MANUAL REF : TLAC/SR-POH/R/J

SHERWOOD RANGER ST Series

P I L O T S O P E R A T I N G HANDBOOK

Issued by :-

THE LIGHT AIRCRAFT COMPANY LTD

Applicable only to
Sherwood Ranger

Serial No .....

The Light Aircraft Company Ltd
Hanger 4 Little Snoring Airfield
Fakenham
Norfolk
NR21 0JL

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INTRODUCTION

General

This manual has been written for the benefit of all persons who intend to operate or fly Sherwood Ranger ST series microlight aircraft, and contains the information necessary to enable pilots who possess the required skill and experience, to successfully fly the aircraft in a safe and efficient manner. Together with the appropriate, Maintenance Manual it forms part of the mandatory documentation necessary for the issue of a United Kingdom permit to fly. It is only applicable to the aeroplane whose serial number and registration No. is shown on the front cover.

Note : For aircraft not registered in the United Kingdom it is the responsibility of the operator to confirm with the relevant airworthiness authorities in the country in which the aircraft is registered that the technical documentation provided meets all local requirements.

It is not intended that any information contained herein be regarded as constituting a manual of flying instruction, and it is assumed that all persons intending to fly the Sherwood Ranger possess the qualifications and knowledge required by current legislation with respect to pilot licensing. See Section 8 for recommended experience requirements and type conversion details.

Amendments are published by THE LIGHT AIRCRAFT COMPANY LTD.

The current amendment state of this copy is given on the Amendment Record Sheet, page 1 - 3.

Additional information, which may be relevant to the operation of a particular aeroplane by virtue of deviations from the standard build specification, or other appropriate reason, is supplied in the form of supplements to this manual. Supplements are published either by THE LIGHT AIRCRAFT COMPANY LTD. or by any other person or organisation producing a modification to the aircraft which has been approved by the United Kingdom Civil Aviation Authority or other appropriate authority.

Supplement No.1 contains details of any / all optional equipment fitted to the aircraft at initial factory build.

Supplement No.2 contains copies of the OEM operation and maintenance data for the specific engine type fitted to this aircraft. This information is provided for reference only and operators should contact the relevant Engine Manufacturer to obtain any updates which may be published from time to time.

A list of the approved supplements which have been provided for this particular aircraft is shown in Appendix 3

It is essential that this manual is read completely and fully understood before any attempt is made to fly the aeroplane.

IMPORTANT NOTE :-

It is the aircraft owner or operator's responsibility to ensure that, before operating the aircraft, an appropriate authorisation / permit to fly is obtained from the relevant airworthiness authority of the country in which the aircraft is registered.

REVISION RECORD SHEET

Amendment No	Issue Date	Affected Pages

SYMBOLS ABBREVIATIONS AND TERMINOLOGY

General Airspeed Terminology and Symbols

CAS	Calibrated Airspeed is indicated airspeed corrected for position and instrument error and expressed in mph. Calibrated airspeed is equal to TAS in standard atmosphere at sea level.
IAS	Indicated Airspeed is the speed shown on the outer scale of the airspeed indicator and expressed in mph.
TAS CAS	True Airspeed is the airspeed expressed in mph relative to undisturbed air which is corrected for altitude and temperature.
VA	Manoeuvring Speed is the maximum speed at which application of full available control will not over stress the aeroplane.
VNE	Never Exceed Speed is the speed limit that may not be exceeded at any time.
VS	Stalling Speed is the minimum steady flight speed at which the aeroplane is controllable.
VY	Best Rate-Of-Climb Speed is the speed which results in the greatest gain in altitude in a given time.

Meteorological Terminology

OAT	Outside Air Temperature is the free air static temperature. It is expressed in either degrees Celsius (Centigrade) or degrees Fahrenheit.
STANDARD TEMP	Standard Temperature is 15° C (59 F) at sea level pressure altitude and decreases by 2° C (4 F) for each 1000 feet of altitude.
PRESSURE ALTITUDE	Pressure Altitude is the altitude read from an altimeter when the barometric subscale has been set to (1013 mb).

Engine Power Terminology

BHP	Brake Horsepower is the power developed by the engine.
RPM	Revolutions Per Minute is the engine speed (number of revolutions engine turns per minute.)

SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

Aeroplane Performance & Flight Planning Terminology

DEMONSTRATED CROSSWIND VELOCITY	Demonstrated Crosswind Velocity is the velocity of the crosswind component for which adequate control of the aeroplane during take-off and landing was actually demonstrated during certification tests.
USABLE FUEL	Usable fuel is the fuel available for flight.
UNUSABLE FUEL	Unusable fuel is the quantity of fuel that cannot be used in flight.
G P H	Gallons per hour is the amount of fuel (imperial gallons) consumed per hour.
G	G is a unit of acceleration equivalent to that produced by a force of gravity.

Weight and Balance Terminology

REFERENCE	Reference Datum is an imaginary vertical plane from DATUM which all horizontal distances are measured for balance purposes.
STATION	Station is a location along the aeroplane longitudinal axis given in terms of the distance from the reference datum.
ARM	Arm is the horizontal distance from the reference datum to the centre of gravity (C of G) of an item.
MOMENT	Moment is the product of the weight of an item multiplied by its arm.
CENTRE OF GRAVITY (C of G)	Centre of Gravity is the point at which an aeroplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the aeroplane.
C of G ARM	Centre of Gravity Arm is the arm obtained by adding the aeroplane's individual moment and dividing the sum by the total weight.
C of G LIMITS	Centre of Gravity Limits are the extreme centre of gravity locations within which the aeroplane can be operated at a given weight, usually
documented as	distances from the reference datum.
BASIC WEIGHT.	Basic Weight is as determined in the Weight and Centre of Gravity Schedule, see Section 7.
MAXIMUM AUTHORISED WEIGHT	Maximum Authorised Weight (MAW) is the maximum weight to which the aeroplane is Certified.

SYMBOLS ABBREVIATIONS AND TERMINOLOGY

The following units of measurement are used throughout this manual.

Primary Units

Units used on graphs and in the text are as follows:-

Quantity	Unit Name	Symbol
Distance: Horizontal - Large	Mile	mile
Linear Dimension	Inch	in.
	Foot	ft.
	Metre	m
Speed: Horizontal	Miles per hour	mph.
Vertical	Foot Per Minute	ft/min
Temperature	Degree Celsius	^{o}C
Weight	Pound	lb.
	Kilograms	kg
Moment	Inch Pound	in/lb
Pressure	Pound Per Square Inch	lb/in^2
Liquid Quantity	Imp. Gallon	gal
Liquid Flow	Imp. Gallon Per Hour	gal/h

DESCRIPTION AND DESIGN FEATURES

General

The Sherwood Ranger ST series are conventional open cockpit microlight Biplanes of tailwheel configuration. Originally designed for home construction from pre-fabricated kits, they are now also produced by TLAC Ltd as factory finished, ready to fly, aircraft. They have a two seat tandem cockpit but may be flow either dual or solo. Solo operation is carried out from the rear cockpit only.

The tough, durable construction, coupled with excellent performance and handling qualities, ensures that the Sherwood Ranger is equally suited to a variety of operational requirements, such as circuit training from minimum length rough grass strips, or cross-country flying from paved airport runways.

One of the main features is that the wings can be folded by removing four securing pins. No disconnection of flying control circuits is necessary, and the overall folded width is such that the aircraft can be transported by road on a simple trailer. The rigging operation from trailer to preflight check can be accomplished by one person in about three minutes.

With the exception of the plywood wing ribs and spruce trailing edge, the airframe is mainly constructed of 6082 Aluminium tubing, with joints formed by plates and extrusions, bolted and riveted together to form the structure. Fibreglass mouldings are used for the engine cowlings, forward turtle decking and other small non-structural items, the complete airframe being covered in heat shrink polyester fabric (Oratex $_{TM}$).

Fuel is carried in a single tank located in the fuselage aft of the engine and in front of the cockpit.

A "Truss" type undercarriage is attached to the fuselage, with rubber bungees providing shock absorption.

Conventional three axis dual flying and engine controls are fitted with differential frise ailerons on all wings, steering during taxiing being effected by steerable tailwheel or differential braking of the main wheels. Heel operated drum brakes are fitted to the main wheels as standard. Solo flying is carried out from the rear seat only.

The Sherwood Ranger ST can be powered by variety of engines, this manual deals with Rotax 582 (Blue Top) or Jabiru 2200A powered aircraft. If your aircraft is powered by or has been re-engined with any other engine type you should contact TLAC for further advice before operating the aircraft.

Primary flight controls

Ailerons and elevators are operated in the conventional manner through stick type control columns, centrally mounted in each cockpit. The upper ailerons are connected by a control rod to the lower ailerons which are driven directly by a cable and bellcrank system. The elevator is operated through a combination of control rods and cable. Non adjustable rudder pedals are fitted in each cockpit, interconnected through control cable to the rudder. Cable tension in the system is maintained by

springs attached to the front pedals. Externally adjustable Heal brakes are fitted in the rear cockpit only and operate independently from the rudder pedals.

DESCRIPTION AND DESIGN FEATURES (Continued)

Trim

No trim adjustment is available for ailerons or rudder. A cockpit adjustable elevator trim tab is fitted as standard and, operated from a lever situated on the right hand side of each cockpit. The lever is pushed forwards for nose down trim, and pulled back for nose up trim.

Control locks

No dedicated control locks are supplied. The elevator and ailerons can be locked by securing the rear control column using the seat harness lap strap.

Stall warning

Due to the docile stalling characteristics, a stall warning device is not fitted.

Instruments

Instruments may be fitted in both front and rear cockpit panels. Instruments mounted in the front panel can be viewed from the rear cockpit over the passenger's shoulders. The standard instruments fitted and their locations are listed below.

Front Cockpit **(Rotax Engine aircraft)**

Flight Instruments	Engine / System Instruments
* Slip Ball	* Voltmeter
	* Exhaust gas temp / Cylinder head temp

Front Cockpit **(Jabiru Engine aircraft)**

Flight Instruments	Engine / System Instruments
* Slip Ball	* None

Rear Cockpit **(Rotax Engine aircraft**)

Flight Instruments	Engine / System Instruments
* Altimeter	* Tachometer
* Airspeed Ind	* Water temperature
	* Electronic Fuel Gauge

DESCRIPTION AND DESIGN FEATURES (Continued)

Rear Cockpit **(Jabiru Engine aircraft)**

Flight Instruments	Engine / System Instruments
* Altimeter	* Multi-Function Electronic Display (1)
* Airspeed Ind	* Electronic Fuel Gauge

(1) N.B. In the event of failure of the engine multi-function display unit, or the power supply to it, the aircraft should be landed as soon as practicable.

Underside of Cabane - Above Front Cockpit (All aircraft)

Flight Instruments	Engine / System Instruments
* Compass	* None

Accommodation / Seats / Harnesses

Accommodation is provided for a maximum of two occupants in a tandem seating arrangement. Basic seats are non adjustable and consist of a plywood base and backrest. Double density foam cushions are supplied to provide both comfort and protection in the event of a heavy landing / accident.

Entrance to the rear cockpit is facilitated by a foot support on the lower right hand rear fuselage longeron. To enter the rear cockpit stand upright on the seat and grasp both rear cockpit uprights. Using these to support the body weight, step down onto the cockpit floor structure and slide into the seat. Try to avoid placing significant weight on the fibreglass combing. Exit by reversing the procedure.

To enter the front cockpit it is necessary to stand on the reinforced walkway area of the lower right hand wing. This is marked by a black non-slip surface. Grasp the front fuselage upright and diagonal for support, and lean forwards to clear the top wing whilst standing up. Place the left leg onto the cockpit seat, move across through the cockpit uprights and pull the other leg onto the seat. Using the sides of the fibreglass combing for support, step down onto the floor structure and slide into the seat. Avoid placing undue weight on the fibreglass combing. Exit by reversing the procedure.

Seats are not adjustable but additional cushions may be used to obtain the desired seating position so that all controls are easily and fully accessible.

Provided that cushions are, removed a sit-on type parachute can be accommodated in both cockpits, however it may impede access to and from the front cockpit, depending on the size of the occupant.

Both cockpits are fitted with fully adjustable quick release lap straps and full shoulder harness. The shoulder harnesses must be done up at all times and should be kept tight during flight.

DESCRIPTION AND DESIGN FEATURES (Continued)

Baggage

No provision is made for baggage.

Fire extinguisher

No provision is made for a fire extinguisher.

Engine

The standard ST series aircraft are fitted with either a ROTAX 582 (Blue Top), or a Jabiru 2200A, engine.

The Rotax unit is a liquid cooled, two cylinder, twin carburettor two-stroke engine, developing 64 BHP at 6500 RPM, which drives the propeller through a 2.58:1 "B" type reduction gearbox.

The Jabiru unit is an air cooled, four cylinder, single carburettor four-stroke engine, developing 80 HP at 3300 RPM and driving the propeller directly from the crankshaft.

Refer to Supplement No.2 for further specific details engine and accessories are fitted to this aeroplane.

Engine controls

The engine is controlled by quadrant throttle levers, interconnected by a control rod and mounted on the left hand side of each cockpit. Pushing the lever forwards opens the throttle. A single fuel enrichment control (Choke), marked ON - OFF is fitted in the rear cockpit and is used for starting only. Ignition switches, and battery master switch, are mounted on the instrument panel in the rear cockpit only and marked OFF in the down position.

Engine starting utilises an electric starter operated from a button mounted on the rear cockpit instrument panel.

Propellers

The standard propeller fitted to the Rotax engine is an Arplast, 3 blade, 65 ins. diameter ground adjustable pitch type.

The standard propeller fitted to the Jabiru engine is a Hercules 6032 309-C 2 blade, wooden, fixed pitch type

All propellers arte fitted with spinners and matching back plates as standard.

DESCRIPTION AND DESIGN FEATURES (Continued)

Alternative propellers may be fitted subject to approval by the appropriate authorities. If an alternative propeller is installed refer to Supplement No.1 for full details.

Fuel system

A composite fuel tank is mounted in the front fuselage section it has 40 ltr capacity. A filler cap, situated on the top surface of the tank, is accessible for re-fuelling from the ground or by standing on a low level ladder. Markings near the filler indicate grade of fuel, and for Rotax engine installations, grade of oil and required oil/fuel ratio.

Tank contents are indicated by a digital gauge installed in the rear cockpit. The tank is vented through the fuel cap.

The tank outlet, into which a coarse finger filter is fitted, is situated at the rear inboard corner of the tank, this being the lowest point in the tank. A gascolator with Curtis water drain valve is also fitted into the lower surface of firewall.

Fuel is gravity fed to the engine compartment through a gated, plunger operated, rotary valve type, fuel cock, mounted on the right hand side of the fuselage with the operating plunder positioned such that it can be operated from the rear cockpit. The plunger is gated in the On and Off positions with a clear and visible difference in position between On and Off. In addition ON - OFF markings indicate plunger positions.

Pitot-static system

Airspeed and altitude are measured by an unheated pitot-static head located on the starboard interplane strut.

Leading Dimensions

Wingspan :	7.92m (26.0ft)
Wing Area :	15.6 sq m (167.9 sq ft)
Length :	6.1m (20.0ft)
Height :	2.24m (7.35ft)
Width (With Wings Folded) :	2.32m (7.6ft)
Wheel Base :	3.65m (12.0ft)
Wheel Track :	1.34m (4.42ft)
Cabin Width :	0.62m (2.03ft)

NORMAL OPERATING PROCEDURES

Introduction

This section provides the procedures and check lists for the conduct of normal operation of Sherwood Ranger series aircraft.

Ground Handling & Rigging

Trailering

When trailering the aeroplane, use only trailers that have been built to a design approved by The Light Aircraft Company Ltd. These can be easily towed by an average family saloon at up to the maximum recommended speed of 50 mph. The main wheels and tail wheel should be secured to the trailer, and the wing support yoke and cradles must be in position. To prevent the ingress of foreign objects, it is strongly recommended that fabric covers are fitted over the cockpits, wing root ends and pitot/static heads.

Do not trailer during wet weather unless unavoidable, in which case the cockpit should be securely covered with a fitted tonneau cover. The best way to dry the aircraft is to either fly it, or trailer it in dry weather .

Rigging and Derigging

It is normal practice to store, rig and de-rig the aeroplane whilst on the trailer. If full time hangarage is available, a trailer is not essential and the wings can be folded to minimise storage space, in which case refer to steps 2 to 9.

Rigging

1.) Position trailer on level surface, check that jockey wheel is fully retracted and uncouple from towing vehicle. Ensure that both wheel wells are laying flat on ground surface.

2.) Working on one side of the aeroplane first, withdraw the top and bottom wing retaining pins to their full extent.

3.) Unclip the Interplane Strut from the wing support yoke, and slide the wing support cradle outwards whilst applying upwards pressure on the Interplane Strut.

4.) Grasp the lower wing at the tip and supporting the aileron to prevent damage, swing the wing assembly forwards.

5.) Move round to the wing root. Maintain the wing in position by pulling on the bracing wires.

Ground Handling & Rigging (Continued)

6.) Insert the top and bottom fixing pins and lock into position.

Note :- Inspect pins for security, lubrication, damage ie. evidence of bending. If unusual insertion or withdrawal force is necessary, investigate thoroughly.

7.) Collapse and remove the jury struts

8.) Move round to the opposite side and remove the wing support yoke from the fuselage.

9.) Repeat operations 2 to 6

10.) Remove securing clamps from mainwheels if fitted.

11.) Remove securing clamp from tailwheel position and grasping the tailwheel, push the aeroplane forwards, over the trailer towball until well clear.

Carry out a thorough check "A" and pre-flight inspection before flight.

De-rigging

Securing the aircraft onto the trailer and de-rigging is accomplished by carrying out the above procedures in reverse order.

Picketing

Specific picketing points are not fitted, tie down ropes can be attached to the main and tail undercarriage positions. Tie downs should not be attached to any other part of the aircraft structure. In the event of strong winds it is best to secured the aircraft to its trailer and if possible put it undercover in a suitable building. Alternatively the wings should be folded(and secured in the folded position). The aircraft should then be securely tied down by the main and tail undercarriage

Levelling

The top longerons in the rear cockpit should be used as a base for longitudinal and lateral levelling.

Airspeeds For Safe Operation

WARNING:- All airspeeds given in this manual should be used as a guide only. They are based on flight testing the prototype aeroplane at maximum authorised weight.

With light aircraft in this weight category, the variable load represents a significant percentage of the all up weight. Large variations in crew weight will therefore have a considerable effect on aircraft performance, particularly take-off run and climb rate.

Airspeeds For Safe Operation (Continued)

Air temperature, pressure, humidity, turbulence and pilot skill will also affect the optimum speeds for a particular operation.

In this section airspeeds are recommended for each phase of flight. Where applicable the recommended power setting that corresponds to airspeed is shown in brackets. Where a single figure is quoted this is applicable when the aircraft is operating at its maximum authorised weight.

It is recommended that, in general, the aircraft should not be flown during normal operations at speeds less than 1.3 x VS

Take off	IAS MPH
Normal Climb Out (Full Power to 1000’ then reduce throttle to climb as required)	55 - 60
Climb (RPM As required)	
Best Rate of Climb @ Sea level (Full Power)	55 - 60
Best Angle of Climb @ Sea level (Full Power)	50 - 55
Approach /Landing	
Normal approach (RPM As Required)	55 - 60
Short field approach (RPM as Required)	53
Maximum Turbulent Air Penetration Speed (VNO)	70
Manoeuvring Speed (VA)	80
Maximum Demonstrated Crosswind	10
Never Exceed Speed (VNE)	100

Pre-flight Inspections

Refer to the Maintenance Schedule Check "A" if first flight of the day.

Whilst approaching the aeroplane, take general note of any unusual stance, symmetry or wrinkled fabric which may indicate airframe damage. Note also any fluids, especially fuel or oil, pooled below the aircraft. Any fuel or oil leaks should be investigated before flight.

Remove tie-down ropes / straps and position wheel chocks as required.

Pre-flight Inspections (Continued)

Visually check the aircraft for general condition using a walk-round inspection as detailed in the Checklist Procedures. In cold weather, remove even small accumulations of frost, ice or snow from wing, tail and control surfaces.

Starting at the cockpit, carry out inspections in sequence as listed in the Checklist Procedures.

Checklist Procedures

Pre-flight (Walkround) Inspection

Cockpit (Start here, move round aeroplane anti-clockwise)

1.	Control locks (if fitted)	Remove
2.	Ignition Switch	Off
3.	Battery Master	On – Check Fuel Gauge - Off
5.	Front Seat & Harness	Condition (Secured for Solo Operation)
6.	Rear Seat & Harness	Condition
7.	Fuel cock	On
8.	Control System	Full and free, undamaged correct sense
9.	Centre section	Secure, undamaged

R.H. Top and Bottom wings (Starting at T.E.)

1.	Wing fabric	Undamaged, no wrinkles
2.	Trailing edges	Undamaged, drain holes clear.
3.	Aileron operating cables	Free, undamaged
4.	Pitot Head & Static Source	Cover removed, clear & undamaged
5.	Wing hinges	Lubrication, split pinned
6.	Ailerons	Fabric secure, security of attachment, freedom of movement, T.E undamaged, operating push rod secure, ball joints free, interconnecting push rod secure, ball joints free
7.	Interplane strut	Undamaged, secure.
8.	Wing tips	Secure, undamaged.

R.H. Top and Bottom wings (Starting at T.E.) - Continued

9.	Flying and Landing Wires	Tension, condition, wirelocking on turnbuckles clevis pins, split pins.
10 .	Leading edge	Undamaged, secure.
11.	R.H. front wing retaining pins	Inserted and locked top and bottom & safety straps in place.

Checklist Procedures

Pre-Flight (Walkround) Inspection - Continued

13. R.H. Undercarriage	Undamaged, tyre pressure, creep marks, bungee chords, security
14. R.H.Brake	Cable and unit secure
15. Tie-down	Confirm removed
16. Wheel chocks	As required
17. Lower fuselage fabric	Check for damage

Front Fuselage & Engine Compartment

Note :- Some of the components in the engine compartment may not be visible through the inspection hatch, (these are indicated with an *) and will require removal of the top cowling for thorough inspection. Unless the installation has flown less than 25 hrs, or relevant maintenance work has recently been carried out, these items need only be inspected at the first flight of the day, or after every 3 flying hours, whichever occurs sooner.

1. Engine* (Ensure Ign'n switches off)	Check security of rubber mounts by lifting at prop hub. Pull through with prop to check gear box, compression etc.
2. Engine mount*	Inspect for security, cracks in tubes/brackets
3. Cooling system (Rotax only)	Air Intake clear, radiator for damage and obstruction, leaks, coolant level*, hoses*.
4. Oil System	Oil level check, leaks
5. Carburettors and fuel lines*	Security, leaks,wear in operating cables
6. Air filters	Intake clear, clean* and secure*
7. Exhaust*	Secure, cracks near manifold, freedom of ball joints, missing or broken springs, tail pipe colour
8. Electrical components*	Security, chaffing of wiring, plug caps.
9. Propeller	Secure, undamaged
10. Spinner and backplate	Secure, cracks
11. Cowlings	Damage / cracks – Confirm secure & fasteners locked
12. Gascolator	Drain for water/sediment
13. Fuel tank	Contents (Physically Check), cap secure, vent clear

L.H. Top and Bottom wings (Start at L.E)

1. Wheel chocks	As required
2. Tie-down	Confirm removed
3. Fabric beneath fuselage	Damage
4. L.H.Brake unit	Cable and unit secure

Checklist Procedures

Pre-Flight (Walkround) Inspection

L.H. Top and Bottom wings (Start at L.E) - Continued

5. L.H. Undercarriage	Undamaged, Tyre pressure, creep marks, security,bungee chords
6. L.H. front wing retaining pins	Inserted and locked top and bottom.
7. Flying and Landing Wires	Tension, condition, wirelocking of turnbuckles, clevis pins, split pins.
8. Leading edge	Undamaged, secure.
9. Wing tips	Secure, undamaged.

L.H. Top and Bottom wings (Start at L.E)

10. Interplane strut	Undamaged, secure
11. Ailerons	Fabric secure, security of attachment, freedom of movement, T.E Undamaged, operating push rod secure, ball joints free, interconnecting push rod secure, ball joints free
12. Wing hinges	Lubrication, split pinned.
13. Aileron operating cables	Free, undamaged
14. Trailing edges	Undamaged, drain holes clear.
15. Wing fabric	Undamaged

Rear Fuselage

1. Fabric	Condition, undamaged, wrinkles
2. Stringers	Undamaged
3. Tailwheel	Tyre pressure, security, suspension chords, swivel freedom, steering cable and spring.

Empannage

1. Rudder	Security, full and free movement, cable linkage, clevis pins, split pins, fabric secure.
2. Tailplane and Elevator	Security, full and free movement, cable linkage, Clevis pins, split pins, fabric secure, tension of wire bracing, trim tab secure.

Top Wing Upper Surface (Stand on Rear Cockpit Seat)

1. Fabric condition	Visual inspection for damage

Checklist Procedures

Before Starting Engine

1.	Aircraft position	Clear area, no loose stones, into wind (if possible)
2.	Pre-flight Inspection	Complete
3.	Brakes / Chocks	On / In position
4.	Harness	Adjust and lock
5.	Radios / Avionics	Off
6.	Throttle	Full movement, Friction

Starting Engine

1.	Fuel cock	On
2.	Throttle	Closed
3.	Choke	Set
4.	Stick	Back
5.	Propeller	Clear
6.	Master switch	On
7.	Ignition switches	On
8.	Engine start	Press start button
9.	Engine	Check EGT / T's & P's, Warm up (See Notes)
10.	Ignition	Check dead cut
11.	Chocks	Remove
12.	Choke	Off

Note 1 : Jabiru Engines - Allow the oil to warm up with throttle initially set at 1200 RPM for one minute. If temperature has not reached 15 Dec C in that time increase power to 2000 RPM and maintain until 15 Dec C is reached. Minimum oil temperature for full throttle operation is 40 Dec C.

Note 2 : Rotax Engines – Allow the engine to warm up with the throttle initially set at 2000 RMP for two minutes. Continue at 2500RPM until operating temperatures (Oil and Coolant) are reached.

Power Checks

1.	Position	In to wind
2.	Brakes	On
3.	Control Stick	Held fully back
4.	Temperatures & Pressures	Check in Limits
5.	Throttle	3000 RPM (Rotax) or Set 2000 RPM (Jabiru)
6.	Ignition Circuits	Check – Alternately switch off each ignition circuit in turn. Max allowable RPM drop when running on one system is 300 RPM (Rotax) or 100 RPM (Jabiru)
7.	Temperatures & Pressures	Check still in limits

8.	Throttle	Set back to idle

NORMAL OPERATING PROCEDURES

Checklist Procedures

Taxiing

1.	Steering	Left and Right
2.	Compass	Turn left - decrease, turn right -increase
3.	Slip Indicator	Turn left -slip right, turn right - slip left.

Vital Actions

Before Take - off

1.	Trim	Set neutral
2.	Fuel	On, sufficient
3.	Instruments	Altimeter set, engine temperatures
4.	Harness	Tight
5.	Controls	Full and free
6.	Runway and approach	Clear

During Take - off

1.	Engine	Developing full rpm
2.	Instruments	A.S.I. reading

Climb - Out and Cruise

1.	Engine	Monitor Engine temps. particularly exhaust gas (and CHT on Jabiru)after changing throttle setting.

Before Landing

1.	Fuel	On - sufficient for overshoot.
2.	Instruments	Altimeter set
3.	Harness	Tight

After Landing & Shut Down

1.	Position	Clear of runway, into wind.
2.	Engine	Run for short period at 2500 RPM (Rotax) or 1500 RPM (Jabiru)
3.	Throttle	Closed
4.	Ignition	Off.
5.	Chocks / Tie downs	In position.

Engine Operation

Precautions Before Starting

Before any attempt is made to start the engine, the following important rules must be observed:-

1. Always treat the propeller as live, even with the magneto switch off.

2. Before attempting to start the engine ensure there is an appropriately qualified person in the cockpit and that the aircraft's brakes are firmly applied. Alternatively ensure chocks are placed in front of the mainwheels. These should have rope attached so that they can be pulled clear with the propeller rotating. If it is intended to carry out ground running at high engine power, chocks should always be used and in addition it is strongly recommended that the aircraft is secured to a substantial structure by the tailwheel assembly. At high RPM, the propeller could generate well over 300lbs thrust.

3. Ensure that all spectators are behind the line of the propeller. A broken propeller blade will project forward of its line. This rule also applies to taxiing.

4. Always start the engine with the throttle in the idle position.

5. If at all possible, have a fire extinguisher available close by.

6. Monitor engine temperatures.

7. If the engine refuses to start, refer to the Engine Maintenance Manual (See Supplement 2).

Starting Procedures

Carry out relevant checklist procedures.
Ensure that THROTTLE lever is in idle position, i.e. closed.
Set CHOKE control to fully open. (This may not be necessary if engine is warm).
Ensure that battery master switch is ON, i.e. UP.
Ensure that ignition switches are ON, i.e. UP.
Start the engine - Push start button until engine starts.

Running

Immediately after the engine starts, open the throttle slightly. As it warms up, gradually close the choke whilst monitoring the engine for smooth running. Let the engine run at low power – initially 2000 RPM for Rotax or 1200 RPM for Jabiru - until minimum operating temperatures are reached. Do not allow the engine to idle at speeds which produce excessive vibration.

Engine Operation

Running - continued

Depending on the OAT, it could take several minutes before minimum operating temperature is reached, especially with water cooled systems (i.e. Rotax). - refer operating limitations.

DO NOT operate the engine above 2500RPM (Rotax) or 2000RPM (Jabiru) until minimum temperatures have been reached.

DO NOT operate the engine with the aircraft stationary on the ground at greater than 4000 RPM for Rotax engines or 3300 RPM for Jabiru engines.

Always perform engine run up into wind.

Stopping

Reduce engine speed and allow to run at smooth idle speed for 2 or 3 minutes before stopping. (This allows the temperature distribution to stabilize and reduces the risk of thermal shock during cooling).

Close THROTTLE fully and switch off IGNITION
(Avoid stopping engine suddenly whilst running at high RPM)

Close FUEL COCK

Switch off MASTER SWITCH

Ground Operation

Taxiing

The Sherwood Ranger has been demonstrated capable of successful ground control in wind velocities exceeding 20 MPH, however taxiing speed should be reduced and care taken accordingly in wind strengths exceeding 10 MPH.

To assist in preventing the aircraft nosing over, it is generally advisable to hold the control stick fully backwards during taxi-ing and any time when the engine is running, particularly when the throttle is opened. This puts a down load on the tailplane, counteracting the overturning moment generated by the thrust from the propeller and drag from the wheels. When taxiing downwind in strong wind or gusty conditions, there may be a tendency for the wind to generate lift on the tail surface with the elevator in the full up position, in which case the stick should be moved forward sufficiently to prevent this.

Ailerons should be held neutral whenever facing or taxi-ing into or down wind. As a turn commences cross wind, move the stick towards the wing tip which is coming into wind. Up aileron

Taxiing – Continued

will be applied to that wing, reducing the possibility of sufficient force being generated to overturn the aircraft. This means that when turning from a down wind direction, the stick will follow the direction of the turn, and conversely when turning from an into wind direction, the stick would be moved in the opposite direction to the turn.

Directional control during the take-off and landing run, or during taxiing is effected by the rudder pedals, moving the left rudder forwards will turn the aeroplane left, and vice versa. At high airspeeds or large throttle openings, the airflow over the rudder generates the necessary turning force, otherwise it is supplied by the steerable tailwheel. Differential use of the heel brakes can also be used to assist manoeuvring especially in confined spaces.

To slow the aeroplane down by use of brakes apply both brakes equally and at the same time. Applying greater force to one or other brake will induce the aircraft to turn.

Caution! applying the brakes too harshly may tip the aeroplane onto its nose, especially if the wind is on the tail quarter. It is advisable not to use brakes unless necessary.

When taxiing on a long straight, it is good practice to steer the aeroplane on a gentle zig-zag course to clear the blind spot forwards of the nose.

In the interests of safety and good airmanship, the following rules should be adhered to before and during taxi-ing:-

1. Ensure that chocks have been removed from wheels.

2. Open the throttle gradually and slowly, if the aircraft does not begin to move after about the 1/2 throttle position, stop the engine and investigate for obstructions such as chocks, long grass, wheel in a ditch, etc.

3. Ensure that the area ahead of the aircraft is clear of persons and unobstructed.

4. Never Taxi faster than walking pace.

5. If unable to stop, for any reason, i.e. strong following wind, steep gradient, jammed throttle or brake failure, switch off engine and steer for largest open space. Try to turn the aircraft into wind before coming to rest.
6. Never taxi in a confined space or within the close vicinity of persons. Try to ensure that the direction of movement is always away from persons, particularly crowds.
7. If a collision is obviously inevitable, switch off engine and try to swing the aircraft around at the last second such that the wing tip strikes first and absorbs the impact.

Power check

It is important to check full-throttle engine operation early in the take-off run. Any sign of rough engine operation or sluggish engine acceleration is good cause for discontinuing the take-off. Smooth and uniform throttle application should be used to ensure best engine acceleration and give long engine life.

High throttle run-ups over loose gravel are especially harmful to propeller tips, avoid take off runs over this type of surface if at all possible.

Flight Operation

Take Off - Normal take off

Note :- Before takeoff, always ensure that the wind velocity is within the limits of aircraft and piloting skills. As a general rule, do not operate in wind speeds higher than 20 MPH.

Conventional tailwheel techniques are used during take-off.

Before beginning the roll, align the nose of the aircraft with the take-off direction, as near into wind as possible. Choose some fixed object ahead with which to maintain directional reference.

With the stick full back, open the throttle slowly and progressively, maintaining directional control with the rudder. As the aircraft starts to accelerates, gently push the stick fully forwards until the tailwheel lifts clear of the ground. Gradually back off the forward stick so as to maintain the flying attitude. Be ready to prevent the aircraft from nosing over due to retarding action on the wheels caused by long grass or ditches etc., by applying the necessary amount of backward movement of the stick.

As the tailwheel rises, there may be a tendency to swing due to propeller gyroscopic, torque and slipstream effects. Rudder will have to be applied to counteract this. Keep the nose aligned with the previously fixed object during the take-off run by use of the rudder.

The acceleration will be very rapid, and the aircraft will lift from the runway as the airspeed passes through about 35 - 40 MPH indicated airspeed. Once airborne, allow airspeed to increase to 55 - 60 MPH and adopt the climb attitude to maintain.

Take Off - Soft field or long grass take off

Use similar techniques, but to counteract the nose over moment caused by increased mainwheel drag, maintain the tailwheel just clear of the ground during the take-off roll. The aircraft will become airborne at a lower flying speed, and it will be necessary to ease the stick forward to allow acceleration to the normal climb speed.

Note:- The take-off run may be longer. It is recommended that for this type of operation, the aeroplane be fitted with the larger mainwheel tyre option, and flown as lightly loaded as possible.

NORMAL OPERATING PROCEDURES

Take Off - Crosswind take off

The aeroplane has been demonstrated to be capable of operating in cross winds of 10 MPH. without undue piloting skills being required. Operation in higher cross wind velocities will depend on pilot skill.

At the start of the take-off run, apply full up aileron to the into wind wing, i.e., control stick into wind. As speed builds up, reduce aileron to maintain the wings level. In a strong cross wind, it may be necessary to allow slight bank into wind to prevent drift.

Allow the aircraft to accelerate to a speed slightly higher than normal by maintaining the tailwheel as high a possible, but without endangering the propeller by ground proximity. Fly the aircraft positively off the ground to prevent possible settling back to the runway while drifting. When clear of the ground make a coordinated turn into the wind to correct the drift.
Note: The aircraft will tend to weathercock into the wind, especially as the tail lifts; be prepared to correct with rudder.

Climb

A normal climb speed of 55 - 60 MPH is recommended once all ground obstacles have been cleared. This speed offer good visibility and rate of climb, plus adequate engine cooling. The best angle of climb for obstacle clearance will be obtained at 50 - 55 MPH. Carefully monitor engine temperatures and avoid overheating.

It is not normally advisable to make prolonged climbs at full throttle. Throttling back above 1000ft above ground level to a power setting which still gives an acceptable climb rate will give greater economy, increase engine life and decrease the noise factor.

Cruise

The recommended cruise speed for the aircraft is approximately 70 MPH.

Always approach the desired cruising speed from a slightly higher speed, this will produce a more efficient aircraft attitude. Trim out using the cockpit elevator trim tab, otherwise stick trim forces are very light.

Mixture control is not fitted and consequently operating at high altitude will cause the engine to run rich. In general it will be found that engines adjusted in accordance with the maintenance manual for particular ground level conditions will operate satisfactorily up to 5000ft above ground level.

Monitor engine temperatures regularly, particularly the exhaust gas temperature during a change in throttle setting.

WARNING:- Avoid cruising at any engine RPM which induce vibration.

NORMAL OPERATING PROCEDURES

Descent

Since the standard aircraft is not fitted with carburettor heat control, it is advisable to carry out descent with power on whenever there is likely to be a risk of carburettor icing.

Carry out the before landing checklist procedures when in the downwind position.

Caution :- The engine will cool rapidly during a low power descent, apply power accordingly to prevent temperatures falling below minimum operating. Do not exceed limit speeds shown in Section 4.

In still air the aircraft has a best glide speed of approximately 60mph and will descend at around 700 feet per minute, giving a glide ratio of 7.5:1. The aircraft will thus cover approximately one mile for each 700 feet of height lost.

Turns

Turns are carried out as for a conventional 3 axis controlled aircraft. A high rate of roll is achieved by coordinating ailerons and rudder. **STEEP TURNS MUST NOT EXCEED 60 DEGREES OF BANK.**

Aerobatic manoeuvres

AEROBATIC MANEUVERS INCLUDING DELIBERATE SPINNING ARE NOT APPROVED.

Stalls

The stalling characteristics are docile at all throttle openings provided that the aeroplane is in balance on entry. A power off stall will result in the nose pitching down slightly at the break, coupled with a high rate of descent. A stall at high engine power may not produce a noticeable nose down pitch. The nose attitude will be very high and the aircraft may still be gaining height. Relaxing back pressure on the stick will give an immediate increase in speed and rate of climb. No stall warning device is fitted, however, a slight elevator buffet may be felt just before the stall.

Recovery from a power off stall is immediately effected by applying power and lowering the nose until flying speed is regained. Height loss is less than 50 ft. from initiation of recovery procedure.

Although the ailerons are effective in the stall, it is good aviation practice to counteract any tendency for a wing to drop by using <u>RUDDER</u> only, maintaining the ailerons central.

NORMAL OPERATING PROCEDURES

Landing

Normal Landing

Both power on and power off approaches at 55 - 60 MPH can be made, but whilst controlling the rate of descent with power will be found most comfortable and less demanding, it is strongly recommended that all pilots become thoroughly proficient at glide approaches, using sideslipping techniques to control the rate of descent. Reduce speed by 5 MPH as the threshold is crossed. Increase all speeds by 5 - 10 MPH in turbulent conditions.

It is good practice to contact the ground at as low a speed as possible. Ideally, the main wheels and tailwheel will touch together, with the stick full back. Close the throttle immediately that the main wheel have touched the ground and maintain directional control using rudder until the aircraft has stopped.

Taxi clear of the runway.

NOTE:- In common with all tailwheel aircraft, if the mainwheels touch down before the stick is full back, and whilst the aircraft is in a flying attitude, the tail will descend rapidly thus increasing the angle of attack of the wings. Unless checked immediately by forward movement of the stick, this will lead to a situation where the aircraft balloons into the air with a high nose attitude and very low airspeed. If this occurs execute the Baulked Landing Procedure.

Short field landing

When making a landing where obstacle clearance or ground roll is a factor, a powered approach with the normal approach speed reduced by up to 5 MPH. will produce the best results. Control the speed so that the aeroplane is almost stalled at the round out. Close the throttle and apply full up elevator. Hold full up elevator and brake as heavily as possible without nosing over.

Land directly into wind if possible. The approach path can be made steeper by side-slipping.

Caution :- Exercise care when flying the approach at reduced airspeeds in turbulent conditions.

Crosswind landing

When landing in a strong crosswind, the wing down or crab method of drift control can be used. Judge the wind velocity and establish the drift early in the approach. The success of the landing will depend almost entirely on the skill and technique of the pilot. The maximum demonstrated crosswind is 10 MPH. Do not operate in cross-wind or turbulent conditions until fully familiar with the flying characteristics.

Baulked landing

If it is decided that a landing cannot be made successfully from a particular approach due to such reasons as obstructed runway, overshoot picture or balloon landing, apply full power immediately and establish a positive rate of climb at 55 - 60 MPH.

Side slips to landing

Side slips are effective in either direction in the Sherwood Ranger, but see caution below. Rapid descents with high sink rates can be obtained through a properly executed slip. It is recommended, however, that slips are practiced at a safe altitude until the pilot is familiar with the aircraft. A safe slip speed will depend on load, pilot proficiency and local conditions, but in general, 5 MPH should be added to the normal approach speeds.

LIMITATIONS

Introduction

This section presents the operating limitations, instrument markings and basic placarding necessary for the safe operation of the aircraft, its engine, standard systems and standard equipment.

The aircraft must only be operated in day, V.M.C. conditions, and over terrain where, in the event of engine failure during any phase of flight, a safe landing can be made.

Airspeed Limitations

Airspeed limitations and their operational significance are shown below:-

SPEED		IAS(MPH)	REMARKS
VNE	Never exceed speed	100	Do not exceed this speed in any operation .
V_{NO}	Maximum structural cruising speed	70	Do not exceed this speed except in smooth air, and then only with caution.
VA	Manoeuvring speed	80	Do not make full or abrupt control movements above this speed.

Airspeed Indicator Markings

MARKING	RANGE IAS(MPH)	SIGNIFICANCE
N/A	38 - 80	Normal operating range. Lower limit is V_S (stall speed). Upper limit is maximum manoeuvring speed.
N/A	80 - 100	Operations must be conducted with caution and only in smooth air.
Red Line	100	Maximum (never to exceed) speed for any operation.

Engine Limitations & Instrumentation

Rotax 582 UL DCDI Mod 99 (Blue Top)

Operating Limits		
Maximum Take-Off RPM	6400 RPM (5 min limit)	
Cruise RPM	Avoid any RPM band which produces excessive vibration	
Coolant Temperature	MAX 80 °C (175 °F)	MIN 65 °C (150 °F)
Maximum Exhaust Gas Temperature	650 °C (1200 °F)	

Engine Instruments			
Instrument	**Normal Operating Range**	**Caution Range**	**Max Limit (Red Line)**
Tachometer	2500 to 6000 RPM	6000 to 6400 RPM	6400 RPM
Water Temp. Gauge	60 to 80 °C	80 to 90 °C	90 °C
EGT Gauge	590 to 650 °C	N/A	650 °C

Jabiru 2200A

Operating Limits		
Maximum Take-Off RPM	3300 RPM	
Maximum Oil Temperature	Absolute 118 °C	Continuous 100 °C
Minimum Oil Temperature for Operation at Full Throttle	40 °C	
Oil Pressure Max / Min	MAX 76 psi	MIN 31 psi*
Maximum Cylinder Head Temperature (1)	Absolute 200 °C	Continuous 180 °C

* Min Oil pressure for ground running only is 11 psi. Do not operate at high power below 31psi
(1) Operation between 180 and 200 °C is permissible for a maximum of 5 min.

Engine Multifunction Display		
Instrument	**Display Range**	**Limit (Red Light)**
Tachometer	0 to 3500 RPM	3300 RPM
Oil Temperature	0 to 130 °C	120 °C
Oil Pressure	0 to 100 psi	Below 31 or Above 76 psi
CHT	0 to 250 °C	200 °C

Weight Limits

Maximum take-off weight	990 lbs (450 kg)
Maximum pilot weight (Rear cockpit)	198 lbs (90 kg)
Minimum pilot weight (Rear cockpit)	120 lbs (55 kg)
Maximum pass. weight (Front cockpit)	198 lbs (90 kg)
Minimum pass. weight (Front cockpit)	0 lbs (0 kg)

Centre of Gravity Limits

Forward	3.8 inches (96 mm.) aft of datum
Aft.	7.7 inches (196 mm.) aft of datum

Reference Datum

The reference datum is the centre line of the fuselage cross member which carries the main undercarriage leg and lower wing main spar attachments.

Manoeuvre Limits

The aircraft is not cleared for Aerobatic Manoeuvres. The following manoeuvres are approved:-

Manoeuvre	Recommended Entry Speed
Steep turn (not exceeding 60° angle of bank)	65 - 70 MPH
Stalls	Slow deceleration
Abrupt use of the controls is prohibited above	80 MPH
Spins	Prohibited

Note : - SPINS ARE PROHIBITED. In the case of an inadvertent spin, standard spin recovery techniques should be used.

Flight Load Factor Limits

Flight load factor (Gross weight)	+ 4 g - 2 g

Fuel Limitations

Maximum usable Fuel (Single tank)	9 Imp. Gallons	40 ltrs
Unusable Fuel	Negligible (Approx 0.5 ltrs)	

Placards

The following information is displayed in the aircraft in the positions described :-

1. In full view of the pilot (Rear cockpit)

Maximum pilot weight (Rear cockpit)	198 lbs (90 kg)
Minimum pilot weight (Rear cockpit)	120 lbs (55 kg)
Maximum pass. weight (Front cockpit)	198 lbs (90 kg)
Minimum pass. weight (Front cockpit)	0 lbs (0 kg)

Max. manoeuvring speed	VA	80 MPH IAS
Never exceed speed	VNE	100 MPH IAS
Stall speed	VS	40 MPH IAS
Aerobatic manoeuvres (including spins)	PROHIBITED	
Max. flight load factors	+ 4 g - 2 g	

2. Near each fuel tank filler.

Rotax Engines
Fuel – 100LL / UL91 / Unleaded

Jabiru Engines
Fuel – 100LL / UL91

3. Near oil tank filler (Rotax Engines Only)

Oil – 2 Stroke Synthetic

4 Near fuel Selector (In Cockpit)

ON OFF

Placards (Continued.)

5. Near Trim Lever (In Cockpit)

< Nose Dwn. Nose up >

6. On Rear Instrument Panel as follows: -

(a) Near each ignition switch. (and battery master switch)

ON
|__|
| |
OFF

(b) Below engine start button.

ENGINE START

(c) Below Water Temperature gauge. (Rotax Engine Only)

WATER TEMP.
MAX. 90° C

(d) Below Exhaust Gas temperature gauge (Rotax Engine Only)

EXH.GAS
MAX.650° C

(e) Below engine multi function display unit (Jabiru Engine Only)

Instrument	**Limit (Red Light)**
Tachometer	3300 RPM
Oil Temperature	120 °C
Oil Pressure	Below 31 or Above 76 psi
CHT	200 °C

IF UNIT OR PRIMARY POWER SUPPLY FAILS IN FLIGHT LAND AS SOON AS PRACTICABLE

EMERGENCY PROCEDURES

Introduction

This section recommends procedures that will enable the pilot to cope with emergencies which may be encountered during operation of the aeroplane. If proper pre-flight inspections, operating procedures, and maintenance practices are used, emergencies due to airframe or engine malfunction are extremely unlikely. Likewise, careful flight planning and good pilot judgment can minimise enroute weather emergencies. However, should any emergency develop, the guide-lines in this section should be considered and applied as necessary to correct the problem.

Airspeeds for safe operation (IAS)

Engine failure after take-off.	55 - 60 MPH
Manoeuvring speed	80 MPH
Maximum glide	60 - 65 MPH
Precautionary landing with engine power	50 - 55 MPH
Landing without engine power	55 - 60 MPH

Engine Failures

See EMERGENCY CHECKLIST PROCEDURES for appropriate checks.

If the engine fails during the take-off, prior to lift-off, the aeroplane should be stopped as soon as possible. Carry out appropriate procedures. In cases of partial failure, resulting in slight loss of power, the pilot may have the option of continuing the take-off or aborting it. Obviously this is a decision that must be made by the pilot in light of existing conditions, however, an aborted take-off in most case is the safest option.

If the engine fails, either completely or partially, shortly after take-off, it is essential that the nose of the aeroplane be lowered promptly so that a safe airspeed can be maintained, see section 3, Airspeeds For Safe Operation. At low altitudes, in most cases, the aeroplane should be flown straight ahead for a landing, with only small directional changes to avoid obstructions. Seldom is there sufficient altitude available for a 180° gliding turn back on the runway. Carry out the appropriate checks if time permits. These checklists are based upon the assumption that the pilot will have adequate time to secure the fuel and ignition system prior to touchdown, however, the overriding priority is to maintain control of the aeroplane.

If the engine fails in flight (complete loss of power) the best glide speed as shown in Speeds For Safe Operation, should be established as quickly as possible. Turn the aircraft downwind, and select a suitable landing area. If time permits an effort should be made to determine the cause of the engine failure and an engine restart should be attempted as per the appropriate checklist. Otherwise prepare for a forced landing.

Forced landings

If the engine cannot be restarted and a forced landing is imminent, select a suitable landing zone and carry out the checks as listed in the Emergency landing without engine power, checklist. Give priority to maintaining control and landing into wind.

If engine power is available and a landing is to be attempted at an area other than an airport, the landing area should be observed from a low but safe altitude. Inspect the terrain for obstruction and surface conditions prior to attempting a landing. Carry out checks as shown in the Precautionary landings with engine power, checklist.

NOTE:- If a landing is made on a very rough surface, it is possible that the aircraft will nose over and come to rest upside down. If this happens, hold onto the structure whilst releasing harness to prevent possible injury caused by falling onto head or neck.

Flight in Icing Conditions

Flight in known icing conditions is prohibited, however, carburettor icing may be encountered at any time. Normally, the first indications of carburettor ice is a drop in engine RPM, which may be accompanied by slight engine roughness.

Applying a higher throttle setting, or changing altitude, may cure this, however, since carburettor heat is not available, a forced landing without power may become necessary and should be planned for.

Carburettor icing is more likely in humid conditions. In view of this flight close to the base of cloud or prolonged ground operation on damp grass should be avoided.

Airspeed Indicator Failure

If erroneous readings are suspected on the instruments associated with the pitot static system (airspeed indicator, altimeter and vertical speed indicator), a possible cause is ice or water accumulation in the pitot head,

Obviously in a situation such as this, a landing should be planned as soon as is practicable. With the throttle closed, a good approximation of airspeed can be obtained from the sound of the air passing through the rigging wires and structure. Practice flying without reference to the ASI at safe altitude.

Engine Fires

See EMERGENCY CHECKLIST PROCEDURES.

EMERGENCY PROCEDURES

Emergency Checklist Procedures

Engine failure / loss of power during takeoff run

1.	Throttle	Idle
2.	Ignition	Off
3.	Fuel	Off
4.	Position	Roll Clear of Runway (If Possible)

Engine failure immediately after take off

1.	Airspeed	55 - 60 MPH
2.	Fuel	Off
3.	Ignition	Off
4.	Harness	Tight
5.	Landing	Straight Ahead

Engine failure during flight

1.	Airspeed	60 - 65 MPH
2.	Select landing area	Unobstructed- into wind
3.	Fuel	On
4.	Throttle	Open
5.	Choke	On / Off
6.	Ignition	On
7.	Starting	Try engine start if prop. stopped

NOTE:- If propeller stops, it may be possible to re-start by diving aircraft. Do not attempt this below 1500ft A.G.L. Observe airspeed and flight load factor limitations.

8.	If Engine fails to start	Prepare for force landing without power

NOTE:- Gliding distance with no wind is approximately 1 mile for each 700ft of altitude above terrain.

Emergency landing without engine power

1.	Airspeed	55 - 60 MPH
2.	Fuel	Off
3.	Ignition	Off
4.	Battery master (If fitted)	Off
5.	Harness	Tight
6.	Touchdown	Into wind - as slow as possible

EMERGENCY PROCEDURES

Emergency Checklist Procedures

Precautionary landing with engine power

1.	Select field	Fly over, noting terrain and obstructions. Plan circuit and final approach into wind.
2.	Harness	Tight
3.	Airspeed	50 - 55 MPH
4.	Touchdown	Slow as possible
5.	Fuel	Off
6.	Ignition	Off

Engine fire (on ground)

1.	Fuel	Off
2.	Power	High as possible until engine stops.
3.	Ignition	Off
4.	Crew	Evacuate aircraft.
5.	Position	Pull clear of other aircraft
6.	Action	Extinguish fire

Engine fire (in flight)

1.	Fuel	Off
2.	Ignition	Off
3.	Action	Side slip to prevent flames spreading to cockpit. Attempt to blow out by increasing airspeed to limit.
4.	Forced landing	Execute (as described in without power)

PERFORMANCE SPECIFICATIONS

GROSS WEIGHT	990 LBS (450 KG.)
TOP SPEED AT SEA LEVEL	80 MPH
RATE OF CLIMB AT SEA LEVEL	Approx 650 FT/MIN
TIMED CLIMB TO 1000 FEET ABOVE SEA LEVEL	2 min (At Max Wt)
TAKE OFF: (Short grass)	
Ground Roll	60 M (198 ft)
Total distance over 50ft obstacle	265 M (870 ft) Rotax Engine 275 M (902 ft) Jabiru Engine
LANDING: (Short grass)	
Ground Roll	80 M (260 ft)
Total distance over 50ft obstacle	295M (968 ft) Rotax Engine 315M (1033 ft) Jabiru Engine
STALL SPEEDS:	
Power Off	40 MPH
Power On	38 MPH
POWER LOADING	15.23 lbs/b.h.p. (Rotax) 12.37 lbs/b.h.p. (Jabiru)
FUEL CAPACITY TOTAL	40 ltrs
BASIC EMPTY WEIGHT	Max. Rotax 572 lbs. 260kgs Max. Jab2200 589lbs. 268kgs
USEFUL LOAD	Min 400 lbs. 182 kg.

Performance specifications are based upon standard atmosphere zero wind and gross weight condition

<u>WARNING.</u>
Performance figures can vary with any aircraft depending on pilot skill, weight, c of g, air temperature, pressure, humidity, surface condition, wind speed, turbulence and wind shear conditions. Kit built aeroplanes may also vary substantially. It is the pilot's responsibility to asses these factors before flying.

WEIGHT AND BALANCE

Introduction

As with any other flying machine, it is essential that the balance of the aeroplane is correct, and the maximum authorised weight (MAW) is not exceeded. Flying with the centre of gravity (C of G) outside specified limits is potentially hazardous; the stability and control of the aircraft may be seriously impaired. It is most likely that under all normal loading conditions the limits will not be exceeded, however, it is essential to become familiar with procedures for calculating the C of G, and aware of factors which influence it.

General

To enable accurate calculations to be made, it is necessary to know the weight of the basic aeroplane, and the position of its C of G relative to the datum point. This is determined by weighing the aeroplane and producing a Weighing Report, from which, a Weight and Centre of Gravity Schedule can be compiled. These documents contain the information necessary to calculate the loaded C of G. The maintenance manual gives details of how to weigh the aeroplane and produce them.

The aeroplane will have been weighed and a Weighing Report produced, at production. It should be re-weighed at the interval specified by the appropriate airworthiness body in the country where the aircraft is registered and operated, or at any time after major repair or modification work, including painting, or the addition / removal of permanently fitted equipment has been carried out.

A copy of the latest Weight and Centre of Gravity Schedule should be inserted at the back of this manual and forms Appendix 2. It relates only to the specific aeroplane for which this manual is applicable. It should be noted that certain placards (refer to Section 4) will require to be amended / replaced in the event of a change to the aircraft's total basic weight.

Note :- The basic aeroplane is defined as the aeroplane fitted with minimum equipment. The basic aeroplane weight includes the weight of unusable fuel and all essential fluids.
The empty weight is the basic aeroplane weight, plus the weight of optional equipment and fixed ballast, fitted to that particular aeroplane.

The weight and position of the load that the aeroplane is to carry will affect its loaded C of G. The load can be split into two types:-

1) The variable load, which will depend upon the particular role for which the aeroplane is equipped. It will consist of the pilot plus any optional equipment which is fitted. Items and their relevant arms are shown in Part B of the Weight and C of G Schedule.

2) The disposable load, which consists of the weight of fuel, other consumable fluids, and passengers, and is shown under Part C of the Weight and C of G Schedule.

Ready to fly weight is obtained by adding the variable and disposable loads to the basic aeroplane weight. The important C of G position is that obtained with the aircraft in this condition, and will vary depending on the weight and position of these loads.

General (Contd.)

Note:- Although different regulations may apply in other countries, British Civil Airworthiness Requirement, section "S", with which microlight aircraft operated in the U.K. must comply, stipulates that the empty aeroplane weight, plus the weight of full fuel, plus the placarded maximum weight of crew and passengers, must not exceed the Maximum Authorised Weight (MAW). This means that it is not possible to carry additional fuel instead of a passenger, or carry additional optional equipment instead of full fuel, even though operating well below the (MAW). In addition, the C of G must remain within permitted limits whilst carrying any placarded combination of pilot weight, passenger weight and fuel load, without the requirement for removable ballast. Where optional equipment is fitted, it may be necessary to fit fixed ballast to achieve this condition, see maintenance manual for details.

By knowing the weight and C of G of the aeroplane in its basic condition, and the weight and position relative to the datum, of the variable and disposable items , it is possible, by calculation, to determine the position of the loaded C of G relative to that datum.
Obviously the further the load is away from C of G, the more it will influence its position. A heavy load placed on the C of G will not cause a change in the C of G, however a relatively light load placed at the tail or nose of the aircraft, could cause significant change. Bear this in mind if repairs, modifications or equipment installations are carried out.

In general, it is only necessary to investigate the maximum weight and maximum fore and aft C of G positions.

With the Sherwood Ranger, the maximum forward position will occur under the following loading conditions:-

1. Minimum weight pilot. (rear cockpit) 55 kg. (121 lbs.)
2. Maximum weight passenger (front cockpit) 90 kg. (198lbs).
3. Max. fuel.

The maximum aft or rear C of G position will occur under the following conditions:-

1. Maximum weight pilot. (rear cockpit) 90 kg. (198 lbs.)
2. No passenger (front cockpit).
3. Min fuel

If calculations show that the C of G limits are not exceeded at either of these loading conditions, it can be assumed that any combination of loads which do not exceed placarded figures or MAW will fall within.

The MAW should not be exceeded under the following conditions :-

1. Maximum weight pilot. (rear cockpit) 90 kg. (198 lbs.)
2. Maximum weight passenger (front cockpit) 90 kg. (198lbs).
3. Maximum fuel.

WEIGHT AND BALANCE

Determining The Weight and Centre of Gravity of The Loaded Aircraft

Whenever the aeroplane is weighed, or optional equipment is fitted or removed, the weight and centre of gravity position of the loaded aeroplane should be checked for the extremes of loading conditions shown above. It may be necessary to fit ballast at the foreword or rear positions so that the C of G remains within limits.

To determine the loaded weight and centre of gravity, a load sheet should be prepared for each loading condition, as shown in the Sample Load Sheet Calculation, page 7-4.
A blank Load Sheet is provided in Appendix 2. This can be copied as required.

Enter the data and calculate in the appropriate columns as follows :-

1. From the Weight and Centre of Gravity Schedule, Part A, obtain the weight, the arm (C of G), and the total moment about the datum, of the basic aeroplane.

2. From the Weight and Centre of Gravity Schedule Part B, obtain the weight, arm and moment, of the applicable variable load items.

Note :- The arm is the distance of the load from the datum. The moment is the arm multiplied by the weight. Some arms, and consequently moments, may be negative.

3. From the Weight and Centre of Gravity Schedule Part C, obtain the weight, arm and moment, of the applicable disposable load items.

4. Add the weights of the basic aeroplane, the variable load items and the disposable load items to give the total weight.

This is the Loaded Weight of the aeroplane and must not exceed the MAW.

5. Add the moments of the basic aeroplane, the variable load items and the disposable load items to give the total moment.
Divide the total moment by the total weight to give the total arm.

This is the position of the loaded C of G. It must lie within the limits relative to the datum as shown in Section 3.

SAFETY INFORMATION

Introduction

This section on safety information has been added to refresh owners and pilots knowledge of a number of safety subjects applicable to any type of flying. In addition, specific information is given on type conversion Sherwood Ranger.

It is strongly recommended that these subjects be reviewed periodically.

General Considerations & Precautions

The Flying Site

The Sherwood Ranger is capable of operating from short grass / gravel airstrips as well as paved runways. This said it is the responsibility of the pilot to consider the suitability of each and every site from which the aircraft is to be operated. The following information is offered purely for guidance.

Runways should be long enough and have sufficient clear areas at either end to allow for possible emergencies such as engine failure on take-off or brake failure on landing. The runway surface should be considered in terms of ruts or pot-holes, loose stones and length of grass. With regard to grass consideration should also be given to whether it is wet or dry and if wet how soft the ground is. Operating from wet grass is likely to increase take-off and landing distances considerably. The aircraft should not be operated from waterlogged strips. The circuit area should be free from turbulence producing obstructions such as hills, large buildings or tall trees. It should be possible to carry out a safe force landing from any phase of the flight.

The Weather (General Considerations)

The Sherwood Ranger is only approved for flight by day in Visual Meteorological Conditions. It is therefore vital that weather forecast information is obtained and considered before each flight. Particular attention should be paid to forecast cloud base, visibility and wind speeds. Temperature and humidity should also be considered especially with regard to both airframe and carburettor icing. The aircraft is not approved for flight in cloud or known icing conditions. (See also the advice below with regard to flight in turbulent conditions)

Turbulent Weather

All Microlight aircraft are particularly susceptible to turbulence. A complete weather briefing prior to beginning a flight is an essential element of a safe trip.

Updating the weather information enroute is another safety aid. However, the wise pilot also knows weather conditions change quickly at times and treats weather forecasting as professional advice rather than an absolute fact. He obtains all the advice he can, but stays alert by using his knowledge of weather conditions.

Thunderstorms, squall lines and violent turbulence should be regarded as extremely dangerous and avoided. The hail and tornadic wind velocities encountered in thunderstorms can destroy any aeroplane, just as tornadoes destroy nearly everything in their path on the ground.

Turbulent Weather (Continued)

NOTE:Conditions which are regarded as slightly turbulent in a light aircraft can be severe in a Microlight.

A roll cloud ahead of a squall line or thunderstorms is visible evidence of violent turbulence, however, the absence of roll cloud should not be interpreted as denoting the lack of turbulence.

Flight in turbulent air

Even though flight in severe turbulence is to be avoided, flight in turbulent air may be encountered under certain conditions.

Flying through turbulent air presents two basic problems, to both of which the answer is correct airspeed. If you maintain an excessive airspeed, you run the risk of structural damage or failure, or if your airspeed is too low, you run the risk of stalling.

If turbulence encountered in cruise or descent becomes uncomfortable to the pilot or passenger, the best procedure is to reduce speed to VNO, the maximum turbulent air penetration speed, listed in the limitations section of this handbook. This speed gives the best assurance of avoiding excessive stress loads, and at the same time provides a margin of airspeed to prevent inadvertent stall due to gusts.

Beware of over controlling in attempting to correct for changes in attitude. Applying control pressure abruptly will build up g-forces rapidly and could cause damaging structural stress loads. You should watch particularly your angle of bank, making turns as wide and shallow as possible, and be equally cautious in applying forward or back pressure to keep the nose level. Maintain straight and level attitude in either up or down drafts.
Avoid flight at low altitude over mountainous terrain, particularly near the lee slopes. If wind velocity near the level of the ridge is in excess of 25 knots and approximately perpendicular to the ridge, mountain wave conditions are likely over and near the lee slopes. If the wind velocity at the level of the ridge exceeds 50 knots, a strong mountain wave is probable with strong up and down drafts and severe or extreme turbulence, quite capable of destroying a microlight aircraft.

The worst turbulence will be encountered in and below the rotor zone which is usually 8 to 10 miles downwind from the ridge. This zone is characterized by the presence of "roll clouds" if sufficient moisture is available. Altocumulus standing lenticular clouds are also visible signs that a mountain wave exists, but their presence is likewise dependent upon moisture.

Mountain wave turbulence can, of course, occur in dry air and the absence of such clouds should be taken as any assurance that mountain wave turbulence will not be encountered. A mountain wave downdraft may exceed the climb capability of your aeroplane. Avoid mountain wave downdrafts.

Vortices - Wake Turbulence

Every aeroplane generates wakes of turbulence while in flight. Part of this is from the propeller or jet engine and part from the wing tip vortices. The larger and heavier the aeroplane, the more

Vortices - Wake Turbulence (Continued)

pronounced and turbulent the wakes will be. Wing tip vortices from large heavy aeroplanes are very severe at close range, degenerating with time, wind and space. These are rolling in nature from each wing tip. In tests, vortex velocities of 133 knots have been recorded. Exhaust velocities from large aeroplanes at take-off have been measured at 25 MPH, 2000 feet behind medium large aeroplanes.

Encountering the rolling effect of wing tip vortices within two minutes or less after passage of large aeroplanes is the most hazardous to light aircraft. This roll effect can exceed the maximum counter roll obtainable in an aeroplane. The turbulent areas remain for as long as three minutes or more, depending on wind conditions, and may extend several miles behind the aeroplane. Plan to fly slightly above or to the side when following large aircraft.

Because of the wide variety of conditions that can be encountered, there is no set rule to follow to avoid wake turbulence in all situations. Use prudent judgment and allow ample clearance, time and space following or crossing the wake of large aircraft and in all take-off, climb out, approach and landing operations. This information is particularly applicable to Microlight aircraft operating from airfields at the same time as general aviation aircraft.

The Aircraft

Obviously the machine should always be fully inspected in accordance with the maintenance manual and the engine run in accordance with the manufacturers recommendations. Any problems encountered during flight must be thoroughly investigated before further flight.

The Pilot

Probably the most important factors of all are the experience and fitness of the pilot. Ideally they should have previous experience on tail wheel type aircraft, (preferably of the older generation e.g. Auster, Tiger Moth, Piper Cub etc). It is very strongly recommended that any pilot who has not previously flown a tail wheel aircraft receives appropriate instruction from a suitably qualified flying instructor before flying the Sherwood Ranger.

In all cases it is essential that pilots are in current flying practice (preferably on a tail wheel type) and have read this manual thoroughly. Particular attention should be given to the section on below on “Type Conversion” prior to undertaking the first flight in a Sherwood Ranger.

The following should be considered with regard to the health and fitness of the pilot.

Medical Facts

Fatigue

Fatigue generally slows reaction times and causes errors due to inattention. In addition to the most common cause of fatigue, insufficient rest and loss of sleep, the pressures of business, financial

worries and family problems, can be important contributing factors. If your fatigue is marked prior to a given flight, do not fly.

Hypoxia

Hypoxia is simple terms is a lack of sufficient oxygen to keep the brain and other body tissues functioning properly. Wide individual variation occurs with respect to susceptibility to hypoxia. In addition to progressively insufficient oxygen at higher altitudes, anything interfering with the blood's ability to carry oxygen can contribute to hypoxia (anaemia, carbon monoxide, and certain drugs). Also alcohol and various drugs decrease the brain's tolerance to hypoxia.

Your body has no built in alarm system to let you know when you are not getting enough oxygen. It is impossible to predict when or where hypoxia will occur during a given flight, or how it will manifest itself. A major early symptom of hypoxia is an increased sense of well-being (referred to as euphoria). This progresses to slow reactions, impaired thinking ability, unusual fatigue, and a dull headache feeling.

The symptoms are slow but progressive, insidious in onset, and are most marked at altitude starting above 10,000 feet. Night vision, however, can be impaired starting at altitudes lower than 10,000 feet. Heavy smokers may experience early symptoms of hypoxia at altitudes lower than is so with non-smokers. It is unlikely that the Sherwood Ranger will normally be operated at sufficient altitude for hypoxia to become a problem.

Hyperventilation

Hyperventilation or over breathing, is a disturbance of respiration that may occur in individuals as a result of emotional tension or anxiety. Under conditions of emotional stress, fright, or pain, breathing rate may increase, causing increased lung ventilation, although the carbon dioxide output of the body cells does not increase. As a result, carbon dioxide is "washed out" of the blood. The most common symptoms of hyperventilation are, dizziness, hot and cold sensations, tingling of the hands, legs and feet, nausea, sleepiness, and finally unconsciousness.

Should symptoms occur, consciously slow your breathing rate until symptoms clear and then resume normal breathing rate. Breathing can be slowed by breathing into a bag, or talking out loud.

Alcohol

Common sense and scientific evidence dictate that you do not fly as a crew member while under the influence of alcohol. Even a small amount of alcohol in the human system can adversely affect judgment and decision making abilities.

Drugs

Self-medication or taking medicine in any form when you are flying can be extremely hazardous. Even simple home or over-the-counter remedies and drugs such as aspirin, antihistamines, cold tablets, cough mixtures, laxatives, tranquilizers, and appetite suppressers, may seriously impair the

judgment and co-ordination needed while flying. The safest rule is to take no medicine except on the advice of your Aviation Medical Examiner.

Type Conversion

It must be stressed that whilst the Sherwood Ranger is a very simple and easy aeroplane to fly, for safe and reliable operation, it requires similar levels of skill, discipline, airmanship and knowledge to that required for any tailwheel type light aircraft.

As a general guide, unless having carried out a dual check with a pilot suitably experienced on the Sherwood Ranger, pilots should have undertaken training to at least solo stage on tailwheel aircraft such as Chipmunk, Piper Cub, Auster or similar, and be in current flying practice, before attempting to fly the aeroplane.

It is strongly recommended that the aircraft is operated from an area, and in such a manner that in the event of engine failure during any phase of flight, the aircraft can be easily positioned such as to enable a glide landing to be carried out onto a suitable surface, preferably into wind. (Note:- An aircraft operating on a Permit to Fly is not allowed to overfly a congested area in the U.K.)

It is recommended that all pilots, irrespective of experience, should carry out their initial flying under the guidance and supervision of an appropriately rated flying instructor who has had flying experience in the Sherwood Ranger or similar type of aircraft.

The main characteristics which may differ slightly from the aircraft you have previously flown are detailed below.

Controls (Flying)

The controls are light, i.e. low stick forces, and sensitive.
There may be an initial tendency to over control.

Controls (Engine)

The throttle is on the left hand side on the standard aircraft, the control stick being operated with the right hand.

Cockpit Environment

Wearing a crash helmet with visor, slip stream and noise in an open cockpit can initially seem disconcerting, but soon becomes familiar. In particular, if your only experience is with four stroke engines, the high operating engine revs of a two stroke engine (Rotax 582 powered aircraft only) may seem to be excessive. Lots of practice taxi-ing will help. Also the ground below and the sensation of flying may seem different when not viewed through Perspex from an enclosed cabin.

SAFETY INFORMATION

Type Conversion (Contd.)

Take Off and Landing Conditions

In common with most Bi-Planes, the approach without power will be steeper than a clean flapless monoplane.

Use caution when landing on runways that are covered by water or slush which cause hydroplaning (aquaplaning), a phenomenon that renders braking and steering ineffective because of the lack of sufficient surface friction. Snow and ice covered runways are also hazardous.

Use caution when taking off and landing during high wind conditions. Also be aware of special wind conditions caused by buildings or other obstructions located near the runway in a crosswind pattern.

Take-Off Run

Unless experienced on tailwheel type aircraft, maintaining directional stability may be found difficult, particularly with a cross wind. A certain amount of anticipation is necessary and practice makes perfect.

Stalls, Spins and Slow Flight

Stalls, and slow flight should be practiced at safe altitudes to allow for recovery. Either of these manoeuvres should be performed at an altitude in excess of 2000 feet above ground level. Wing drops near the stalls should be corrected with rudder only. Maintain aileron neutral.

Spins are prohibited in this aeroplane. Since spins are proceeded by stalls, a prompt and decisive stall recovery protects against inadvertent spins.

Rules and Regulations

Below is a checklist of the recommended and legal requirements before your first flight in the Sherwood Ranger.

Recommended checklist:

1) Check all information issued by The Light Aircraft Company Ltd.

2) Read Sherwood Ranger Pilots Manual.

3) Read Sherwood Ranger Maintenance Manual.

4) Current solo experience on tailwheel aircraft. **OR**

SAFETY INFORMATION

Rules and Regulations (Continued)

5) Supervision by an appropriately qualified & experienced flying instructor.

6) Aircraft thoroughly inspected.

7) At least Third Party insurance.

Legal Requirements:

1) A current pilots licence and certificate of experience.

2) Aircraft registered and correct display of registration letters.

3) A current medical certificate.

4) The airfield or landowners permission to fly.

5) A current permit to fly.*

* (Or alternative authorisation from the appropriate airworthiness authority in the state of registration of the aircraft)

APPENDICES

APPENDIX 1 - AIRSPEED INDICATOR SYSTEM CALIBRATION INFORMATION

APPENDIX 2 - WEIGHT AND CENTRE OF GRAVITY DATA

APPENDIX 3 - INDEX OF AIRCRAFT SPECIFIC SUPPLEMENTS

APPENDIX 3

INDEX OF AIRCRAFT SPECIFIC SUPPLEMENTS

SHERWOOD RANGER MSN TLAC-1-XXX

A supplementary manual is provided which contains information applicable to any particular feature or use of the aeroplane which is not covered by the information and data included in the main Pilot's Operating Handbook

The particular supplements provided for this aircraft are recorded on the record below

It is the operator's responsibility to ensure that the content of all Supplements remains up to date. This should be done by reference to the relevant equipment manufacturers where appropriate

Supplement No.	Subject	Issued By	Date
1	Factory Fitted Optional Equipment	TLAC	
2	Engine Operation / Maintenance		