must always be operated in accordance with the procedures and specifications set out in the Jabiru engine manuals.

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4.6.10 Stalls

In any attitude or under any loading condition there is no natural stall warning. An artificial stall warning horn is set to activate 5 to 10 KIAS above the stall speed in any configuration. All controls

are effective up to and completely through the stall and there is no noticeable tendency to enter a spin after the stall.

4.6.11 Approach and Landing

Landings are normally conducted with full flaps. The landing approach is conventional. Care must be taken to ensure airspeed is accurately maintained during the final landing approach. Timely and appropriate use of power should be exercised to maintain the desired flight path and airspeed. Excessively high approach speeds will result in prolonged floating and increased landing distance. Normally the throttle should be fully closed during the 'flare' to reduce the tendency to float and prolong the touchdown. Touchdown should occur on the main wheels initially, followed by the nose gear which should be held clear of the ground during the initial ground roll. Positive braking may then be applied depending on requirements and circumstances. For maximum braking effectiveness the wing flaps should be retracted and back pressure applied to the control column.

4.6.12 Cross Wind Landing

The J170-D has been approved for operations in crosswinds of up to 14 Knots.

When landing in a strong cross wind use a wing low, crab, or a combination method of drift correction. Avoid a prolonged hold off by allowing the aircraft to settle onto the runway in a slightly nose high and wing low attitude, touching down on the into wind mainwheel first followed by the other mainwheel and then the nose gear in quick succession. In strong and/or gusty wind conditions it may be desirable to make the final approach at a slightly higher than normal airspeed with partial or no flap selected.

4.6.13 Baulked Landing

In a baulked landing (go-around), the wing flaps should be retracted to take-off immediately after full power has been applied. Upon reaching a safe airspeed, the flaps should be smoothly retracted to the full up position and a normal climb established.

4.6.14 Flight Over Water

When life preservers and rafts are required, crew life preservers should be worn at all times. Life rafts can be stowed in the baggage compartment.

4.7 Advanced Procedures

The following procedures are advanced techniques designed for special circumstances. To carry them out successfully the pilot must be well trained and experienced in the particular aircraft being used. Before attempting them the pilot must realistically assess the circumstances and their skills.

WARNING

The following procedures are used in less than optimal conditions. They are inherently less safe than normal procedures. The operator attempts them at their own risk.

4.7.1 Short Field Take-Off

Crew	HARNESS SECURE / BRACE
Aircraft Weight	MINIMISE
Ground Inspection	COMPLETE
Measure runway length	MARK TAKE-OFF ABORT POINT
Wheel Spats	ON FOR LONG GRASS OFF FOR SOFT SURFACE
Elevator Trim	NEUTRAL
Fuel Shutoff value	ON
Fuel Pump	ON
Carburettor Heat	OFF (COLD)
Wing Flaps	TAKE OFF (1st Stage)
Position	FOR MAX POSSIBLE RUNWAY LENGTH
Engine	WARM THOROUGHLY
Brakes	HOLD FULL ON BY HAND
Throttle	FULL. Wait for engine RPM to peak
Brakes	RELEASE
Elevator	FULL BACK until nose wheel lifts 25mm (1”). AS REQUIRED after
Abort	IF NOT AIRBORNE BY ABORT POINT
Rotate	AS SOON AS POSSIBLE
Lift-off	BEST ANGLE OF CLIMB SPEED until clear of obstacles.

NOTE

Short field take-offs are potentially high risk manoeuvres. Reducing rotation and climb speeds lower the aircraft’s safety margins, especially in a cross wind, wind gust or if the engine fails. Where possible, they should only be attempted in good conditions. If students are being taught short field take-offs the weather conditions must be appropriate and a long runway used.

WARNING

If high power is applied when the propeller is over loose gravel, grass etc propeller damage will result.

WARNING

It is possible to over-rotate the aircraft in ground effect to a dangerously nose-high pitch, resulting in a stall once clear of ground effect. Allow pitch angle & airspeed to stabilise out of ground effect before applying aggressive pitch inputs.

4.7.2 Short Field Landing

Approach	FLAT. Aim for wheels to touch as near to the target point as possible. Approach under power.
Power	APPROX 1500 RPM
Airspeed	55 KIAS
Touch-down	AT TARGET POINT. Wheel brakes are the best way to slow the aircraft. Touching down positively and slightly fast then braking heavily will give shortest landing distances.
Power	IDLE
Brakes	HEAVY. DO NOT LOCK WHEELS.

NOTE

Short field landings are potentially high risk manoeuvres. Reducing approach speeds and approaching under power lower the aircraft's safety margins, especially in a wind gust or if the engine fails. Where possible, they should only be attempted in good conditions. If students are being taught short field landings the weather conditions must be appropriate and a displaced threshold used.

NOTE

Short field approaches require great precision in airspeed and height control. Pilots must be prepared to go-around early.

NOTE

After heavy braking such as that required for a short field landing brake temperatures will rise dramatically and afterwards brake effectiveness may be significantly reduced.

WARNING

If the aircraft overruns the runway stop the engine to minimise propeller and engine damage

4.7.3 Soft Field Take-Off

Crew	HARNESS SECURE / BRACE
Aircraft Weight	MINIMISE
Ground Inspection	COMPLETE
Measure runway length	MARK TAKE-OFF ABORT POINT
Wheel Spats	OFF FOR SOFT SURFACE
Elevator Trim	NEUTRAL
Fuel Shutoff Valve	ON
Fuel Pump	ON
Carburettor Heat	OFF (COLD)
Position	FOR MAX POSSIBLE RUNWAY LENGTH
Engine	WARM THOROUGHLY
Brakes	HOLD FULL ON BY HAND
Throttle	FULL. Wait for engine RPM to peak
Brakes	RELEASE
Elevator	FULL BACK until nose wheel lifts 25mm (1"). AS REQUIRED after
Wing Flaps	UP DURING INITIAL GROUND ROLL
Abort	IF NOT AIRBORNE BY ABORT POINT
Wing Flaps	FULL DOWN at 45-50 KIAS
Rotate	AS SOON AS POSSIBLE
Lift-off	BEST ANGLE OF CLIMB SPEED until clear of obstacles.

NOTE

Soft field take-offs are potentially high risk manoeuvres with reduced safety margins, especially in a cross wind, wind gust or if the engine fails. Where possible, they should only be attempted in good conditions. If students are being taught soft field take-offs the weather conditions must be appropriate and a long runway used.

WARNING

It is possible to over-rotate the aircraft in ground effect to a dangerously nose-high pitch, resulting in a stall once clear of ground effect. Allow pitch angle & airspeed to stabilise out of ground effect before applying aggressive pitch inputs.

WARNING

If high power is applied when the propeller is over loose gravel, grass etc propeller damage will result.

4.7.4 Soft Field Landing

Crew..... HARNESS SECURE / BRACE

Surface Test:

Wing Flaps ..... TAKE-OFF (1st Stage)
Approach..... FLAT. Aim for wheels to touch as near to the target point as possible. Approach under power.
Power..... APPROX 1500 RPM
Airspeed..... 5 KIAS ABOVE STALL
Main Wheels..... TOUCH.
Go-Around..... EXECUTE

Landing:

Wing Flaps ..... FULL
Approach..... FLAT. Aim for wheels to touch as near to the target point as possible. Approach under power.
Power..... APPROX 1500 RPM
Touch Down ..... MINIMUM / STALL SPEED
Go-Around..... APPLY IF NEEDED
Power..... IDLE
Brakes..... AS REQUIRED

NOTE

Soft field landings are high risk manoeuvres with potential for the aircraft to flip or become un-controllable due to the soft surface. Where possible, they should only be attempted on a known runway in good conditions. If students are being taught soft field landings the weather conditions must be appropriate and a long runway used.

NOTE

Soft field approaches require great precision in airspeed and height control. Pilots must be prepared to go-around early.

4.7.5 Crosswind Take-Off

Normal take-off checks	COMPLETE
Aileron	POINT FULLY TOWARDS WIND.
Normal take-off procedure	APPLY
Aileron	EASE AS REQUIRED as speed increases
Nose wheel	ON GROUND to maintain directional control until approximately 45 KIAS.
Rotate & climb	CARRY OUT. Avoid aggressive pitch input until aircraft is clear of ground effect.

4.7.6 Crosswind Landing – "Wing Low" Method

Jabiru Aircraft recommend using the "wing low" method of landing in crosswinds as it allows the strength of the crosswind to be continually assessed during the final approach and is less likely to cause directional control issues on touch-down.

Wind Strength	CHECK using the wind sock.
Runway & Surrounds	ASSESS. If the crosswind is strong carry out a low pass over the runway to check for control authority, areas of sink or turbulence. Note trees, hangars, hills etc will cause turbulence. Consider displacing threshold to avoid turbulence if safe.
Wing Flaps	AS NEEDED. Landing with less flap angle increases approach speed and improves control authority. Angle of attack increases and approach angle decreases however.
Approach Speed	HIGH. Add 5 – 10 KIAS to improve control authority & stall speed margin.
Direction	CHOOSE. Pilots flying from the left (command) seat normally prefer a cross wind from the left.

WARNING

Do not attempt to land with a tail-wind component.

Runway Alignment	SET EARLY. Allow a long final leg.
Aileron on Final	APPLY: lower the wing on the wind side of the aircraft. i.e. if the wind is coming from the left apply left aileron & lower the left wing.
Rudder on Final	APPLY AS NEEDED to keep the aircraft aligned with the runway.
Control Authority	ASSESS. If the aircraft centreline cannot be held on the runway centreline during final the crosswind is too strong & the landing must be aborted.
Power	APPROX 1500 RPM
Touch-down	1 MAIN WHEEL FIRST: the wing low orientation is maintained during flare & landing. Align nose wheel with runway before the wheel touches.
Nose Wheel	LOWER EARLY. Do not hold off nose wheel

	in crosswind conditions: lower it to improve directional control.
Power	IDLE
Brakes	AS NEEDED. DO NOT LOCK WHEELS.
Aileron / Elevator Deflection	MAINTAIN: in strong wind the aircraft must be "flown" during ground operations to minimise the risk of being flipped. See Section 8.2

NOTE

When flying with "crossed controls" such as left Aileron with right Rudder the aircraft will be out of balance and experience higher than normal drag. Descent rates will increase. Aircraft response to control inputs may be slower than normal.

4.7.7 Crosswind Landing – "Crab" Method

Situation Assessment	AS FOR "WING LOW" METHOD
Aircraft positioning & configuration	AS FOR "WING LOW" METHOD
Runway Alignment	SET EARLY. Allow a long final leg.
On Final	"CRAB" AIRCRAFT: Adjust aircraft heading so that its course over the ground aligns with the runway. The aircraft nose points off to the windward side. Aircraft is in balance.
Power	APPROX 1500 RPM
Wing into wind	LOWER BEFORE STRAIGHTENING
Touch-down	STRAIGHTEN BEFORE TOUCHDOWN: Use the rudder to align the aircraft with the runway just before the wheels touch.
Nose Wheel	LOWER EARLY. Do not hold off nose wheel in crosswind conditions: lower it to improve directional control.
Power	IDLE
Brakes	AS NEEDED. DO NOT LOCK WHEELS.
Aileron / Elevator Deflection	MAINTAIN: in strong wind the aircraft must be "flown" during ground operations to minimise the risk of being flipped. See Section 8.2

4.7.8 S-Turns

S-turns are a means of losing excess height during the landing approach to position the aircraft correctly for touch-down. Essentially the pilot flies the aircraft through a sequence of left and right turns within an arc of 90° left to 90° right of the desired heading. In a turn the aircraft has significantly higher drag than normal and so descent rates increase considerably. In addition the turns effectively increase the distance from the aircraft to the threshold, allowing more time to lose height.

Remember that stall speed increases with bank angle – in a 60° bank with full flaps the J170-D will stall in still air at around 57 KIAS. An airspeed margin of around 10 KIAS above stall speed is recommended – more in gusty or turbulent conditions.

Power	IDLE
Speed	67 KIAS
Flaps	FULL DOWN
Bank Angles	DO NOT EXCEED 60°
Ground Conditions	ALLOW FOR TURBULENCE / GUSTS

WARNING

Repeated banks at low height and relatively low speed can lead to a stall / spin accident if the pilot allows speed to drop too much. Monitor airspeed, bank & pitch angles carefully; note the raised stall speed during banks. Initial training must be carried out at a safe altitude (recommended 8000' AGL) to allow time for recovery in the event of an inadvertent spin.

4.7.9 Side Slips

Side slips are a means of losing excess height during the approach to landing. A side slip is where a pilot deliberately inputs "crossed controls" – i.e. right rudder with left aileron. Note that this is an extension of the "wing low" method of carrying out cross wind landings – except instead of applying the minimum control input to direct the aircraft along the runway the pilot applies excess inputs resulting in an exaggerated "wing low" configuration. With this combination of controls the aircraft will experience relatively high drag and associated sink rates. Because of the propeller wash most aircraft will slip better in one direction than another – typically a J170-D will prefer to be configured with the left wing low – i.e. apply left aileron and right rudder.

Power	IDLE
Speed	67 KIAS
Flaps	FULL DOWN
Bank Angles	DO NOT EXCEED 60°
Ground Conditions	ALLOW FOR TURBULENCE / GUSTS
Recover / straighten	EARLY: aircraft will take time to recover

WARNING

Deliberately crossing controls at low height and relatively low speed can lead to a stall / spin accident if the pilot allows speed to drop too much. In this configuration the aircraft has high drag and will require time to recover and to respond to new inputs. Monitor airspeed carefully. Aggressive slipping should be avoided as it may cause turbulence and vibration over the tail. Initial training must be carried out at a safe altitude (recommended 8000' AGL) to allow time for recovery in the event of an inadvertent spin.

5. PERFORMANCE

5.1 TAKE OFF AND LANDING DISTANCES

Take-Off Distance	600 m (From stationary to a height of 50')
Landing Distance	513 m (From a height of 50' until stationary)

Note:

All distances quoted are for an aircraft at gross weight, operating from a paved runway surface at sea level in an ICAO standard atmosphere.

CAUTION

Take-Off and Landing distances will vary significantly depending on many factors – including aircraft condition & configuration, pilot technique, airfield and weather conditions. Operators must be aware of this and allow suitable safety margins for their operations.

5.2 RATE OF CLIMB

Rate of Climb at Sea Level[4]	500 fpm

Note:

All distances quoted are for an aircraft at gross weight, operating from a paved runway surface at sea level in an ICAO standard atmosphere.

5.3 CRUISE SPEEDS / RPM / FUEL CONSUMPTION

- Cruise speed values given are based on tests carried out at gross aircraft weight, at sea level and around 28°C. Values are averaged. Actual values will vary slightly from one aircraft to the next. Values used for flight planning should be based on previous experience with the specific aircraft wherever possible.
- Fuel consumption values given are averaged. Actual values will vary slightly from one aircraft to the next. Values used for flight planning should be based on previous experience with the specific aircraft wherever possible.

RPM	Fuel Consumption (Litres/hr)	IAS (Knots)
2600	11	85
2700	13	91
2800	15	95
2850	16	97
2900	17	99
3000	20	103

[4] At Gross Weight, ICAO Standard Atmosphere

5.4 Airspeed Indicator System Calibration

Conditions:

Power: As required for level flight or maximum rated RPM as appropriate.

KIAS	KCAS		
	Flaps UP	Flaps Take-off	Flaps Landing
42	-	-	40
45	-	43	43
47	45	45	45
50	48	48	48
56	53	54	54
57	54	55	55
63	60	60	60
73	70	70	70
85	81	82	82
94	90	-	-
106	101	-	-
113	108	-	-
125	120	-	-
135	129	-	-
140	134	-	-
146	140	-	-

NOTE

Indicated airspeed assumes zero instrument error

6. WEIGHT AND BALANCE INFORMATION

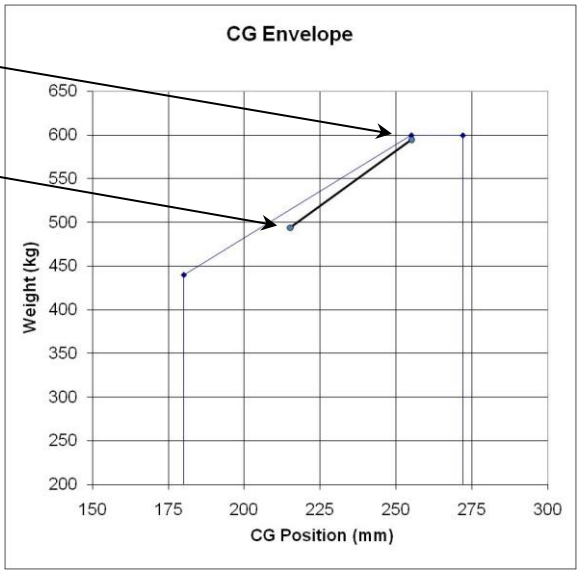
6.1 CG RANGE

Forward Limit:	180-mm (7.09”, 18.2%MAC) aft of datum up to & including 440 kg (970lb) 255-mm (10.0”, 25.8%MAC) aft of datum at 600kg (1323lb) Linear variation between points.
Aft Limit	272-mm (10.718”, 27.5%) aft of datum at all weights
Datum	Wing Leading Edge
Levelling Means	
Longitudinal	Spirit Level placed on the lower section of the door frames (left or right side).
Lateral	Spirit Level placed across the fuselage between the left and right side lower door frames.
Arms	
Arm for Front Seat Station	297-mm aft of datum
Arm for Baggage On Shelf	920-mm aft of datum
Fuel Station (5 Litres)	451-mm aft of datum

J170-D CG Envelope

Example CG movement:
Lower point = 2x86kg, no fuel.

Upper point = 2x86kg, full fuel.



6.2 Baggage Zones

The cabin has one baggage zone:

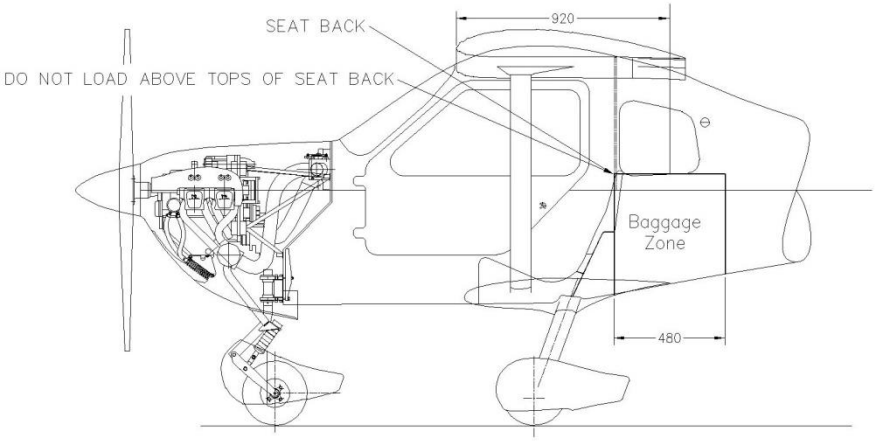


Figure 6.3.1 – Baggage Zones

Baggage is restrained using the straps fitted in the baggage area.

6.3 MINIMUM EQUIPMENT LIST

System Instruments and/or Equipment	VFR Day	Remarks
Communications		
VHF Comm	A/R	As required per local operating regulations
Electrical Power		
Alternator Battery Voltage Indicator	1 1 1	
Fire Protection		
Portable Fire Extinguisher	A/R	As required per local operating regulations
Flight Controls		
Pitch Trim Indicator Pitch Trim System Flap Position Indicator Stall Warning System	1 1 1 1	
Fuel		
Fuel Quantity Indicator Fuel On/Off Valve	2 1	
Ice & Rain Protection		
Engine Alternate Air Induction System	1	

System Instruments and/or Equipment	VFR Day	Remarks
Navigation & Pitot Static		
Altimeter	1	
Airspeed Indicator	1	
Magnetic Compass	1	
Time Piece	1	May be carried on the pilot
Turn Co-ordinator	A/R	As required per local operating regulations
Pitot/Static System	1	
Transponder	A/R	As required per local operating regulations
Engine Indicating		
Cylinder Head Temperature	1	
Tachometer	1	
Oil Pressure	1	
Oil Temperature	1	
Fuel Pressure	1	
Oil Quantity (Dip Stick)	1	
Caution Warning System	1	Fuel, electrical, and vacuum systems
Approved Pilot's Operating Handbook	1	

6.4 AIRCRAFT WEIGHT DATA

Insert Page 6.2 here

Insert Page 6.3 here

Insert Equipment List here.

6.5 TRIM SHEETS

The trim sheets included below, when used correctly, provide a means of calculating the aircraft weight and CG position without manual calculations. An example of using the sheet is included for reference.

6.5.1 Index Units

The chart is based on an aircraft "EMPTY WEIGHT TRIM INDEX" which is calculated using the following formula:

$$\text{Empty Weight Trim Index} = \frac{\{(\text{Aircraft Empty Weight}) * (\text{Empty Weight Arm})\}}{1000}$$

For reference, the example below shows two 85kg people, 5kg in Baggage Zone and 60L of fuel. The aircraft's starting Index Unit is 54.4 at 320kg.

Example Trim Index Calculation:		
Aircraft Empty Weight	=	320-kg
Aircraft Empty Weight Arm	=	170-mm aft of datum
Empty Weight Trim Index	=	(320 x 170) / 1000
	=	54.4

6.5.2 Calculate Aircraft Weights

1-1 Use the Aircraft Empty Weight obtained from the latest aircraft weighing records to enter the vertical "Aircraft Empty Weight Scale" on right hand side of the chart.

1-2 Move horizontally to the left into the next scale which is the "Crew Weight" Scale.

1-3 Move vertically downward one line on this scale for each 10-kg of weight that is placed on the front seats, and mark a point.

1-4 Move horizontally to the left from the point made in Step 1-3 to enter the next scale which is the "Baggage Weight" Scale.

1-5 Move vertically downward one line on this scale for each 5-kg of weight that is placed in Baggage Zone and mark a point.

1-6 Move horizontally to the left from the point made in Step 1-5 to enter the next scale which is the "Fuel Quantity" Scale and mark a point, This point is the "Zero Fuel Weight Reference Point"

1-7 Move Horizontally to the left of the "Zero Fuel Reference Point" and Mark a "Zero Fuel Weight Line" across the "Aircraft Trim Condition" Graph.

1-8 From the "Zero Fuel Point" on the "Fuel Quantity Scale" (marked in Step 1-6), move vertically downward one line for each 10-***litres*** of fuel being carried at the take-off condition. Mark this "Take-Off Fuel Point" on the scale.

1-9 Move horizontally to the left, and mark a "Take-Off Fuel Weight Line" across the "Aircraft Trim Condition" graph.

6.5.3 Calculating the Operating CG Locations

2-1. Take the calculated Empty Weight Trim Index and mark its position on the Aircraft Index Units Ladder at the top of the sheet.

2-2 Draw a vertical line down from the point marked above to intersect with a sloping line in the “Crew Index Units” scale and mark this point.

2-3 Calculate the weight of the crew and round this value to the nearest 10-kg.

2-4 Move horizontally to the right from the point marked in Step 2-2 one line for each 10-kg of load calculated. (i.e. 60-kg = 6 lines) and mark a point at this location.

2-5 Draw a vertical line down from the point marked above to intersect with a sloping line in the Baggage Area scale and mark this point.

2-6 Calculate the weight that will be placed Baggage Area and round this value to the nearest 5-kg.

2-7 Move horizontally to the right from the point marked in Step 2-5 one line for each 5-kg of load calculated. (i.e. 20-kg = 4 lines) and mark a point at this location.

2-8 Drop a vertical line down from the point marked in Step 2-10 to intersect a sloping line in “Fuel Chart”, and mark a point at this location.

2-9 Continue the Vertical Line began in Step 2-11 down to intersect with the “Zero Fuel Weight Line” drawn in Step 1-9. mark this point as the “ZERO FUEL Condition”

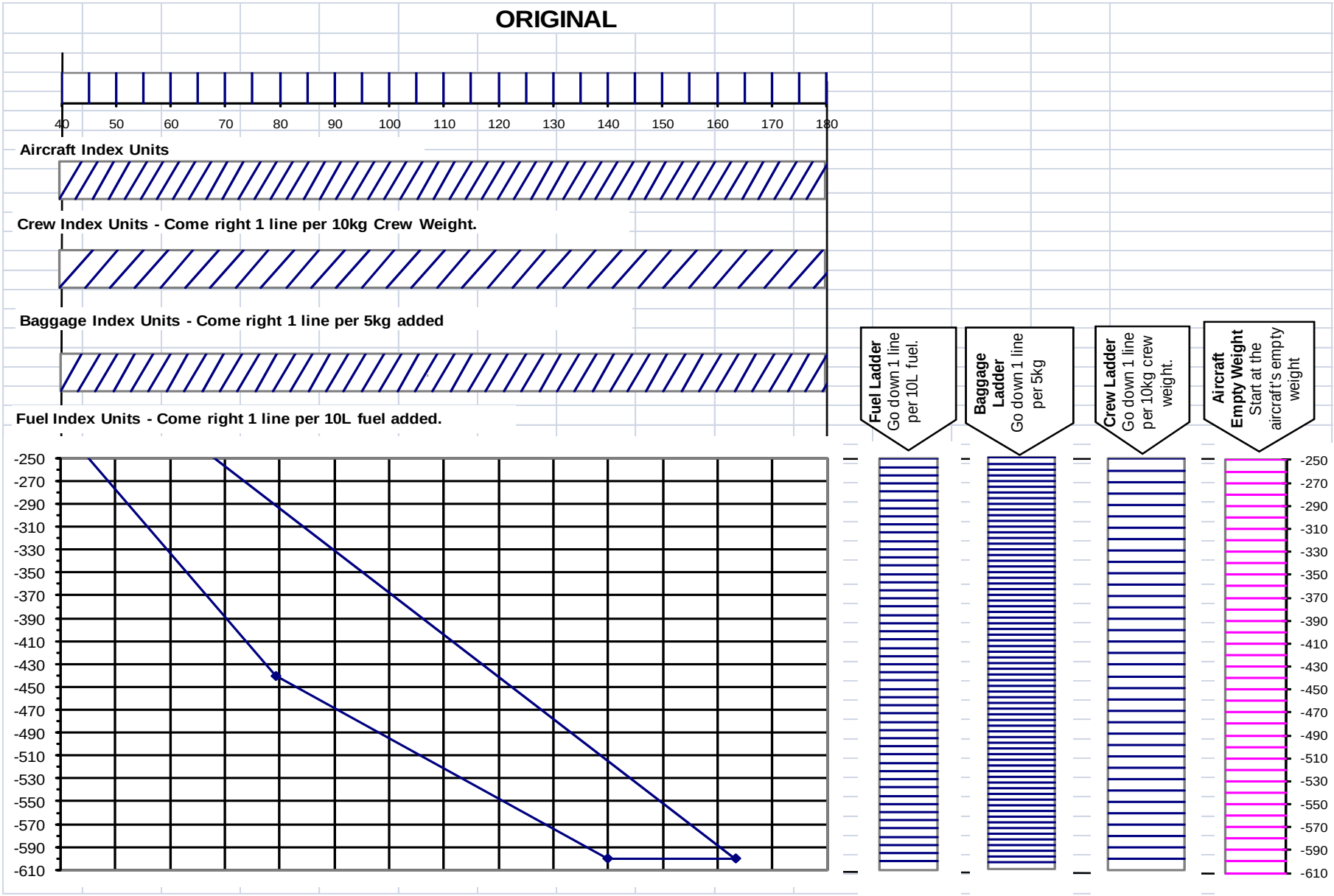
2-10 Move horizontally to the right from the point marked in Step 2-11 in the “Take-Off Fuel Box”, one line for each 10 litres of take-off fuel, and mark this point.

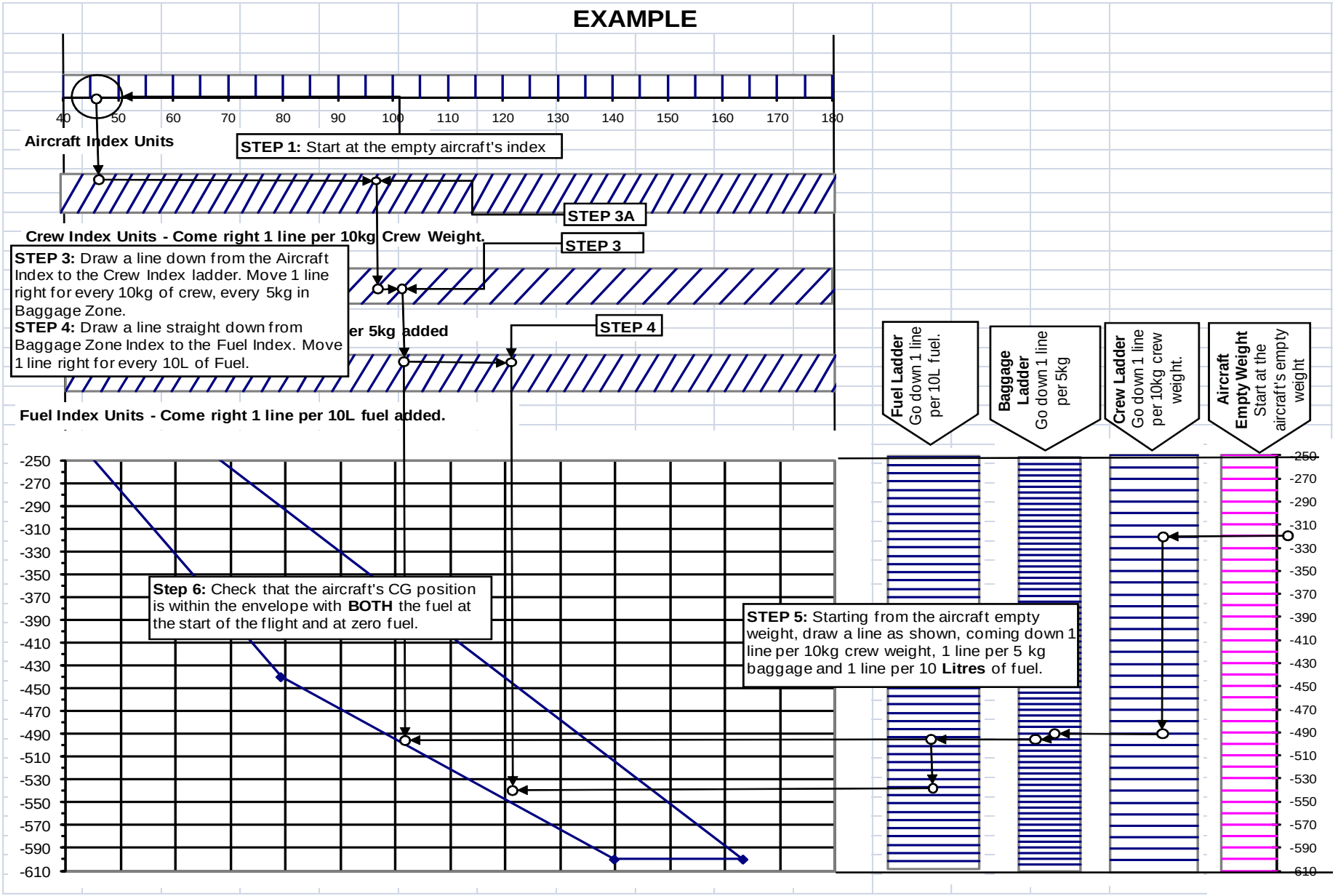
2-11 Move vertically downward from the take-off fuel point marked in Step 2-13 to intersect with the “Take-Off Fuel Weight Line” marked in Step 1-9. Mark this point the “Take-Off Condition”

6.5.4 Allowable Loading Conditions

An allowable loading condition exists when both the “Zero Fuel Condition”, and the “Take-Off Condition” fall with the area bounded by the Line in the Aircraft Trim Conditions Box.

ORIGINAL


40 50 60 70 80 90 100 110 120 130 140 150 160 170 180
Aircraft Index Units
Crew Index Units - Come right 1 line per 10kg Crew Weight.
Baggage Index Units - Come right 1 line per 5kg added
Fuel Index Units - Come right 1 line per 10L fuel added.
Fuel Ladder Go down 1 line per 10L fuel.
Baggage Ladder Go down 1 line per 5kg
Crew Ladder Go down 1 line per 10kg crew weight.
Aircraft Empty Weight Start at the aircraft's empty weight
-250 -270 -290 -310 -330 -350 -370 -390 -410 -430 -450 -470 -490 -510 -530 -550 -570 -590 -610


EXAMPLE
40 50 60 70 80 90 100 110 120 130 140 150 160 170 180
Aircraft Index Units
STEP 1: Start at the empty aircraft's index
STEP 3A
Crew Index Units - Come right 1 line per 10kg Crew Weight.
STEP 3
STEP 3: Draw a line down from the Aircraft Index to the Crew Index ladder. Move 1 line right for every 10kg of crew, every 5kg in Baggage Zone.
STEP 4: Draw a line straight down from Baggage Zone Index to the Fuel Index. Move 1 line right for every 10L of Fuel.
er 5kg added
STEP 4
Fuel Index Units - Come right 1 line per 10L fuel added.
Fuel Ladder Go down 1 line per 10L fuel.
Baggage Ladder Go down 1 line per 5kg
Crew Ladder Go down 1 line per 10kg crew weight.
Aircraft Empty Weight Start at the aircraft's empty weight
-250 -270 -290 -310 -330 -350 -370 -390 -410 -430 -450 -470 -490 -510 -530 -550 -570 -590 -610
Step 6: Check that the aircraft's CG position is within the envelope with BOTH the fuel at the start of the flight and at zero fuel.
STEP 5: Starting from the aircraft empty weight, draw a line as shown, coming down 1 line per 10kg crew weight, 1 line per 5 kg baggage and 1 line per 10 Litres of fuel.

7. DESCRIPTION OF AIRPLANE AND SYSTEMS

7.1 GENERAL

The Jabiru J170-D is a high wing strut braced monoplane. The aircraft layout is shown below.

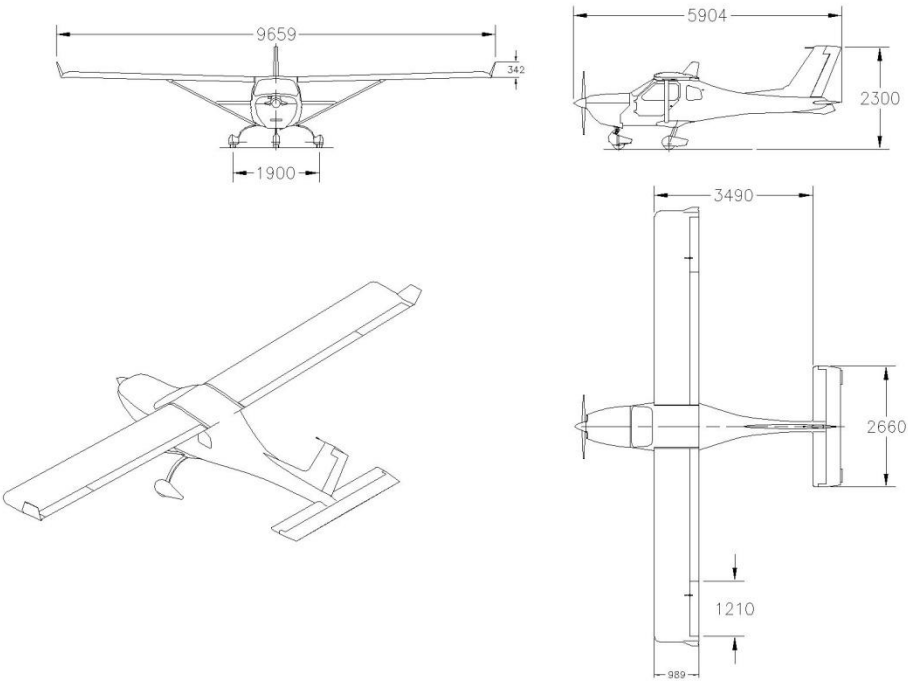


Figure 1-1 Three View Drawing of the J170-D
Note: *All dimensions in millimetres*

7.2 AIRFRAME

The fuselage, engine cowlings, wings, empennage, main undercarriage legs and all control surfaces are constructed of fibreglass-epoxy resin composite. The nose leg, engine mount and wing struts are the only large structural elements made from metal. The aircraft uses a tricycle, nose-wheel undercarriage layout and is equipped with wheel spats (fairings) as standard equipment.

Main fuel tanks are built into the wings while a smaller header tank is fitted behind the sound curtain at the rear of the cabin.

7.3 FLIGHT CONTROLS

The J170-D is equipped with conventional 3-axis controls; Ailerons, Rudder & Elevator. The aircraft is also equipped with wing flaps to reduce landing speed.

The ailerons are a differential design (they move upwards around twice as much as down) to reduce adverse yaw – the tendency for the aircraft to want to turn right while banking left.

The wing flaps are a slotted design to provide maximum lift for minimum drag. Flaps are driven electrically via a switch on the instrument panel.

The aircraft uses a steerable nose wheel for ground operations – the rudder pedals are permanently connected to the nose leg so that it moves in concert. Main wheel brakes (non differential) with a lockable park brake are provided.

The aircraft is equipped with an elevator trim system to minimise pilot loads in different modes of flight. The system works by applying spring loads to the elevator control, holding it in place. The trim is very positive and if necessary the aircraft can be landed using the trim as the primary pitch control.

7.4 INSTRUMENT PANEL

The J170-D may be customised with several different instrument panels. The primary instruments are fitted in front of the pilot while radio equipment is located centrally. A typical layout is shown below – note that several optional instruments are fitted to this particular aircraft. While the type, number and arrangement of the instruments in a given aircraft will vary the general arrangement will be as shown:

- Throttles at either side of the panel
- Radio, transponder, GPS & fuel gauges near the centre of the panel
- Ignitions & start switches located in front of the pilot
- Pull controls for carburettor heat, cabin heat & choke in the centre of the panel at the bottom.
- Compass on top of the panel or on the wing carry-through beam above the windscreen.
- Switch for the electric flaps in the centre of the panel near the bottom (USA instrument panel has a flap switch at each side of the panel above the throttle).
- “No Smoking” & “No Intentional Spins” placards on panel face.



7.5 FLIGHT INSTRUMENTS

7.5.1 Powerplant Instrument Markings

Instrument	Red Line Minimum Limit	Green Arc Normal Operating	Red Arc/Line Maximum Limit	Yellow Arc Precautionary Range
Tachometer	-	-	3300 RPM	-
Cylinder Head Temperature	-	Up to 180°C (356°F)	200°C (392°F)	180°C - 200°C (356° - 392°F)
Oil Pressure	80 kPa (11 psi)	220 - 525 kPa (31 – 76 psi)	525 kPa (76 psi)	80 - 220 kPa (11- 31psi)
Oil Temperature	15°C (59°F)	80 - 100°C (176° - 212°F)	118°C (244°F)	100°C - 118°C (212 °- 244°F)
Fuel Pressure	5 kPa (0.75psi)	5 – 28 kPa (0.75 – 4 psi)	28 kPa 4 psi	-
Voltage	-	10.5 – 15 Volts	-	-

7.5.2 ASI markings

Refer to section 2.1.1 for Airspeed Indicator markings.

7.5.3 EFIS & EMS LIMITATIONS DISPLAY

Where aircraft are equipped with EFIS or EMS displays, they are programmed to display limitations and alarms etc as a part of their installation into the aircraft. These limitations must be displayed for the aircraft to comply with its certification basis. If adjustments are required to the displays the work must be carried out before further flight by an authorised person with reference to the user manuals for the instruments, and the following lists give the minimum information which must be displayed.

7.5.4 Required EFIS limitation displays:

- Never exceed speed, V_{NE} (Red line speed, top of yellow arc)
- Maximum structural cruising speed, V_C (Top of green arc, bottom of yellow arc)
- Maximum Flap Extension speed, V_{FE} (Top of white arc)
- Stall speed with full flap, V_{S0} (Bottom of white arc)
- Stall speed clean, V_{S1} (bottom of green arc)

7.5.5 Required EMS Displays:

- RPM Red line
- Maximum continuous CHT (Top of CHT green arc, bottom of yellow arc)
- Maximum Take-Off CHT (Red line for CHT, top of yellow arc – no more than 5 minutes)
- Maximum continuous Oil Temperature (Top of oil temp green arc, bottom of yellow arc)
- Maximum Take-Off Oil Temperature (Red line for oil temp, top of yellow arc)
- Minimum Fuel Pressure (start of green arc)
- Maximum Fuel Pressure (end of green arc)
- Minimum Idle Oil Pressure (Redline & start of yellow arc)
- Minimum Flight Oil Pressure (end of yellow arc, start of green arc)
- Maximum Oil Pressure (End of green arc)
- Minimum System Voltage (Bottom of green arc)
- Maximum System Voltage (top of green arc)

Note

The display of these limitations are required for the aircraft's certification. It does not comply with the certification basis if these limits are missing or modified.

7.6 Engine

Manufacturer: Jabiru Aircraft Pty Ltd
Model: Jabiru 2200-B

7.7 Propeller

7.7.1 Jabiru Fixed Pitch Wooden Propeller

Manufacturer:	Jabiru Aircraft Pty Ltd
Model:	C000262-D60P42
Type:	Wooden, Fixed Pitch
Number of blades:	2
Diameter:	1524 mm (60 in)
Pitch	1067 mm (42 in)
Max RPM:	3300

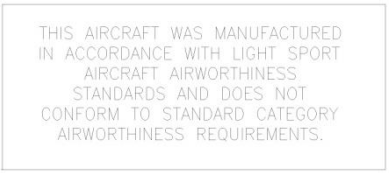
7.7.2 Jabiru Fixed Pitch Composite Scimitar Propeller

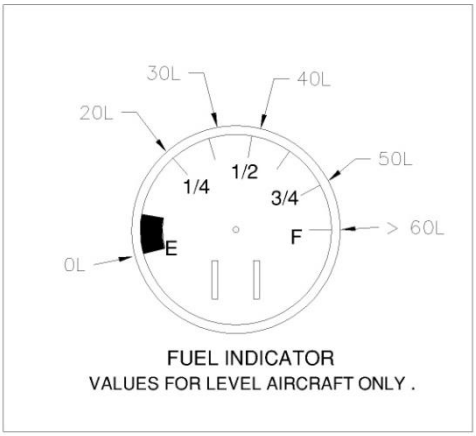
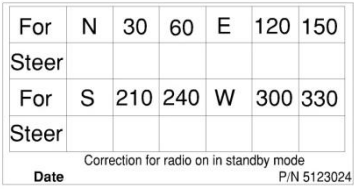
Manufacturer:	Jabiru Aircraft Pty Ltd
Model:	4A482U0D
Type:	Composite, Fixed Pitch
Number of blades:	2
Diameter:	1524 mm (60 in)
Pitch	965 mm (38 in)
Max RPM:	3300

7.8 PLACARDS

The following placards are required, and are to be located in the proximity indicated.

7.8.1 Cockpit Placards General

Warning Placard P/No. 5A069B0D	 Fitted on the rear Face of the Forward Wing Spar Carry-through Beam in the Cabin Ceiling.
LSA Category Placard P/No. 5A060A0D	 Fitted on the rear Face of the Forward Wing Spar Carry-through Beam in the Cabin Ceiling.
No Smoking P/No. 5A035A0D	 Fit to instrument panel.
No Intentional Spins. P/No. 5A072A0D	 Fit to Instrument Panel
No Aerobatics, No Operations in IMC. P/No 5A141A0D	 Fit to Instrument Panel
Owners Manual P/No 5A075A0D	 Fitted to Inside of RH Door above the Door Pocket.
Door Open LHS P/No 5027094	 Fitted to the Outsides of LH Door Above the Door Catch Lever

Door Open RHS P/No 5028094	 Fitted to the outside of RH Door Above the Door Catch Level
Door String Placard P/No 5026094	 Fitted on Inside of both Doors Above Door Handle.
Fuel Gauge P/No. 5A050A0D Where Equipped	 Fitted on the instrument panel immediately below fuel gauges.
Electric Fuel Gauge Quantities. P/No. 5A053A0D Where Equipped.	 Fit inside wing root immediately aft of windows through to electric fuel gauge senders
Compass Card P/No. 5123024	 Fit in compass card holder attached to compass.

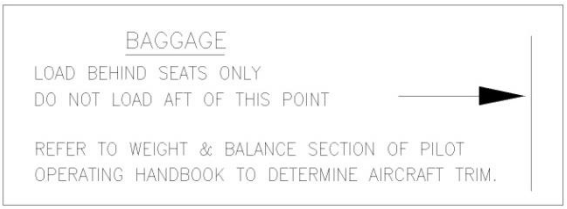
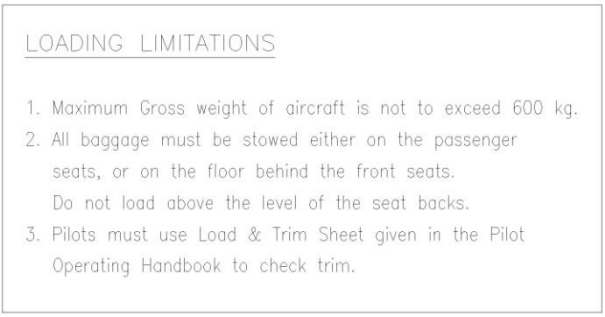
Baggage P/No. 5A037A0D	 Fit to right side fuselage wall immediately below window.
Baggage P/No. 5A074A0D	 Fit to inside of fuselage on right side just below rear quarter window. Locate vertical line in line with rear of baggage shelf.
Loading Limitations P/No 5A073A0D	 Fitted on inside of fuselage of RHS of cabin below rear quarter window.

Table 2.15.1

7.8.2 Cockpit Controls

Trim Position P/No. 5A031A0D (1 OFF)	 Fit to centre console beside of elevator fwd stop, between trim levers.

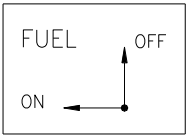
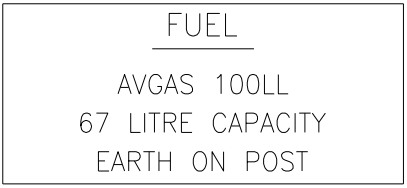
Brake On P/No. 5A031B0D	 Fit to centre console beside brake lever, arrow pointing aft.
Fuel Shutoff valve Position P/No 502319N	 Fitted on the Main Beam in front of the Fuel SELECTOR Valve
Carby Heat P/No 5A030A0D	 Fitted to lower central section of instrument panel.

Table 2.15.2

7.8.3 External Fuselage

Static Port P/No 5043094	 Attach to LHS of Vertical Fin in line with Static Tube
Fuel Grade- Wing Tanks P/No 5091344 2 OFF	 Attach to top skin of wing adjacent to Fuel Filler Cap.
Nose Wheel Inflation. P/No. 5A062A0D	 Attach to left side of nose wheel spat.

Main Wheel Inflation. P/No. 5A061A0D	INFLATE MAIN WHEEL TO 45 psi (310 kPa) Attach to outsides of main wheel spats
Engine Oil P/No. 5A008A0D	ENGINE OIL AEORSHELL W100 – SUMMER AEROSHELL 15W50 – WINTER OR EQUIVALENT AIRCRAFT GRADE DETERGENT ENGINE OIL DO NOT USE AUTOMOTIVE GRADE OILS Attach to inner face of door in top engine cowl.
Dipstick Inside P/No. 5A007A0D	DIPSTICK INSIDE Fit to outside of oil door in upper engine cowl.
Door Lean. P/No. 5A013A0D	DO NOT LEAN ON DOOR Fit to top of doors.
Wing Bolt Tightening P/No 5039094 Qty 8 Required	**DANGER DO NOT TIGHTEN** Attach to the fuselage and wings beside each wing, and lift strut attachment fitting.
Earth on Post P/No. 5A066A0D	EARTH ON POST Attach to upper wing skin beside fuel filler earth post.
No Step P/No. 5A006A0D Qty 2 required.	NO STEP Fit to top of main wheel spats
Earth on Exhaust P/No. 5029094	EARTH ON EXHAUST Attach to the lower fuselage on the pilot's side immediately above the exhaust outlet pipe.

8. HANDLING AND SERVICING

8.1 INTRODUCTION

This section of the manual provides information on how to handle and service the Jabiru J170-D.

8.2 GROUND HANDLING – TAXIING

When taxiing, it is important that speed and use of brakes be kept to a minimum. All controls must be utilized (see Figure below) to maintain directional control and balance; this is particularly important in windy conditions but is good practice at all times. Using the controls in this manner makes it less likely for a gust of wind to catch the aircraft and deflect or flip it.

The carburettor heat control knob should be pushed full IN (that is, NOT selected) during all ground operations unless heat is absolutely necessary.

Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller.

DO NOT accelerate over loose gravel or cinders or propeller damage will result

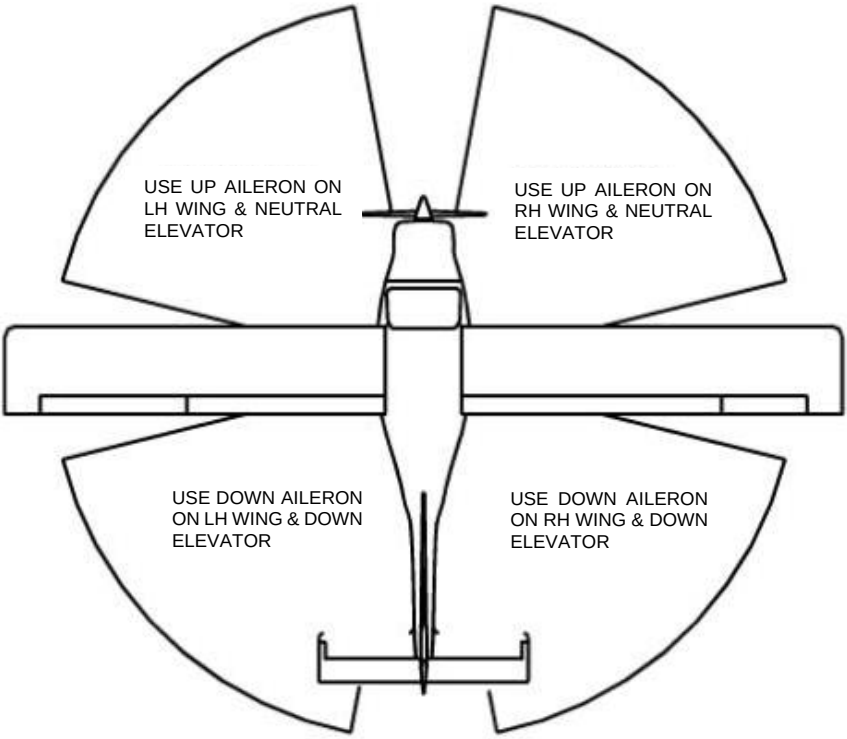


Figure 8-1 – Use Of Controls During Taxi

8.3 TOWING INSTRUCTIONS

The Jabiru J170-D is a relatively small and light aircraft and should be towed by hand only. The recommended method is to grasp the propeller immediately beside the spinner and tow the aircraft forwards from there. Alternatively the aircraft may be pushed backwards by pressing against the front of the horizontal tail close beside the fuselage.

WARNING

Do not push on control surfaces

8.4 Securing The Aircraft

8.4.1 TIE-DOWN INSTRUCTIONS

The J170-D is equipped with 3 built-in tie-down points: 1 under the tail and another under each wing at the top of the wing strut. To secure the aircraft ropes must be tied from each of these to hard-points on the ground.

In very exposed conditions or where strong winds are predicted it is recommended that the aircraft be secured by a fourth point at the nose leg. Pass a rope around the nose leg within the nose leg housing and attach to a hard-point on the ground. Nose and tail ropes should not have slack but must not be too tight.

NOTE

Always leave sufficient slack in the wing ropes so that the ropes would not be over-tight if a tyre deflated overnight.

8.4.2 Control Locks

In Australia it is a requirement that an aircraft anti-theft device be fitted. For the J170-D this consists of a small padlock which is passed through a throttle shaft, preventing high power settings being applied.

It is recommended that the crew harnesses are looped around the control yoke while the aircraft is unattended to prevent the controls blowing in the wind.

8.4.3 Security

Whenever an aircraft is unattended it is recommended that valuables be removed or placed out of sight if possible. Ensure that all cabin doors are locked.

8.5 SERVICING

8.5.1 Fuelling

a. Ensure the aircraft is parked on level ground with the handbrake OFF – to enable it to quickly be pushed clear in an emergency.
b. Connect the main bowser earth wire to the tip of the engine exhaust
c. Stand on a small ladder or similar so that the fuel level is clearly visible through the filler.
d. Connect the earth wire of the pump nozzle to the earth point on the fuel filler BEFORE removing the tank filler cap.
e. Remove the filler cap and fill the tank. Allow for expansion of the fuel: do not over-fill tanks.
f. Re-fit the filler cap.
g. Repeat the process for the second wing tank.
h. Use a fuel tester to take samples from each wing tank and from the header tank. The sample points for the wing tanks are on the underside of the wing near the fuselage while the test point for the header tank is inside a small fairing under the tail of the aircraft aft of the sound curtain.
i. Inspect each fuel sample for contaminants. Verify that the correct fuel is being used by the colour of the sample (Blue for AVGAS 100LL, green for AVGAS 100/130)
j. Disconnect the earth cables. Stow the cables, step ladder, fuel hose and any other equipment securely away from the apron.

WARNING

- *Never fuel in an area that is enclosed or where fumes could reach ignition point. DO NOT SMOKE or allow open flames or sparks in the vicinity. Never add fuel while the engine is running.*
- *Use only approved fuel containers and never transport fuel in an unsafe manner.*
- *Always check for fuel contamination. Contamination is a major cause of engine failure. The best place to avoid contamination is at the source. Once your fuel is in the container a very hazardous potential exists. Use a clean safety approved storage container. Do not overfill the container - allow for expansion.*
- *The engine is designed for use with aviation gasolines and unleaded MOGAS which has an Octane Rating of 95 RON of higher. Be sure to use products of at least the standard shown in Section 8.6.*
- *Always earth the aircraft through the Earthing Point provided at the fuel filler before removing the fuel cap.*
- *Before first flight of the day, and after each refueling, use a sampler cup and drain a small quantity of fuel from the fuel tank sump quick drain valve -check for water, sediment and contamination.*

8.5.2 Fuelling – Alcohol Content Test

As the use of Ethanol in MOGAS becomes more widespread it has become difficult to be sure of a fuel's Ethanol content. Jabiru Aircraft recommend the following test be carried out before a new batch of MOGAS is used.

The test uses the principle of phase separation of a water/fuel sample and agitating the sample to induce phase separation. If alcohol is present, the alcohol combines with the water and separates out of the gasoline.

a. Using a clear jar of about 100-200 ml capacity (ideally a long and narrow jar) add about 10% by volume of water and mark the level of the water on the jar;
b. Add a sample of the fuel to be tested to the jar so that the relative volumes are about 10% water, 90% fuel;
c. Shake the sample vigorously and then allow the sample to settle;
d. Check the level of the "water";
e. If the level is the same as previously marked on the jar, no alcohol is present in the fuel and the fuel is acceptable for use;
f. If the level of "water" increases, alcohol is present in the fuel.

At the time of writing Jabiru Aircraft are delivered with an OEM fuel tester marked with graduations for use in assessing alcohol content.

8.5.3 Engine Oil

a. Ensure the aircraft is parked on level ground.
b. Where possible, shut down and allow the engine to sit for at least 5 minutes before measuring oil level.
c. Open the oil door on the upper cowl. Remove the dipstick from the engine and wipe clean with a clean rag.
d. Re-fit the dip-stick to the engine. It must be screwed in fully.
e. Remove dip-stick & check the level indicated. Ensure the oil level is between the marks.
f. If required, top up the sump with fresh oil of the same brand and grade. Note that approximately 300ml are required to raise the level from the bottom mark to the top. A small funnel must be used to avoid spilling oil. Alternatively, partially insert the dipstick so that the lower end is in the engine filler tube and the upper end standing proud of the cowl. Place the neck of the oil bottle against the stick and pour carefully: the oil will cling to the dipstick and be guided into the engine. If required, use a rag or similar as a wind shield to prevent oil being blown away from the stick.

NOTE

For short flights (up to 1.5 hours) it is recommended to maintain the oil level at the lower dipstick mark as this reduces oil temperatures and the rate of oil use. Oil use varies between aircraft however: ensure that oil is sufficient for the intended flight.

WARNING

Note: Do not use any type of automotive oil. Aviation oils have been blended specifically for the operating conditions found in an air cooled aero engine operations. Using automotive oils has been found to be detrimental to the operation of the Jabiru Engine. Jabiru has not verified the attributes claimed by oil additive manufacturers and warn against using them as they may have detrimental effects.

8.6 APPROVED FUEL GRADES & SPECIFICATIONS

- Avgas 100LL
- Avgas 100/130
- MOGAS with minimum Octane Rating of **95 RON** may be used but is not recommended (the fuel specification placard; P/No 5091344, does not explicitly state 'MOGAS' because it is not recommended).
- Do not use fuel additives such as Octane Boosters.

WARNING

For the reasons noted below Jabiru Aircraft do not recommend using MOGAS. It is important to realise that due to the lower QA standards, even following best practice it is still possible for a particular tank-full of MOGAS to be unsuitable or unsafe for use. Jabiru Aircraft may choose to void any warranty for engines and airframes which have been damaged due to "bad" MOGAS. Operators who choose to use this fuel do so at their own risk.

WARNING

Jabiru has not verified the attributes claimed by fuel additive manufacturers and warn against using them as they may have detrimental effects.

CAUTION

Using a fuel which is not recommended may have detrimental effects on airworthiness, maintenance and safety.

a. Compared to AVGAS the chemical, delivery and storage quality control requirements for MOGAS are much less stringent. Because of this, there is no practical way for an operator to know that any given volume of MOGAS bought through normal sources will be compatible with use in a Jabiru Aircraft Engine.
b. A large amount of testing using MOGAS has been carried out by Jabiru Aircraft under controlled conditions and this has shown that MOGAS can be a suitable fuel. However, experience in service where conditions are not controlled has shown it to be inconsistent and inherently risky – contributing to many different service difficulties.
c. Do not mix AVGAS with MOGAS. The two fuels are chemically distinct and the qualities of a mixture impossible to predict. Refer to Jabiru Service Letter JSL007 for more information.
d. Alcohol levels in MOGAS must be monitored. Operators must test each batch before use to ensure alcohol levels are within limitations. Do not trust that the fuel is what the seller claims.
e. Further information on fuels is given in Jabiru Service Letter JSL007. Any operator considering using MOGAS must read, understand and follow the requirements it contains.

8.6.1 Fuel Containing Alcohol

WARNING

For the reasons noted below Jabiru Aircraft do not recommend using any fuel containing Ethanol. Operators who choose to use this fuel do so at their own risk.

CAUTION

Using a fuel which is not recommended may have detrimental effects on airworthiness, maintenance and safety.

a. Early J170-D aircraft were equipped with fuel tanks sealed using a compound which is soluble in alcohol. Using a fuel containing alcohol in these tanks will damage the sealant, leading to fuel leaks. Later aircraft use a sealant which is compatible for use with fuels containing up to 10% Ethanol. Refer to Jabiru Service Letter JSL007 for details on how to determine which sealant is which.
b. An operator planning to use any MOGAS must determine which sealant is used in their aircraft and take measures to ensure only appropriate fuels are used.
c. Fuels containing alcohol are inherently unsuitable for use in aircraft due to the way they absorb moisture from the air and change over time.
d. Further information on fuels – including Ethanol content – is given in Jabiru Service Letter JSL007. Any operator considering using MOGAS or an Ethanol blend fuel must read, understand and follow the requirements it contains.

8.7 APPROVED OIL GRADES & SPECIFICATIONS

Jabiru Aircraft approves lubricating oils of any brand name conforming to specifications MIL-L-6082 for straight mineral oil and SAE J1899 for ashless dispersant oil.

Straight mineral oil must be used during the first 25-50 hours of operation for new and overhauled engines, or until the oil consumption has stabilised. After the first oil change it is recommended that ashless dispersant oil be used.

8.7.1 Engine Oil Viscosity Grade:

The following chart is intended to assist in choosing the correct grade of oil and must be considered as a guide only. Multiviscosity grades can also be used.

Average Ambient Temperature	Mineral Grades	Ashless Dispersant Grades
Above 35° C (95°F)	SAE 60	SAE 60
15° C to 35°C (59° to 95°F)	SAE 50	SAE 50
-17°C to 25°C (1° to 77°F)	SAE 40	SAE 40

Equivalence of SAE and commonly used Commercial Grade designations:					
SAE:	20	30	40	50	60
Commercial:	55	35	80	100	120

8.8 BRAKES

The brakes of the J170-D use automotive brake fluid. Refer to the aircraft Technical manual for details of appropriate brake fluid specifications.

WARNING:

The JABIRU uses automotive brake fluid (DOT 3 or DOT 4). DO NOT use Aircraft hydraulic fluid (mineral based) or damage to the brake system will result.

8.9 CLEANING & CARE

Keeping the aircraft clean is important. Besides maintaining the appearance of the aircraft, cleaning makes inspection and maintenance easier.

Transparencies: These should be cleaned carefully with plenty of fresh water and a mild detergent, using the palm of the hand to feel and dislodge any caked dirt or mud. A sponge, soft cloth or chamois may be used but only as a means of carrying water to the plastic. Rinse thoroughly then dry with a clean, moist chamois. DO NOT rub the plastic with a dry cloth as this builds up an electrostatic charge, which attracts dirt. Oil and grease may be removed by using a soft cloth moistened with mineral turpentine.

CAUTION

DO NOT use gasoline, alcohol, Buzene, Acetone, Carbon Tetrachloride, fire extinguisher fluid, de-icer fluid, lacquer thinner or glass window cleaning spray.
These solvents will soften and craze the Plastic.
DO NOT use a canvas cover on the windshield or windows as the cover may scratch the plastic.

Interior Surfaces: Interior surfaces should be cleaned with a soft cloth, fresh water and a mild detergent. Volatile substances such as those mentioned in the previous section must never be used.

Exterior Surfaces: The exterior surfaces, under normal conditions, require a minimum of polishing and buffing.

CAUTION

DO NOT polish or buff the aircraft within the first 2 weeks after delivery from the factory as surface treatments take up to 14 days to properly cure.

Generally, the exterior surfaces can be kept bright by washing with water and a mild soap or detergent, followed by a rinse with water and drying with a cloth or a chamois.
Remove stubborn oil and grease with a cloth moistened with mineral turpentine, then wash with water and a mild soap, rinse and dry as stated before.
After the curing period the aircraft may be waxed with a good quality automobile wax. A heavier coating of wax on the leading edges of the wing, tail and on the engine nose cap will help reduce abrasion encountered in these areas.

CAUTION

DO NOT use Silicon based cleaning materials as Silicon is absorbed into the composite materials and may affect reparability.

Aluminium surfaces: The aluminium surfaces require a minimum of care, but should not be neglected. Wash and clean as detailed for exterior surfaces above.

CAUTION

JABIRU aircraft are designed for minimum maintenance. However, special attention should be applied when the aircraft has been used in extremely corrosive conditions, e.g. beach landings with sand and salt. Always ensure the aircraft is thoroughly hosed and washed immediately after such use. Pay particular attention to wheels and external controls. Always hose down wheels & spats after landings in mud or sand to ensure brakes, wheels & spats are free of dirt build-up.

Engine & Engine Compartment: The engine should be kept clean since dirty cooling fins and baffles can cause overheating of the engine. Also, cleaning is essential to minimise any danger of fire and provide easy inspection of components. Recommended cleaning procedure is lightly spray with degreasing fluid – after sealing coils and starter motor. WIPE clean with brush and cloth.

CAUTION

DO NOT hose engine. Electrical components may be damaged by moisture. Ensure electrical components are protected against moisture. Caustic cleaning solutions should not be used.

Propeller: Wash with soap and water, rinse with clean water and dry with cloth or chamois.

CAUTION

Do not use a wax based substance as this would make it almost impossible to refurbish the prop if needed at a later stage.

9. SUPPLEMENTS

9.1 FLIGHT TRAINING SUPPLMENT

There is no separate FTS for the J170-D. Refer to the normal and emergency procedures detailed above for handling & operating recommendations.

9.2 INFORMATION FOR THE OWNER

9.2.1 IMPROVEMENTS OR CORRECTIONS

In the interests of product development, we encourage owners to make suggestions related to design improvements. However, the final decision on their adoption or otherwise rests with JABIRU AIRCRAFT Pty Ltd.

Any issues or corrections required of Jabiru publications are requested to be passed on to Jabiru in writing to incorporation in subsequent revisions. Emails to info@jabiru.net.au are recommended.

9.2.2 CONTINUED OPERATIONAL SAFETY REPORTING

The owner/operator of a LSA is responsible for notifying the manufacturer of any safety of flight issue or significant service difficulty upon discovery. The following proforma may be used:

Date:	
Aircraft Model	
Aircraft Registration	
Aircraft S/No.	
Engine S/No.	
Details of item:	
Name of Reporter:	
Preferred Contact Details of Reporter	

9.2.3 OWNER CHANGE OF ADDRESS NOTICE

Each owner/operator of a LSA is responsible for providing the manufacturer with current contact information where the manufacturer may send the owner/operator supplemental notification bulletins. The following proforma may be used & sent to Jabiru Aircraft at info@jabiru.net.au or the contact details given in Section 0.3.

Aircraft Model	
Aircraft Registration	
Aircraft S/No	
Previous Owner:	
New Owner:	
Contact Details of New Owner	

9.3 SUPPLEMENTS

This section consists of a series of supplements, each being self contained and providing details and procedures associated with the fitment of optional and special purpose equipment.

Each supplement contains a brief description, and where applicable, operating limitations, emergency and normal procedures, and the effect on aircraft performance. The data contained in a supplement adds to, supersedes, or replaces similar data in the basic POH when operating in accordance with the provisions of that supplement.

The Log of Supplements shows the CASA Approved Jabiru Aircraft Supplements available for the J170-D at the date of publication of this POH. The Log of Supplements page can be utilised as a Table of Contents for this section. A check mark (✓) in the Install column indicates that the corresponding supplement is incorporated in the POH.

It is the owner's responsibility to ensure that new Jabiru Aircraft Supplements received after receipt of the POH are recorded on the Log of Supplements page.

In the event that the aircraft is modified at a non Jabiru Aircraft facility through an STC or other approval method, it is the owner's responsibility to ensure that the proper supplement, if applicable, is installed in the handbook and the supplement is properly recorded on the Log of Supplements page as amended from time to time.

9.4 LOG OF SUPPLEMENTS – JABIRU AIRCRAFT SUPPLEMENTS

Applicable to aircraft serial number J170-D _____

Install	Doc. No.	Title	Date

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